The Impact of the Introduction of Computers into the Faculty of Health Science:

A case study of organisational change

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A Dissertation submitted to the Department of Education, The University of Queensland, in fulfilment of the requirements for the degree Doctor of Philosophy.

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Abstract

In 1989 the University of Central Queensland, Faculty of Health Science, committed itself to a major instructional development project for its nursing education program. This thesis is a case study report documenting and analysing the management of the resulting project, funded by both the National Priority Reserve Fund (NPRF) and the University, to develop computer-based learning materials.

This study examines the project and its management from the perspective of the project participants to demonstrate the motivation for some of the decisions and their consequences. The study highlights some of the deficiencies of the project and its management, how they were resolved, and their consequences.

Initially the study was seen as simply descriptive, using qualitative techniques that allowed the participants to describe the process and its results. As the project, and this study, progressed it became increasingly obvious that the participants were involved in changing a system where the most obvious challenge was change itself. The changes experienced were not only technological, but included a redefinition of the nursing education program, new roles and directions for the University, and the necessity to adapt to new management techniques and structures.

This study includes excerpts from interviews with almost all of the staff and project students engaged in the first two years of the Health Science project, selected nursing students from the pre-registration program, staff and administrators from other areas of the University, and individuals involved as computer suppliers and consultants to the Project. Another source of data was the documentation generated by the operation and management of the project. This documentation included formal project papers and reports as well as day-to-day memorandums, electronic mail messages and other correspondence, formal and informal.

This study was not intended to judge the success of the CAL/CML activities within the faculty of Health Science. Inevitably, however, participants and observers ask whether the activities were a success. The response has been mixed, and may depend upon the respondent's degree of involvement in the CAL/CML activities. From a short term perspective:

- all of the staff and students use computers regularly,
- many of the staff *are* involved in developing computer-based instructional materials, and
- some staff are using the available tools to develop courseware that is very different from standard Health Science materials.

As well, from its own budget Health Science funds computer support positions and infrastructure (hardware, software and network) upgrading. It is budgeting for an additional student lab, and has begun investigating multimedia applications. As the CAL/CML Academic Coordinator (1993, personal communication, 23 February) indicated:

> In hindsight, we've done at least two-thirds of what we started out to do—and the base is there—staff are committed to CAL. Some of them will never do any CAL development themselves, but they are all committed…
>
> The real benefit is to the students. They are getting the benefit of the materials developed and in the pipeline… and the materials and ideas are being taken elsewhere, through consultancies, etc.

Issues addressed in the study include the novice's fear of computers, the use of electronic mail and related network services, the timing of change, project management, and staffing. Staffing issues include the use of students as technical experts, the acceptance of non-nursing staff in the development of nursing education materials, and the roles of academic and general staff in the development of instructional materials.

The strategic direction provided through the CAL/CML Project faltered as staff size increased and institutional priorities changed. The challenge for Health Science is to develop a new strategic plan that takes into account the current institutional priorities, student needs, and technological realities. The strategic plan must provide a blueprint for the future that is sufficiently flexible to adapt to changing circumstances, people, budgets, and technologies.

Finally, the Faculty must look at the form of its management as one of the strategies for achieving its goals. The conventional management structures of a hospital or teaching institute may not be appropriate for managing change in a technology-based organisation where change is constant.

Declaration

I declare that the material presented in this dissertation is, to the best of my knowledge and belief, original, except as acknowledged in the text, and that the material has not been submitted previously, either in whole or in part, for a degree at this or any other institution.

A. C. Lynn Zelmer

Contents

Acknowledgments

This study describes a major instructional development project. It provides details of the management and courseware development processes used with the project, and is illustrated with sample materials produced by the project. More importantly, it uses the voices of project participants (primarily the project managers, the nurse educators and others who developed the educational materials, and the students who used the materials, but also university administrators, support staff, and other colleagues, hardware and software vendors, and other members of the wider university community) to examine the broader effects and implications of the project.

I owe a great debt to all of these individuals. Without their active support and participation neither the project objectives nor this study would have been achieved. I owe a special debt to the Queensland staff of Apple Computer Australia, Inc., and their local vendor, the Byte Centre (Rockhampton) for their willing support and cross-fertilisation efforts.

The support provided by my co-supervisors—Dr Brian Carss, who more than anything helped define the nature of the problem, and Dr Mary Ann McLees, whose patient advice kept me focussed on the several goals involved—is gratefully acknowledged.

Professor John Smith, my Head of Department, deserves the credit for deciding that a Ph. D. holder would assist the Department's profile more than an author of yet another computing book—although in end he got both. My university colleagues and students are owed a special vote of thanks. Almost everyone works overtime, or waits a bit longer, when fellow workers and lecturers devote a major portion of their time to academic upgrading. The financial assistance for replacement staff provided by Department, Faculty, and University, while greatly appreciated, does not fully compensate. Another study could have been done on academic coping mechanisms as several of my colleagues within the Department simultaneously engaged in higher degree work. My thanks also to those who assisted with data collection, proof reading, and similar tasks—your assistance is greatly appreciated.

Finally, a vote of appreciation to my family. This is not the first Ph. D. in our household, nor will it likely be the last. Teamwork makes the job much easier.

Chapter 1

Introduction

> Go to the people, live among them, learn from them, love them.
>
> Start with what they know, build on what they have.
>
> But, of the best leaders, when the task is accomplished, the people all rejoice—
>
> ‘We have done it ourselves!’ (Harnar and Cummins, 1978).

Context and Purpose of the Study

This study resulted from a National Priority Reserve Fund (NPRF) grant to the Faculty of Health Science, University of Central Queensland, to develop computer-based learning materials for a new nursing education program. As will be detailed in this study, the Faculty of Health Science (FHS) within the University of Central Queensland (UCQ) committed itself to a major instructional development project. This thesis is a case study report documenting and analysing the management of that project.

Initially the study was seen as simply descriptive, using qualitative techniques that allowed the participants to describe the process and its results. As the project, and this study, progressed it became increasingly obvious that the participants were involved in changing a system where the most obvious challenge was change itself. The changes experienced were not only technological, which were expected, but also included a redefinition of the nursing education program, new roles and directions for the University, and the necessity for individuals to adapt to management techniques and structures that differed from their previous experiences.

At the beginning of the study there was little guidance from the literature in answering many of the project's questions. Descriptions of computerisation in educational institutions, and of the software products and/or tools resulting from a major educational materials development project, were plentiful. However:

- There were very few descriptions of the management of the development process itself.

- There was a particular lack of information about the effects of computerisation on nurse education from the viewpoint of nurse educators in Australia.
- There was also a dearth of information about how the introduction of a major instructional development project affects the institution where it is located, and the rationale for, and effects of, decisions taken to achieve the project's goals.

The purpose of this study is to observe and analyse the development of a Computer Assisted/Computer Managed Learning (CAL/CML) system for providing theoretical and experiential learning materials within a tertiary-level professional program.

This study does not use the traditional case study paradigm whereby an external agent observes and evaluates. It is a case study within a participant observer paradigm. While it is a descriptive study, the methodology used is primarily qualitative rather than quantitative and depends upon the observations and evaluations of the participants directly involved in the project under study. The author, as the manager of the NPRF funded project, was one of the principal stakeholders and project participants.

Technological change, computerisation in this instance, seldom occurs so slowly that the participants in the process are not aware of its effects. New ways of working, and new tools for performing existing tasks, are obvious to individuals who have been working for some time using pre-change procedures and tools. It is very difficult, for example, to ignore the appearance of either a new paper form or a computer on a previously paper covered desk.

Even when change is gradual it is not always easy to give up the comfortable routines and tools that have been used in the past. In recent decades technological changes have occurred quickly enough that treasured skills acquired over a long period become valueless overnight, sometimes resulting in a traumatic experience for individuals and institutions.

Occasionally institutions have the opportunity to effect a technological change as part of an expansion or evolutionary disruption of the normal operation of the institution. The development of the new Faculty of Health Science was such an opportunity. As a result, the participants in this study were all aware that information technology was to be used in ways that were new, new both for nursing education and for the institution. However, the extent of the changes were not realised until they were examined in relation to the working environment and the participants' roles within that environment. Even then, relatively few of the participants had a broad enough view of the changes to understand how the changes affected others in the institution and whether the changes were ultimately positive or negative. The study participants, particularly if they had been newly recruited to academia for the new tasks, may therefore not have realised the extent to which their newly defined roles were different from previous practice.

This study describes and analyses the changes that occurred in a fledgling tertiary nursing education program where computers and information technology were adopted as a major component of the development and delivery of instruction.

- The establishment of the Faculty of Health Science and the Diploma/Bachelor of Nursing program resulted from the shift of pre-registration nursing education in Queensland from hospitals to the university sector in 1990.
- The foundation Dean of the Faculty was an 'early adopter' (Rogers, 1962, 150) to the use of computers, specifically microcomputers, in both education and university administration, and had a vision of how they could be used to enhance learning.
- The use of computers for the pre-registration training of nurses at UCQ was the result both of vision and necessity; the lack of adequate resources for a conventional clinical teaching program was a major contributor to the decision to computerise.

This study is an attempt to examine those changes through the eyes of the participants, and to effect closure on the first three years of a major technological change by providing a composite view of that change.

This study occurred in an institution of higher education in Australia that itself was changing from a primarily undergraduate teaching-oriented Institute of Advanced Education to a 'real' university with increased emphasis on research and post-graduate students.

- The University of Central Queensland is a new institution, having achieved university status on 1 January, 1992, after 23 years as the Capricornia Institute of Advanced Education (CIAE) and two transitional years as the independent University College of Central Queensland (UCCQ).

Throughout this study the current institutional designation, the Faculty of Health Science, University of Central Queensland, is used, except when noting historical changes or where participants have specifically used terminology denoting previous designations (Department of Nursing and School of Health Science, SHS, Institute, Capricornia Institute of Advanced Education, CIAE, University College of Central Queensland, and UCCQ). References to Health Science, the Faculty and the University refer to the Faculty of Health Science and the University of Central Queensland, regardless of their exact designation at any particular time.

The Faculty of Health Science

Queensland was the last state in Australia to transfer basic nursing education from a hospital-based to a tertiary-based program. In November 1987 the Capricornia Institute of Advanced Education (CIAE) interviewed for the Head of the fledgling Department of Nursing within the School of Science, a forward looking step that ensured that UCQ had one of the earliest tertiary nursing programs in the state (The Queensland Institute of Technology, now the Queensland University of Technology, had an earlier pilot program).

A Canadian nurse educator and academic administrator was hired with the understanding that she would be the Foundation Dean for a new School of Health Science as soon as the political situation permitted the allocation of the appropriate resources.

The new Dean had been involved in a similar change from hospital-based to tertiary-based training in Canada. Some of the implications of such a change are apparent to even a casual observer. Hospital-based staff, for example, often cannot take up tertiary teaching appointments because more advanced academic qualifications are required for teaching at the tertiary level and they are uncomfortable with the changed emphasis in the tertiary course. Similarly, tertiary-based students are ineligible for the salaries hospital-based trainee nurses previously received.

Other, and often more subtle, factors such as:

- nurse educators in tertiary institutions being expected to engage in research and other scholarly activities in addition to their teaching, clinical and counselling roles; and
- student nurses educated at tertiary institutions being trained in decision-making and having a stronger emphasis on professionalism, but on graduation being perceived by their hospital-trained colleagues as lacking practical experience,

can have far reaching and unforseen consequences.

Students of change theory will recognise the conflict between old and new practices. Experienced nurse educators report that the newly trained tertiary graduates continue to be treated with suspicion until there is a sufficiently large number in the workplace to demonstrate the success of the new program (Dean, Health Science, personal communication).

When the Dean took up her post mid-1988, the Department of Nursing had four other staff, all primarily involved in the delivery of a post-nurse registration (Bachelor of Health Science—Nursing) degree through distance education to approximately 80 students. A campus working party, chaired by a senior lecturer from the School of Humanities and Social Sciences, and assisted by the Acting Head of the Department of Nursing, had also developed a proposal for a basic nursing Diploma program. This proposal was refined during the following months and approved for funding by the Queensland Government in September 1988.

In mid-1989 it was obvious that the time available for developing the program was short, and that the new nursing program was absolutely and relatively under-funded, particularly since UCQ was one of the two worst funded tertiary institutions in Australia (Baldwin, 1990). A January, 1990 intake of 100 students was scheduled, to be followed by two more annual intakes of 100 students before the program would be fully operational. Initial funding, including the necessary capital funds for a new teaching facility, came from the Queensland government as part of the transfer from hospital-based to tertiary-based nursing education. Implied with this transfer from an apprentice-type hospital program to the more academic university course was the necessity to develop more efficient and effective teaching methods, as a Faculty-funded consultancy report (Zelmer, 1989, 14) indicates:

> There are several factors at work in the development of the CIAE nursing diploma program which are favorable to the development of a student-based computer assisted (CAL) or computer managed (CML) approach.
>
> The Institute is in a period of transition from an Institute of Advanced Education to the University of Central Queensland. As part of this change, the staff of the Institute are being encouraged to publish, to develop research and similar interests, and to improve their own professional qualifications. To enable these new activities to be undertaken with minimal increases in resources, they are also being encouraged to improve their teaching efficiency.

In October, 1989 the Faculty accepted the consultant's report (Zelmer, 1989, see also Appendix A) on the potential for using computer assisted and computer managed learning (CAL/CML) within the new Diploma program. The Faculty, the report indicated, wanted to use computers to enrich the learning environment, to provide a wider range of clinical experiences, and to relieve staff of some of the routine chores associated with teaching-learning activities.

The extracts below from the report indicate that it was feasible for the nursing education staff to use CAL/CML techniques to help develop their teaching program. One of the main reasons for the report's recommendation was the newness of the nursing education program. As the teaching staff were just beginning to find or develop all of the required teaching materials, computer-based materials were as feasible as any other materials…

> Normally the switch to a student-based program, whether using computers or by some other means, requires an additional investment of time and resources. However, the development of a new program requires the same work for either a traditional instructor-based program or a student-based program. The course materials will be needed one year at a time as each class moves to the subsequent year. This will provide the opportunity to start reasonably small with the development of a CAL/CML approach, adding new materials each year and using current classes to test materials and approaches (Zelmer, 1989, 15).
>
> There will be a need for all the staff to be involved in the preparation and delivery of learning materials. With a conventional lecture, the lecturer can sometimes 'cheat' on the preparation for a specific lecture, and 'ad lib' the presentation. Students who are expecting to have instructional guidance and materials delivered via a mechanical

> system, whether printed distance education lessons or educational television or CAL, cannot be expected to function when the delivery system fails (Zelmer, 1989, 10).
>
> Courseware development must be the responsibility of every staff member. This does not mean that every staff member should be proficient in every tool or technique, or that every staff member should follow every subject from start to finish. Just as with the present situation where one person in the department is acknowledged as the MS Word 'expert' and another for SPSS, staff members will develop individual competencies and specializations.
>
> Student input must also be encouraged. Many of the assignments and core projects developed by students can be used to expand the core of study materials available to subsequent students. Their case study topics could be selected to fill gaps in the basic materials and their responses to prepared case studies edited for inclusion in the model answers, etc. (Zelmer, 1989, 45).

The report showed that using such computer-based techniques would involve a major commitment on the part of the institution and the new Faculty, but that such a commitment was feasible and would have the potential to improve the learning environment significantly.

> The School of Health Science has a limited 'window of opportunity' for the development of a nursing program using innovative techniques. Likewise, the School cannot afford to develop subject materials twice, once using 'regular teaching methods' and then again using computer enhancement. The School therefore must have adequate administrative and financial support immediately if the opportunity to develop an efficient, challenging, and educationally rewarding approach is not to be lost.
>
> The immediate priority for the School of Health Science must be to establish the Student Learning Lab described in this report, as the delivery of computer-based learning materials depends upon adequate student access to computers. The availability of adequate computer facilities for staff to prepare and test learning materials must be a close second priority (Zelmer, 1989, 1).

At that point, the small Health Science staff was keen to develop a very good, innovative nursing education program. Unfortunately, the consultancy (Zelmer, 1989, 16) established that there was a lack of appropriate computer-based nursing education materials for use in Australian programs.

> Obviously, one of the best ways of achieving the efficiencies of larger class sizes is to use materials and tools that have been developed elsewhere and are available through

> commercial or semi-commercial channels. Because of the lack of computer materials for nursing education in Australia that is not feasible at this time…

The staff, however, believed that they could prepare computer-based materials with about the same effort as they would need to prepare paper-based materials provided they had appropriate support facilities (National Priority (Reserve) Fund application, 1989, Excerpts in Appendix C, and Zelmer, 1989).

By the end of 1989, construction was under way on a new building for the Faculty, additional staff were being recruited, computers began to appear on staff desks, the commitment was firm to prepare CAL/CML materials when time permitted, and the author was seconded for a one-third time appointment to coordinate the computer activities. The scope of these activities was indicated by the anticipation that the academic staff would be increased from effectively nil in 1988 to 27 by 1992 (Bachelor of Nursing Submission, 1991, 23).

The Faculty of Health Science had made a commitment to use Computer Assisted Learning and Computer Managed Learning (CAL/CML) techniques for their three-year Diploma of Health Science (Nursing) program (Dip.Hlth.Sc.(N)). This commitment included staff training in the use of computers, developing appropriate computer and non-computer materials for course delivery, and motivating both staff and students to use the resulting system(s).

As most of the staff had very limited computer experience a decision was made to adopt the Macintosh computer because of its short learning curve, consistent software interface (all programs function similarly, with similar commands), and development tools. From a development point-of-view, the Macintosh was also the only computer which could easily combine text and graphics at a reasonable price (Zelmer, 1989).

The next few months were eventful. A funding request for the development of computer-based learning materials was made to the National Priority (Reserve) Fund (DEET, Department of Employment, Education and Training) and the Faculty received two-thirds of their request, $300,000 over two years, 1990 and 1991. Construction of physical facilities for the new Faculty was completed in 1990. The first 100 student intake for the program was in February, 1990.

In mid 1990 the Diploma program was mandated by the Commonwealth Government (DEET) as a three year Bachelor's degree (Bachelor of Nursing) by 1994 and the Queensland Department of Education required the change to be immediately implemented for students already in the Diploma program.

Health Science computer facilities were primarily developed over the period 1990-1992 and included:

- student access to UCQ computer laboratories for their introductory computing subject;

- staff access to UCQ mainframe computers for communications, research and administrative functions including the library catalogue and student records;
- desktop and portable (laptop, notebook, and handheld) computers for academic and support staff for clinical, academic and research activities, and access to the mainframe system;
- an instructional development (CAL/CML) lab with a flatbed scanner, graphics software and other support tools; and
- a dedicated teaching laboratory.

As adequate and appropriate teaching materials were not available for teaching nursing using CAL/CML techniques (Zelmer, 1989), it was necessary for the Faculty to develop many of their own materials. Although the use of computers was new to many of the staff, the development of computerised instructional materials for the new program was an expected part of their work.

The initial expectation was that teaching materials would be developed by the instructional staff on a three year development/revision cycle. This meant that materials would be prepared year by year, with increasing sophistication of materials and usage as experience with the system increased. By the end of 1992 materials should have been developed for all three years of the program, and the first year materials would have had a major evaluation as the end of their first cycle occurred.

The Impact of Change

This is a study of change both in individuals and the work place. Many of the nurse educators in the Faculty had never used computers previously and were generally seen by staff in other parts of the institution as having no possible interest in computers. The Dean of Health Science (1990, taped interview, 22 October) recalled that one of the senior administrators expressed this quite clearly in late 1988 or early 1989:

> We had been at a computer demonstration and I happened to be walking down the path with him afterwards… He was genuinely quite surprised, 'What was I doing there?' I think he put into words what a good many other people thought. 'What is this lady doing here, I mean a nurse with computers?' These are the people from maths and science, 'we'd heard that maybe business people are interested in computers, but nursing?'.

Such an attitude, while personally discouraging to the Dean, was likely not unreasonable given the general state of limited computerisation in Australian health institutions and the limited use of computers in nursing education in general. Rogers (1962, 13) warned of the problems of introducing innovations and noted that 'it is the *idea* about the new… that is diffused as well as the product itself' [Emphasis in original]. Later he specifically refers to the technologist:

> Many technologists think that advantageous innovations will sell themselves, that the obvious benefits of a new idea will be widely realized by potential adopters, and that the innovation will therefore diffuse rapidly. Unfortunately, this is seldom the case. Most innovations, in fact, diffuse at a surprisingly slow rate (Rogers, 1983, 7).

Change, whether the changing of an attitude or the changing of a practice, is not an instantaneous event. Even with the most successful innovation, some individuals will make the change before others. The majority will accept the change some time later, and a small group will either be very late adopting or refuse to accept the change. The process which individuals, and collections of individuals, undertake as they accept (or reject) any change is a five step process in Roger's model (1983, 163-209):

- *Knowledge*—results from exposure or understanding of function;
- *Persuasion*—occurs as attitudes are formed;
- *Decision*—occurs from activities that lead to choice;
- *Implementation*—occurs when the innovation is put to use; and
- *Confirmation*—is needed because the decision must be reinforced.

The implications of the change process are clear. For an organisation to be successful in adopting a new technological innovation, management of the people who will use the innovation is as important as managing the technology itself.

While the role of a senior leader as a change agent has usually been described in business settings, it seems equally valid in the university setting. Vision is important, but it is not enough. The successful leader also needs to have a good sense of the institutional identity or goals (a difficult task when the institution itself is in flux), be resilient, able to take risks but also to bend before criticism and to be aware of personal limitations (London, 1988, 51).

The problems encountered by the management of Health Science and the CAL/CML project in attempting to motivate and enthuse the Faculty's staff to achieve a nebulously defined goal forms one of the sub-themes of this study.

Organisation and Limitations of the Study

This study is a qualitative analysis of a system undergoing change. The primary methodology used is that of a participant observer, as a participant has access to a qualitatively different type of information than does an outside observer. The essence of being a participant observer is an involvement in the system being studied. These subjective observations were normally documented in the form of semi-structured tape recorded interviews. For the purposes of this study some participants also had be able to step outside their participant roles from time to time to analyse and verify observations.

It was expected that the Faculty would maintain most of the records necessary for describing the CAL/CML project as a normal part of its own evaluation processes. It was recognised, however, that not all documents are kept in a systematic manner. Maintaining such documentation was undertaken as part of this study to assist in the data verification process.

This introductory chapter has set out the background for the study and its purpose. Chapter 2 provides a review of the literature relevant to the study subdivided into sections on instructional design and CAL/CML, change and its management, and qualitative research methods.

Chapter 3 focuses on the methodology used in this study.

Chapters 4 through 6 describe the application and development of CAL/CML concepts and materials within Health Science from a variety of perspectives.

Chapter 4 provides a timeline of events between 1988 and 1992.

Chapter 5 describes the climate for change within the University, and describes the Computer Assisted/Computer Managed Learning process from the point of view of the Health Science participants. It explores some of the changes which occurred as university status was achieved, with particular relevance to those activities which influenced the Faculty and the educational materials development process.

Chapter 6 describes many of those same events from the perspective of those participants (vendors, administrators, etcetera) who functioned outside of the Faculty of Health Science.

In Chapter 7 the author discusses some of the issues raised in the preceding chapters. These include:

- change and the resistance to change;
- management, particularly management style, of both the project and the change process;
- staff roles and expectations, staff training and motivation; and
- institutional roles and expectations, ownership of intellectual property, ownership and use of institutional resources including technologies such as electronic mail.

The conclusions from the study are summarised in Chapter 8 with guidelines for future projects. An update on activities within Health Science in the months following the study and suggestions for a new Health Science strategic plan conclude the thesis.

The appendices include extracts from the major descriptive and evaluative documents for the project, copies of correspondence and other documents which provide some details of the decision-making process, and descriptions of some of the major computer tools and courseware developed during the project.

Finally, the major limitations of the study arise from the nature of the study itself. The participant observer process is both its major strength and its major limitation. The actions of the participants in the study, including the author, were affected by their reactions to the personality and roles of the other participants and by their own changing roles within the changing institution.

Chapter 2

Theoretical Background to the Study

Any sufficiently advanced technology is indistinguishable from magic (Arthur C. Clarke. The Lost Worlds of 2001).

This study, and the project upon which it is based, combine several disparate disciplines, all of which contribute to understanding how the participants worked, what they accomplished, and why they did what they did.

This is a study in the adoption of technology—how the staff and students of a tertiary institution reacted to the adoption of CAL/CML as a teaching technology. The first section of this chapter examines instructional design as it applies to the development of CAL/CML—instructional development theories, guidelines for evaluating software, et cetera.

This is also a study of a system undergoing change. That the study occurred in a tertiary institution, developing teaching materials for nursing education, is secondary to the ethos of change. The study examines a new program, using new teaching technologies, within an institution that was itself evolving from an institute of advanced education into a newly created university. The second section of this chapter continues the examination, begun in the Introduction, of change, its effects, and its management.

Finally, this case study, a documentation and analysis of change and technology by the participants in the institution undergoing change, was implemented using qualitative research techniques. The final section of this chapter examines qualitative research methodologies as they apply to research in general and case study techniques as they apply to this study in particular.

While the study could have focussed on leadership and leadership styles, the question of leadership is not central to the study. Similarly, the study could have focussed on nursing education, particularly nursing education in Queensland and Australia. Although some details of the nursing education program at UCQ were examined in Chapter 1, the Introduction, and others are examined throughout the remaining chapters, nursing education is not central to this study. The theoretical background to these topics has therefore not been examined in this chapter.

Instructional Design and CAL/CML

Introduction

Computer Assisted Learning (CAL) is a technology for presenting educational experiences electronically. CAL materials may use any combination of teaching techniques including didactic, question and answer, simulation or problem solving, and increasingly use a combination of sound, text, graphics, animation, and other visual media (multimedia). Computer Managed Learning (CML) uses the technology to assist in the administration of the educational experiences through electronic testing systems, maintenance of grade books, lesson management, computer mediated communications, and similar tasks.

As with most other teaching media, we can choose to develop simple unsophisticated materials locally or prepare/purchase more sophisticated, and thus more expensive, teaching materials from more professional development units (commercial and other).

The School of Health Science made an initial decision to concentrate on developing materials which could be used by students in an independent study mode to supplement and follow-up on lectures. These computer materials were therefore intended to substitute for some of the weekly tutor-presented small group sessions that are typically used to reinforce the learning of new content materials. Such integrative materials should be easy to prepare, should not require the extensive planning and design required of materials intended for lecture replacement, and should leave the lecturer and students in charge of the learning process.

As will be seen in Chapters 5 and 6, aside from this general approach to CAL development, the Health Science CAL/CML project did not adopt a strong instructional design (ID) framework. The project began as a pragmatic attempt to overcome resource limitations, and worked within those limitations to develop a functional system of courseware production based on the efforts of novice programmers, instructional designers, and lecturers.

The decision to work without a central team of trained instructional designers, computer programmers, and courseware authors may have been naive, but it came from a strong conviction that lecturing staff could, and would, respond to the twin challenges of preparing quality instructional materials and discovering the required instructional design principles. There is strong support for such an approach in the literature. Some writers even question whether *anyone* uses instructional systems design (ISD); Lange and Grovdahi (1989, 36) suggest that ISD may be a case of 'do what I say, not what I do':

> Unfortunately, the limitations of classroom work in university and other settings too often results in training that is heavy on verbalization and light on performance… It may be that persons who create ISD models describe what they believe would be a

> good way to operate rather than a model of what they have **used** themselves [Emphasis in original].

The UCQ project was developed from practical experience gained working in other places and other projects. The project's organisers were not experts in instructional design, but they had been involved in curriculum planning and a wide variety of instructional materials development activities. As well, they had been involved in training individuals in several countries in the techniques of instructional materials development and evaluation. While their own training generally came from the more formal era of Bloom's taxonomy (1956), Mager's *Preparing Instructional Objectives* (1962), and unrealised expectations for programmed learning, they had all worked with projects where informal design strategies had been successful.

Brief History of Instructional Design and Implementation

Instructional design, or instructional system design, is a structured approach to preparing instructional materials. Instructional design is often characterised by the use of a 'systems' approach and story-boards or other tools that had their origins in other discipline areas.

Historically, instructional technology often meant the preparation of audio-visual materials with Minor and Frye (1962) and Kemp (1963) providing standard basic texts. The training of media professionals included the 'hands-on' development of audio-visual media ranging from flip charts and educational motion pictures to educational television and programmed learning. Interestingly, there was very little emphasis on print media *per se*, with readability and similar standards generally focussing on projected media, although Markle's *Grammar of Frame Writing* (1969) set a standard for programmed instruction.

More recently, the Open University in the United Kingdom, and an increasing number of materials development projects funded by the British Council and various United Nations agencies, became forums for the development of good design for instructional text, as Hartley (1978, 7) illustrates:

> Throughout the text the notion of planning is emphasized; this is done for two reasons. Firstly, instructional text is usually more complex in structure and appearance than continuous prose – and thus it requires greater care in its design and presentation. Secondly, technical developments in print and information processing mean that more and more 'non-specialists' are producing instructional materials. Today more control by authors over the layout of instructional text is both necessary and possible.

Research into the presentation of technical information also became broader with the addition of psychology (Wright, 1977) and similar disciplines. The result is that teams investigating aspects of computer-human interface (CHI) are now as likely to include psychologists as computer specialists. Xerox PARC (Palo Alto Research Centre) and Apple Computer Inc. being two examples of this trend.

At the same time, media specialists and other practitioners were making it easier for teachers and community workers to develop their own instructional materials (Zelmer, 1979). In North America this was particularly facilitated by the growing network of community-based radio and television stations and the development of technologies such as portable video cassette recorders (which, as with many technologies having potential for educational use, later evolved into a consumer item, the fully portable hand-held video camera and recorder).

During the eighties instructional design became a discipline in its own right with inputs such as Romiszowski's (1981) *Designing Instructional Systems*, Richey's (1986) *Theoretical and Conceptual Bases of Instructional Design* and Gagné, Briggs, and Wagner's *Principles of Instructional Design* (in its third edition by 1988). The delivery media had also changed; increasingly video and computer-based materials were the media of choice for innovative instruction.

By the late eighties instructional technologists were discussing the limitations to current theories (Merrill and Gagné in Twitchell, 1990-91, and Merrill, Li, and Jones, 1990a), discussing alternatives (Kember and Murphy, 1990), and proposing a 'second generation' instructional design theory (Merrill, Li, and Jones, 1990b). The new definition of 'instruction', Jaspers (1991) argued, must also include the now practical concept of 'interaction'.

The editors of *Educational Technology* presented a special issue (Merrill, 1990) on computer based tools to facilitate the instructional design process, first generation or second, and expert systems to actually perform some of the instructional design tasks. Later in the same year Ross (1990) presented an interactive tool to assist students learning to use instructional design techniques.

The evolution of CAL/CML development tools from general purpose programming languages such as BASIC, COBOL, and SNOBOL towards specialised CAL/CML languages such as AUTHOR, CBTS, ELMS, and PILOT and authoring systems, typified by the product that is now called Authorware Professional, was occurring at the same time. This evolution increased courseware development efficiency by providing specialised CAL/CML functions. Authoring systems simplified the design and development processes, principally by eliminating the need for learning a programming language and by presenting the development process in a visual form.

In 1989 the practical aspects of courseware development, the preparation of instructional materials for student use, still required most developers to be computer programmers, and there seemed to be no acceptable software system for Health Science's needs, 'even at the 50% or 80% needs level' (Zelmer, 1989, 33). However, the situation was rapidly changing, and by

1992 not only had several quality authoring systems tools been introduced onto the market, but it was possible to reasonably easily include audio, video, and other multimedia elements in the previously mainly text-based CAL/CML courseware.

Unfortunately, the practical implementation of instructional design procedures and educational technology has not had as positive a history as this summary would suggest. While slides, filmstrips, and instructional films, more recently supplanted by videotapes serving the same function, have a long history of use within all levels of educational and training institutions, they are expensive to produce and, until the development of the video cassette recorder, a successful presentation often required the services of a trained projectionist. The projectable transparency, seemingly simpler to make and use, has had an equally chequered educational career—overhead projectors are ubiquitous, but even after more than thirty years of use, many users still have not mastered the art of preparing readable transparencies.

Other technologies have been even less fortunate—educational television (broadcast or cable) and programmed instruction (teaching machines and programmed books) failed to achieve the promise that their promoters hoped. Gayeski (1989) reviewed the literature on the failures of information [instructional] technologies and suggested several reasons for their failure:

- some potential users may be fearful of the new technology, particularly if it reduces or inhibits teacher-learner contact,
- the economic and legal impact of the new technologies have often not been properly addressed—people will almost always resist a technology that threatens their job security,
- vendor-led applications have often resulted in inappropriate or poorly designed uses of the technology, and
- technologies are often released before they work reliably.

On the software side, he goes on,

- commercially produced materials are not sufficient,
- most educators want the ability to customise materials locally and are frustrated with a lack of standardisation among competing vendors.

The solution, he suggests, requires three elements: participatory design, standardisation, and local production.

- There needs to be more participation by educators in the development of the technologies and their uses—including in the development of instructional design techniques—and technologists need to become partners with educators rather than being perceived as their opponents.
- Manufacturers and vendors need to work on standardisation—'slides, overhead transparencies and video enjoy wide use because one can find appropriate playback hardware

virtually everywhere’. [Achieving compatibility in these areas has not come easily, and is not yet complete—NTSC, PAL and SECAM formats are still incompatible—but is correct enough to make the point that competing formats such as those that currently plague the CD-ROM market hinder the use of the medium.]

- Finally, local production is crucial to the acceptance and use of any teaching technology. Users want, and often need, to customise materials for local conditions and audiences. For example, nursing education materials that use imperial measures are generally unusable in Australia and require conversion to metric measure.

> As educational technologists, clearly we are faced with some challenges: much of what we have developed doesn't really ‘work’. By coming to grips with this fact, we might more eagerly explore the areas of diffusion of innovation, marketing, and organizational communication to more effectively channel our efforts (Gayeski, 1989, 15).

Success requires commitment—people, resources and time—and perhaps a change of attitude.

> Small scale innovation attempts frequently fail because they lack a critical mass of people, equipment and funding. Perfecting a new approach can be very discouraging to an individual or a small group; having a lot of people ‘in the water’ sharing the load can really help. Risks and experiments can be diffused in a massive effort, and multiple alternate approaches can be tried simultaneously to see what works best.
>
> Even with institution-wide commitment, educational technology innovations will inevitably fail unless the traditional system of rewards shifts to encourage adoption… If merit guidelines don't rank experimentation with new instructional media as a valued activity, then teachers and administrators will choose to invest their time and energy in more traditional pursuits. ‘Freedom to fail’ is also important; missteps are inevitable in developing a new educational paradigm, and innovators should feel that they can take risks without blind alleys being seen as foolish errors (Dede, 1989, 10).

Everyone Can Develop CAL—The Individual Authoring Approach

Zelmer (1989) identified several factors in the development of the proposed UCQ nursing diploma program which were favourable to the development of a student-based computer assisted (CAL) and computer managed (CML) learning approach.

> The Institute is in a period of transition from an Institute of Advanced Education to the University of Central Queensland. As part of this change, the staff of the Institute are being encouraged to publish, to develop research and similar interests, and to improve their own professional qualifications. To enable these new activities to be

> undertaken with minimal increases in resources, they are also being encouraged to improve their teaching efficiency (14).
>
> Normally the switch to a student-based program, whether using computers or some other means, requires an additional investment of time and resources. However the development of a new program requires the same work for either a traditional instructor-based program or a student-based program. The course materials will be required one year at a time as each class moves to the subsequent year. This will provide the opportunity to start reasonably small with the development of the CAL/CML approach, adding new materials each year and using current classes to test materials and approaches (15).

The technology also promised increased potential for small-scale development. Just as desktop publishing packages have made it easier for desktop computer users to prepare pseudo-typeset printed materials, special purpose programming environments and courseware (the individual lessons and other CAL materials which result from the instructional design process) authoring packages have made it easier for those same users to prepare computer-based instructional materials, particularly when the materials are being developed for in-house or prototype purposes.

Conventional wisdom suggests that CAL and CML implementation is only viable for large class sizes because of the dual costs of courseware development and the hardware/software platform required. This wisdom gains particular strength when looking at expensive commercial systems such as the American *Plato* system and many of its current desktop derivatives. As a consequence, professional level products such as Course of Action (now Authorware Professional), on the Macintosh platform, and TenCore on the IBM/MS-DOS platform were rejected by the Health Science project because of their high initial and on-going costs which included royalty and per-copy distribution fees.

The alternative was, and is, small-scale instructional development by individual subject authors. Health Science had local (UCQ) examples that included Graham Pegg's chemistry lessons (Apple II based), Don Morris' biology exercises (Amiga based) and the Department of Mathematics and Computing's commercially available *CapGraph* package (IBM/MS-DOS based).

The literature on small-scale development also provides additional examples. Junkala (1991) is only one of many authors who has written in glowing terms about how easy it is for ‘almost anyone’ to prepare courseware. He claims that authoring languages such as SuperPILOT and authoring systems such as CourseBuilder (TeleRobotics International) and HyperCard (Apple Computer) can be used by college instructors—non-computer people—to prepare CAL materials for classes as small as 25-30 students.

> Authoring systems such as Course Builder and HyperCard can reduce the need for technical and design teams, providing the would-be writer is familiar with some basic instructional paradigms and can make an occasional cross-campus phone call with questions beyond his or her CAL expertise (16).

> Courseware authoring systems were designed to be used by people like me. I know almost nothing about computer theory, and absolutely nothing about what goes on inside the box behind the screen. I am, however, able to read most instruction manuals, follow a menu, and make an occasional cross-campus phone call to someone who knows more than I do. As a special education professor I am cognizant of some instructional theory, and of course I know the content to be covered in my courses. I am now able to combine commercially available authoring technology with my own professional knowledge to produce the courseware I have just described. That's the message: 'Non-computer' people can now create their own CAI [Computer Assisted Instruction] courseware (20).

HyperCard, the most common, and least expensive, of the tools mentioned, is a general purpose presentation tool with its own programming language. HyperCard, and its programming language, HyperTalk, allows the Macintosh computer user to develop a wide variety of 'stacks' (courseware) ranging from simple databases to prototypes of more complex computer products and sophisticated simulations. HyperCard is the most popular tool in the academic and professional press for software tutorials and instructional situations where user interaction is important. HyperCard, while not a true hypermedia tool, can also be used for developing some types of hypermedia applications, is particularly well suited to controlling inexpensive multimedia presentations because of its built-in 'hooks' (procedures) for controlling audio tape recorders, VCRs (videotape recorders), and other presentation devices, and has an extensive theoretical and application-oriented literature.

Similar tools are now available for the IBM/MS-DOS 'Windows' platform, however, developers often continue to prepare more sophisticated courseware on the easier-to-use Macintosh platform and 'port' it across to the DOS platform. This is what occurred, for example, with the interactive materials developed for the *Godwana* exhibit in Brisbane (Paul Campbell, Edge Technology, personal communication) in 1992.

Phillips (1990, 15) indicates that with the new authoring tools, 'prototyping by *individual* authors promises to be an effective approach to CAL development' [emphasis added]. While acknowledging that small portions of a project—presumably where the individual author lacked specific skills or for repetitive work—might be subcontracted as necessary, Phillips (1990, 15) continues:

> The independent author is no longer restricted by either the limited vision of the computer expert nor the need to form a team of specialists. In all disciplines, the demand for effective courseware represents a golden opportunity for the motivated individual educator.

The conventional instructional design approach specifies a process that requires a variety of individual skills. The range of skills required for a major instructional development project, as with the skills required for a successful motion picture or television production, are such that a group of individuals, working as a team, is normally required. In examining the differences between the conventional team approach and individual authoring a distinction must therefore be maintained between the development of materials for a localised situation, such as was faced by the Health Science program, and producing a commercially distributable product.

The individual approach has been typically promoted as a prototyping tool, and the history of computer software products, such as *Vulcan* (now *dBase IV*), demonstrate the success of tools developed by individuals, once a team of designers and programmers, as well as marketing and support personnel, further developed them into commercially viable products.

The relative merits of the two approaches are further compared below in order to understand the Health Science software and courseware development process.

Conventional Team Approach: The conventional team approach depends heavily upon several individuals, each with their own expertise and biases, achieving sufficient common ground to conceive and execute a development project. That this is difficult to achieve is amply illustrated in the music industry, where many performers write their own music and songs, and in the film and television industry, where individual actors have become their own writers, directors and producers. Whether combining the various roles has in fact produced a better result is often open to question, but for the individuals concerned, the process has allowed them to maintain their vision and sense of integrity.

Figure 2.1 illustrates the conventional approach to instructional design. With minimal modification it could also apply to the design of computer programs, films, television productions and other similar complex activities.

While many of the individual steps could be accomplished by an individual, the team approach trades flexibility and individual creativity for consensus and intra-group communication. The reward is, theoretically at least, a better product because it draws on a variety of skills and expertise. Unfortunately, as with any committee activity, the potential also exists for the development of a 'camel', and, particularly with large projects, the overhead cost of team management and associated quality control procedures may exceed the costs attributed to the actual production.

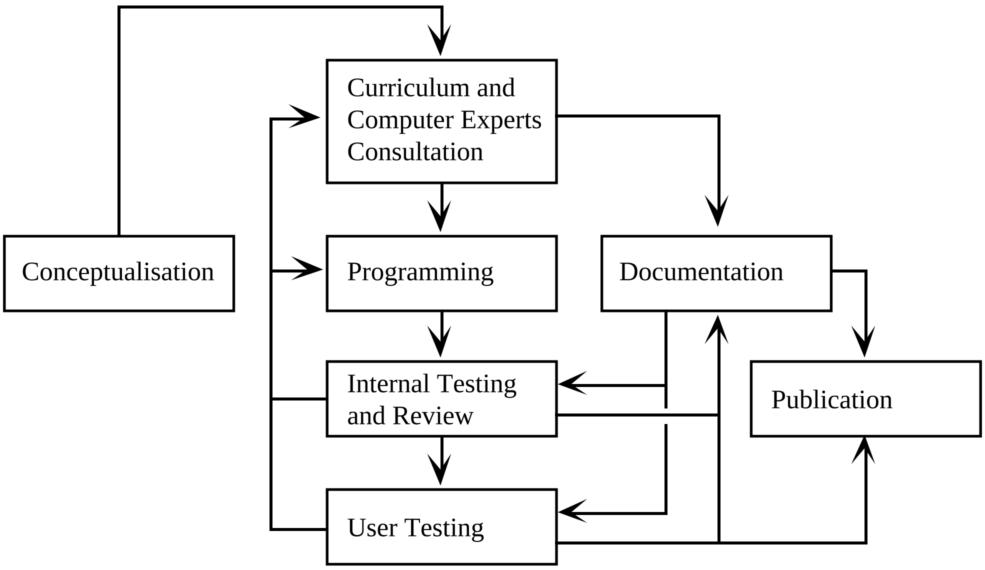


Figure 2.1

The conventional team approach.

Adapted from Phillips (1990, 10)

The Individual Author Approach: The individual author approach advocated by Phillips (1990) involves an iterative process of user testing and refinement similar to the conventional team approach, but all the tasks are to be completed by one individual. The core activities of the individual prototype approach in Figure 2.2 appear at first glance to be simpler than in the conventional team design process illustrated in Figure 2.1. The insert, however, expands the prototype development component of this model to include a second iterative process that makes it closer to the conventional approach. Nothing in this model precludes consultation with or assistance from other individuals, however, the process of formulating expert consensus is not required when all the decisions are made by a single individual.

Advantages and Disadvantages: A commonly expressed concern with the team approach is that it is production driven. The programmers, usually computer experts rather than content specialists, are allowed to proceed from the specification stage through to program development without any contact with users. The potential result is that the finished program meets only the programmer's expectations, and the user has only two alternatives—to adapt to the program or start over.

The individual author prototyping process is author driven, and recognises that the author, usually a content expert and sometimes even a user, has an idiosyncratic approach. This approach is tempered by frequent user testing and the enthusiasm of the author usually carries the project through to completion. The author, having been involved in the development process, is also likely to use the final product, even if the product is technically less sophisticated than a team-produced product.

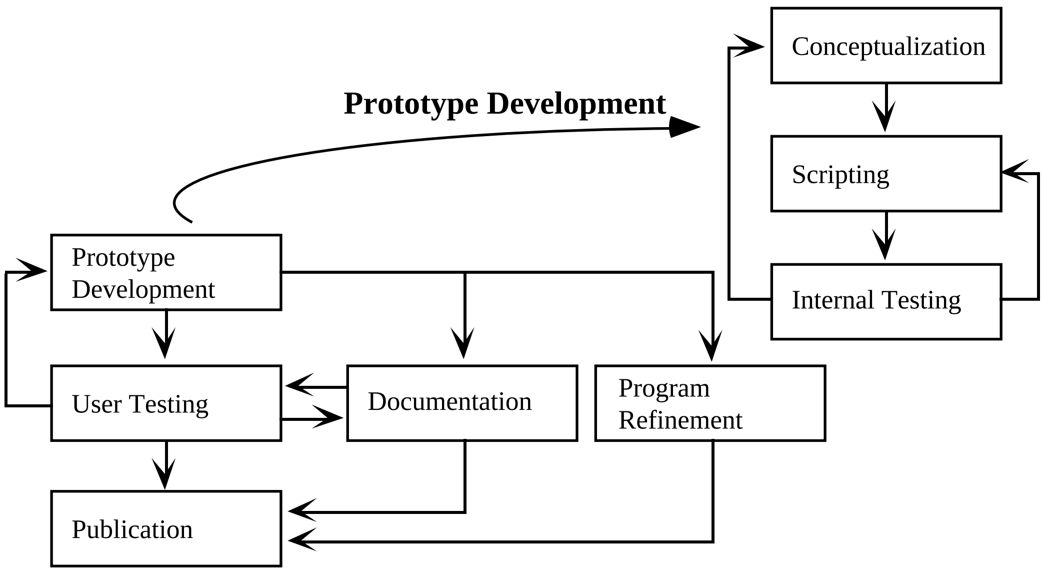


Figure 2.2

The individual author approach.

Adapted from Phillips (1990, 11)

Table 2.1 is also adapted from Phillips (1990) and summarises the main arguments between team and individual author models. The two models are shown here as polar opposites, highlighting the potential for conflict that exists between individuals trained under the two different models. In real life the two design philosophies could function independently within a tertiary institution.

The prototype product is frequently the end of the development process for an individual author preparing materials for use within the institution itself. Often it is only when the product is subsequently commercialised, or the limited materials produced by one author are to be replicated within other areas, that a development team following the more conventional process will be employed. The prototype could then form the operational specification for the team of designers and programmers. Conversely, projects developed through the [semi- or fully-commercialised] central CAL service unit would be expected to follow the design practices of that unit.

Developing the specifications using individual author prototyping could support and enhance the team process where rigid specifications are required, particularly if the team is to develop a commercially viable product. Individual author prototyping could free the team from having to define specifications in advance, thus leading to more appropriate specifications for the task and a less costly development process.

Table 2.1

Assumptions Inherent in Conventional Team and Individual Author Prototyping.

Adapted from Phillips (1990)

Conventional Team		**Individual Author**
Can be predetermined • Live demonstrations not necessary • Requirements will not change after specifications written	**Courseware Specifications**	Cannot be predetermined • Live system demonstration necessary • Operational system produces new requirements and cancels old requirements • User testing produces significant deviation from prototype
Expensive • Programming expensive • Program changes more expensive	**Deviation from Specifications**	Inexpensive during prototype development • Prototype programming inexpensive • Prototype reprogramming less expensive
Possible • Expectations coincide • Differing technical languages not a problem	**Effective Communication Between Experts**	Not possible • Individual expectations do not coincide • Differing technical language (jargon) hinders communication
Sufficient • Flow diagrams, decision trees, data dictionaries define system • Detailed specifications possible and adequate	**Utility of Conventional Graphing and Textual Specification Techniques**	Not sufficient • Flow diagrams, decision trees, data dictionaries cannot represent dynamic systems • Even detailed written specifications inadequate
Rigour necessary • Eliminate fuzzy thinking • Heuristic approach too expensive	**Approach Required**	Flexibility necessary • Encourage open-ended thinking • Heuristic approach most effective

Both models, for all their utility, tend to emphasise the role of the author, the instructional designer, and the programmer rather than the relative effectiveness of various instructional strategies or the needs of the user. Ignoring an analysis of the most effective instructional strategy may be appropriate for a single task educational television production unit or CAL development unit, and is realistic for an individual author working in a single mode of instruction, but is not appropriate for an institution which must purchase or develop all of its instructional materials within a short period of time. An institution requiring a speedy implementation cannot ignore the needs, preferences, and skills of the user without risking failure of the implementation and wasted resources.

Meeting the Needs of Users

Iterative development and empathy for the user is as important for developing courseware as for general software but, as Carr (1988, 24) notes, it is not an easy process:

> Developing for users is not easy. But it provides a methodology that helps you avoid costly errors that are surprisingly common: developing products that nobody wants; or that nobody can learn to use; or that don't meet enough user needs to make them pay money…

Student users may not ‘pay money’ for the use of their CAL materials but they can be quite vocal about activities (and program/courseware bugs) that they see as wasting their time, often a far more important commodity from their point of view. Academic staff (and students) must also feel free to select the technology that best meets the needs of a specific instructional situation. For some staff and students, adapting to computer technology psychologically may not be possible, and some of the instructional needs, such as those met by hands-on clinical experience, ensure that computers can assist but never replace more conventional technologies.

Institutions such as UCQ have chosen computer technology as a means of improving the efficiency of administrative chores (electronic mail, spreadsheets for student grades, et cetera), facilitating academic publishing (word processing, graphical software and desktop publishing) and developing and presenting instructional materials (CAL/CML as well as course notes and similar print materials for both internal and external students). These computer technologies must be seen as simply part of the overall mix of ‘tools’ available to the modern academic whose professional judgement and academic freedom should not be sacrificed to administrative efficiency. Hirvela (1989) notes that technology is used in academia to increase production.

> The fundamental purpose of technology—to make things easier and thus increase productivity—creates the environment in which the pressure to employ technological means of production develops (44).

He goes on to warn that academics must not become pressured by the technology.

> Academics must consider more than the great convenience and ease which educational technology offers in abundance; instead, they must recognise that the freedom to choose their means of production—word processor or computer for many, a typewriter for others, pen or pencil for some—must be preserved if they wish to express themselves in the manner they prefer (45).

This has implications for the acceptance of the new technologies, and is likely an important component in the acceptance of any skills upgrading program aimed at academics using the technology for developing instructional materials.

Carr (1988) argues that too many software developers design products 'for themselves', forgetting the users. To be effective, the programmer (or the courseware author) must:

> Realise that programming is ultimately for the user—the consumer of the software. You must view the process of developing software as a user-driven, software development cycle (18).

His iterative eight step process (Carr, 1988, 20-24), which is summarised below, emphasises contact with users. It is equally applicable to both team and individual author approaches.

- *Know Your Users*: Developers must talk to the target users themselves, and do it before designing the product.
- *Select Appropriate Tools*: Avoid building your own programming tools when you can purchase the building blocks you need for a few hundred dollars.
- *Spend Time on Preliminary Designs*: Run tests on your designs (including discussions with users) to avoid major surprises in later design stages.
- *Use Your Team's Latent Talents*: Recognising what constitutes the 'team' is probably the first step.

> A team-oriented consensus style is in strong contrast to concepts such as chief-programmer-based teams, for example, in which team members exist merely to make the guru chief programmer more efficient, implementing the designs that spring from his head. A benefit of inviting more contributions from team members is that their professional skills will develop more rapidly (Carr, 1988, 20).

- *Design and Develop Through Evolution*: Work from the user-interface inward and from the low-level building blocks upward—for courseware authors this means designing the overall structure (menus, major options, etc.) and the instructional outline (review or basic instruction, question style, branching patterns, etc.) before detailing content—and maintain flexibility.

- *Empathise with Users*: Ease of use must be important, and real ease of use only comes from interacting with real users—talking to them and watching how they use the product (videotape users trying to use your product).

> Programmers who experience first-hand other humans having real difficulties tend to respond empathically and are more motivated to iterate and perfect and polish the overall product for these users—all because the users are real to them (Carr, 1988, 24).

- *Deliver the Product*: Delays in delivery frustrate the customer; support the product once it is shipped.
- *Listen to Your Market*: Talk to actual users of the product, both shortly after the product is released and some months later to get their longer term comments.
- *Reset to Phase One*: Software (or courseware) development is iterative—needs change, tools change, and users change over time.

The consistent message is that user needs are paramount. For the academic institution there are two users, the academic designing a subject or course who requires resource materials (courseware) to use in the delivery of effective instruction, and the student receiving that instruction. The former's needs will sometimes be fulfilled by the individual author prototyping method, determining the needs of the latter requires a program of consultation and testing over the whole life cycle of the courseware. When the needs of the two conflict, common sense suggests that the needs of the 'real' user, the student, must take precedence.

Selecting Instructional Development Resources

A practical system for designing computer-based instructional materials has several components, including students, an instructional design process, staff (individuals or a team), hardware and software. Previous sections in this chapter have looked at instructional design theories and user-involvement. This section briefly examines the selection of software resources for developing a computer-based instructional system. The selection of appropriate software and authoring tools then almost automatically determines the specific hardware platform required for the development and delivery of the courseware.

When the definitive history of computing is written it will be replete with accounts of software and hardware developers who failed to deliver their advertised products on time. Dede (1989) warns, among other things, against relying on any product until it has actually been seen working (Table 2.2).

The soundness of this advice becomes obvious when examining the installation of almost every item of equipment and/or software product during the course of the Health Science project (see

Chapters 4-7). On several occasions Health Science was among the first users of a particular product in Australia and, while there were no major disasters, several activities were delayed waiting for the installation of required components. Most importantly for any similar project, delays were not always caused by external forces—purchasing procedures and internal 'works department' schedules caused as much havoc as the delayed release of a commercial product.

Certain of the guidelines in Table 2.2 may appear contradictory unless they are read in the context of computing as one of the fastest changing technologies ever. It is important to plan wisely, choosing products that have proven themselves and are suited to the specified needs, but it is also important to be willing to take risks—waiting for the perfect solution guarantees that no solution will ever be found.

Table 2.2

Planning Guidelines for Emerging Instructional Technologies.

Extracted from Dede (1989)

- Don't buy anything until you have determined why you want it.
- Never believe something is available until you see it working.
- Pioneering a product is a mixed blessing.
- 'Compatibility' has hidden headaches.
- No single product or vendor is best for all situations.
- Developing software is harder than you expect.
- Deciding on what to buy is only the start of the purchasing process.
- Innovation requires a critical mass.
- Initial costs are just the tip of the iceberg.
- Technology changes individuals and organisations.
- No matter how much you buy, you won't have enough.
- Wisely chosen products are never obsolete.
- Never taking risks guarantees failure.

Selecting, or more properly not selecting, an authoring system was a major decision for the Health Science project in its early days. The consultant's report (Zelmer, 1989) listed sixteen readily available authoring tools on a variety of computer platforms that could have been used. As Collins (1989, 47) explains, there are hidden costs associated with many authoring tools.

> The purchase of an authoring tool is not just a matter of selecting a product and purchasing it, for the actual cost of an authoring tool can involve many hidden costs. A serious, potential author, therefore, should consider not only the use of the

> authoring tool itself, but also the various uses to which the authored courseware will be put, before deciding on the purchase of a tool. Carefully examine the hardware requirements of the tool and any implications for necessary modifications to your present computer and peripherals. Consider also whether or not it would be useful to purchase any of the suggested optional accessories.
>
> Decide as to whether a single user license, site license, or multiple author license is appropriate in your situation. Having established the probable range of uses to which any authored courseware will be put, find out which licenses you will need to obtain. Remember to include in your cost estimates funds to cover attendance at training sessions if you decide that these would be useful. Lastly, remember to also include in your estimates funds to cover the cost of phone calls to the company for help if they do not have a toll-free help number for users of their products. If you are in doubt about hardware requirements or licensing fees, contact the company before you make any commitment to purchase. In the field of courseware authoring, it is definitely 'buyer beware'.

The cost of obtaining site licenses for several authors to use the tools (both on and off-campus) and student use/distribution fees in particular may make some of the available tools too expensive for limited use. One product surveyed by Zelmer (1989, 52-53), for example, required purchasing specially formatted and numbered diskettes for every student courseware item produced—potentially thirty to sixty diskettes per student per year.

Prospective purchasers of an authoring system have a variety of tools, including checklists prepared by practitioners such as Richards and Fukuzawa (1989), but any such tools must be updated regularly to include technological changes.

In 1989 it did not seem appropriate for Health Science to require digital quality audio, 'live video' and colour multimedia capabilities, and few suppliers of the time even hinted at the possibility. Today however, such capability, along with the capability for cross-platform development (the ability to use material prepared on one computer platform on another, Macintosh materials on an IBM/MS-DOS computer, for example) might be more important. This would ensure that the courseware being developed could incorporate the now more mature multimedia techniques and increase student access.

Courseware Design and Evaluation

Educational computer applications have provided a rich research venue for educators, instructional designers and computer specialists. The research ranges from the relative effectiveness of specific presentation formats—often ignoring the more important question of effectiveness in a particular situation—to studies of the way in which individuals interact with the computer itself. Yet, as Coulter (1993) indicated, ‘CAL is still experimental worldwide, and some would say, not yet proven effective’.

Alan Kay (1990, 192-3), gaining insight from the writings of Marshall McLuhan, provides perhaps the most challenging description of the power of the personal computer for educators, and of the need for well-designed courseware to take advantage of the computer's potential.

> I read McLuhan's **Understanding Media** [1964] and understood that the most important thing about any communications medium is that message receipt is really message recovery; anyone who wishes to receive a message embedded in a medium must first have internalised the medium so that it can be ‘subtracted out’ to leave the message behind. When he said ‘the medium is the message’ he meant that you have to **become** the medium if you use it [Emphasis in original].
>
> That's pretty scary. It means that even though humans are the animals that shape tools, it is in the nature of tools and man that learning to use tools reshapes us. So the ‘message’ of the printed book is, first, its availability to individuals, hence, its potential detachment from extant social processes; second, the uniformity, even coldness of noniconic type, which detaches readers from the vividness of the now and the slavery of commonsense thought to propel them into a far more abstract realm in which ideas that don't have easy visualisations can be treated.
>
> McLuhan's claim that the printing press was the dominant force that transformed the Middle Ages into our scientific society shouldn't be taken too lightly—especially because the main point is that the press didn't do it by making books more available, it did it by changing the thought patterns of those who learned to read.
>
> Though much of what McLuhan wrote was obscure and arguable, the total sum was a shock that reverberates even now. The computer is a medium! I had always thought of it as a tool, perhaps a vehicle—a much weaker concept. What McLuhan was saying is that if the personal computer is a truly new medium then the very use of it would actually change the thought patterns of an entire civilisation. He had certainly been right about the effects of the electronic stained-glass window that was television—a remedievalizing tribal influence at best. The intensely interactive and involving nature of the personal computer seemed an antiparticle that could annihilate the passive boredom invoked by television. But it also promised to surpass the book to bring about a new kind of renaissance by going beyond static representations to dynamic simulation. What kind of thinker would you become if you grew up with an active simulator connected, not just to one point of view, but to all the points of view of the ages represented so they could be dynamically tried out and compared?.

Designing the Lesson: McLuhan and Kay provide the challenge. Computer-based instruction is likely to have effects beyond anything we can imagine. It is therefore incumbent on instructional designers to use the best available information to produce courseware that uses the medium effectively.

Table 2.3 lists sixteen principles that Lillie, Hannum, Wallace, and Stuck (1989, 17-31) believe are critical to learning through computer based instruction (CBI) and are based upon more than 650 studies of effective instruction over a ten year period.

Table 2.3

Research-Based Instructional Principles Related to the Design and Development of CBI Software.

From Lillie, Hannum, Wallace, and Stuck (1989, 17-31)

- Beginning lessons with a review
- Beginning lessons with an introduction
- Presenting instruction fluently and precisely
- Using understandable language and concepts
- Using relevant examples and demonstrations
- Ensuring high rates of success
- Presenting instruction at a brisk pace
- Making smooth transitions within and between lessons
- Making assignments and instructions clear
- Summarising the main points of the lesson
- Maintaining reasonable standards
- Checking student performance routinely
- Posing questions one at a time
- Providing instructional feedback
- Affirming correct responses
- Providing sustained feedback after incorrect responses

Schaefermeyer (1990) provides a similar list that permits evaluation of the materials developed because of its strong focus on specifying the target audience, entry and exit level (behavioural) competencies of the learner. As well it encourages the use of cues/prompts and graphics embedded into the content. Figure 2.3 is a matrix (Gagné, Wagner, and Rojas, 1981, from Schaefermeyer, 1990, 12) that has been in common use for over a decade for selecting instructional strategies based on the desired instructional result (event of instruction).

Instructional developers and courseware authors can use it to focus on different strategies for achieving basic instructional goals.

These lists of principles are equally appropriate for designers of paper-based or other instructional materials, especially—as is common at an institution such as UCQ—when those materials would be used by students studying externally.

Events of Instruction

(Adapted from Gagne, Wagner, and Rojas, 1981)

Computer Program Design	Gaining Attention	Informing the Learner of the Objectives	Stimulating Recall of Prerequisite Skills	Presenting the Stimulus Material	Providing Learning Guidance	Eliciting Performance	Providing Feedback	Assessing Performance	Enhancing Retention and Transfer
Drill and Practice	X					X	X		
Tutorial	X	X	X	X	X	X	X	X	X
Exploratory				X	X	X	X		
Simulation		X		X		X	X		
Games	X			X		X	X		

Figure 2.3

Strategies for Achieving Basic Instructional Goals.

From Schaefermeyer (1990, 12)

Defining an effective human-computer interface (HCI) is one of the faster growing research areas in computing today, with the desktop metaphor (the interface design concept that the computer screen should look like a 'desktop', complete with 'folders' and 'stacks' of paper, a 'trash can', et cetera) coming into some disrepute (Laurel, 1991). The desktop interface does however have utility, according to Relan (1991, 8-10) for designing CAL materials:

- Where interaction is required. Touch screens, mice, joy sticks and keyboard input combine to assist the user to move rapidly through a lesson, selecting options and levels of difficulty. The interaction can occur at several levels of complexity ranging from a simple option selection, to moving through a non-linear hypermedia application or a virtual reality unit.

- Where learner control enhances the learning. The use of icons and menus presented in a consistent manner enhances the learner's control over the lesson and permits individualization of instruction.

- Where visualisation is possible. The desktop metaphor uses icons as well as verbal descriptions and a GUI provides the resources for graphical presentations.

- Where learning strategies can be embedded into the lesson design. Cueing strategies such as highlighting and animation, combined with the 'cut and paste' note-taking possibilities can greatly assist in encouraging good study habits.

Relan (1991) also provides guidelines for the development of instructional software in a desktop environment, summarised in Table 2.4, and a rationale, based on current research and instructional design theories, for the most effective use of the unique attributes of the desktop GUI (Graphical User Interface) in CAL development.

Evaluating the Lesson: Courseware materials should be evaluated at two points in the product life cycle. The first evaluation, user testing in the models above and often a very informal activity, involves representative users testing the interface, working through individual elements of instruction, and assessing the overall utility of the unit being designed. This evaluation is essential for determining whether the product works as expected, or even if it works at all. Test runs, observation of representative users attempting to use the product, and interviews with test users are typical techniques.

The second evaluation occurs after the courseware has been completed and released to users, and is necessary to determine whether to continue using or revising the courseware. Commercial producers depend heavily upon sales as an indication of product quality, and the better producers listen to feedback from the users when making revisions to the product. Academic journals often contain evaluations of individual items but courseware evaluation seems to be somewhat ignored in the instructional design process and is only implied in the instructional design models presented earlier in this chapter.

Table 2.4

Guidelines for the Use of the

Desktop Environment for Instructional Software.

Summarised from Relan (1991, 10-13)

- **Instruction which demands high amount of learner control**: Giving control to the user to decide on level of difficulty, selecting options, et cetera, gives control over the lesson for individualization.
- **Creating extensive databases**: The desktop environment allows the user easier access to data. Uses can include tutorials, drills, and situational simulations, all of which require database access.
- **For variable content presentation**: The same data can easily be accessed using different approaches—hierarchal approaches for scientific subjects, non-linear approaches for the humanities—as required.
- **Interactive drills**: The optional display possibilities allow the designer to alleviate boredom through interaction and the use of pull-down answers.
- **Student generated content**: Desktop tools allow active participation of students in writing, creating a database, and sketching, and networked systems can allow collaborative work.
- **Content requiring multi-modal presentations**: Multiple modes of presentation are often recommended for cognitive as well as motivational benefits. The desktop environment is designed to facilitate audio and visual presentation as well as textual.

While a well-designed CAL/CML system or a single lesson, with clearly stated, measurable, instructional objectives, is easy to evaluate—provided there is an adequate allocation of time and resources to conduct the evaluation—the reality in most tertiary education institutions, as Isaacs (1989) laments, is that the resources may not be available for either proper development testing or evaluation of a completed courseware product.

> When one looks at the implementation of computer assisted learning (CAL) in most British or American universities one generally finds a hotch potch of efforts of varying generality, sophistication, success and longevity. The methods and tools used are often totally idiosyncratic, even between staff members in the same department. Support from a central authority within the university is the exception, not the rule. A similar tale can be told of the evaluation of CAL materials and CAL-oriented courses (Isaacs, 1989, 84).

A variety of basic evaluation tools is available from the literature. Lillie et al (1989, 32), for example, rephrase the sixteen items in Figure 2.3 as questions to provide a checklist for use when evaluating instructional software. The first item in their checklist provides a sample of the items [Emphasis in original]:

1. Does the program *begin with a review* of previously learned material? Yes No

Dejoy and Mills (1989) divide their criteria for evaluating materials for adult self-directed learners into four checklists: content, instructional strategies, instructional presentation, and documentation.

Observation of users of the product, perhaps utilising videotape to record work sessions, provides another technique, one that is extremely useful during the user testing portion (the first evaluation) of the development process. O'Malley, Baker, and Elsom-Cook (1991, 59) found a large scale project hard to evaluate as traditional task analysis methods were too low-level, and more formal representations took them 'too far away from the model'. Their most valuable data came from 'detailed observational studies' of the users of the system being evaluated, although the drawbacks to this process included the large amount of data generated and therefore the time required to analyse it, and the unrealistic nature of the observational settings compared to the normal usage setting.

Formal evaluations of large instructional packages are generally expensive undertakings and, although most lecturers do informal evaluations of their teaching materials as required in their subject or course development process, it may be that the costs of a formal evaluation outweigh any perceived benefits for universities, unless there have been significant complaints from the students using the materials. The institution has already made a significant investment in developing or purchasing the product, and unless there is a reason for conducting an evaluation, the time and resources cannot be spared.

Required Computer Competencies

The conventional team model assumes that specifically computer oriented skills—basic use of computers as well as courseware design tools—will be available from one or more members of the design team, not necessarily the subject matter expert(s). The individual author model, on the other hand, assumes that the author will have at least minimal skills in all areas. If McLuhan (1964) and Kay (1990, 192-3) are even marginally correct, then the ability of the courseware developer to use the computer is an important component of the design requirements.

The best computer users, Rodd (1990) notes, are those who learn to understand their computer rather than memorising a rigid list of procedures.

> I have only anecdotal evidence but four years spent training people to operate word processors have left me with the distinct impression that those who have the most difficulty are the ones who want rigid lists of procedures to follow in every eventuality…

> The successful users probably just remember roughly what sort of procedure is needed, then either look up the details or press buttons and see what happens.
>
> Eventually, of course, what works gets "hard-wired" into our brains for things we do a lot, but we certainly don't memorise long sequences of action right off.

Lillie, Hannum, and Struck (1989, 3) have identified a hierarchy of computer literacy skills (Table 2.5) required for educators at three levels of skills/competencies—basic, instructional use, and instructional design and development—and reiterates the need for instructional designers to be fully conversant with their tools.

The person(s) using the courseware in the classroom—lecturer or student—will typically be neither the instructional designer nor the courseware author, yet he or she will require appropriate computer skills to be effective in the computer use. This will likely require regularly scheduled training programs and one or more computer support staff, available in the work area on demand, to ensure that users have the appropriate skills when they are required.

Table 2.5

Computer Literacy Levels for Educators

From Lillie et al (1989, 3)

	Skills/Competencies
Level I **Basic Knowledge**	Understanding of basic computer jargon (disk drive, CPU, menu-driven, control keys, memory, save, retrieve, et cetera.) Ability to use application programs (word processing, courseware, et cetera.) Elementary understanding of basic hardware components
Level II **Instructional applications**	All of the above plus Ability to select and match software with instructional objectives and individual needs of students Ability to evaluate courseware in terms of effective instruction and instructional design principles Application skills in using courseware, instructional management software, and test-scoring software Ability to match design of courseware to individual instructional needs and abilities
Level III **Instructional design and development**	All of the above plus Ability to design courseware, incorporating effective instructional principles Ability to develop (program) instructional software

A Final Caution

A consistent theme from the instructional design theorists and commentators is that determining user needs, and matching those needs to the courseware development, are important aspects of the design process. Instructional designers and programmers have been justifiably criticised for ignoring the user. The ego-centric focus of the individual author process means that practitioners of this approach must be vigilant to ensure that they do not become recipients of the same criticism. Effective instructional design requires designers, teams and individuals alike, to be in continual contact with representative users and constantly testing their designs and products with those representative users.

Change and its Management

> One of the things that we know about human beings is that, in general, they are resistant to change. Even when there are small interruptions to the rhythm and pattern of daily life, most people experience mild tension or irritation. When our lives are disrupted by changes which involve some redefinition of who we are or how we are going to live, the tension is correspondingly greater… even when the change may be both sought and welcomed (Mackay, 1993, 2).

As a result of the Dawkins era (the term of Mr. Dawkins' office as Federal Minister for Education), and its continuing fallout, the Australian tertiary education sector has undergone a period of intense change over the last four to five years. Di Zetlin (1992), general secretary of the Federated Australian University Staff Association, writing for a general audience in the *Weekend Australian* (12-13 September, 1992), indicates that while change has become fundamental to the nature of the university, the quality of our universities still depends upon the vigour of the intellectual debate between staff and students.

> The traditional motto for universities may well have been the more things change, the more they stay the same. Post Dawkins, that motto might well be written: the more things change, the more things change…
>
> The question for the 1990s is whether this tempest of change has a heart…
>
> Above all, in a situation marked by change, we need to respect the idea that the quality of our universities rests upon the vigour and enthusiasm of the intellectual debate which occurs between staff and students at all levels.

The computerisation of tertiary education has overlapped with the Dawkins changes, and, in some respects, has probably become confused with the more fundamental structural changes.

The average academic staff member, for example, reacts to the use of electronic mail because it changes the way decisions are being made, without realising that the *nature* of the decisions being made has also changed. At UCQ, for example, the devolution of funding has resulted in financial decisions being made in the Faculty instead of the Chancellery, and the shift of emphasis from teaching to research has changed the basis for work and recognition within the institution.

Electronic mail is one example of the changing nature of communications, as Zuboff (1988, 381) notes in describing a study of electronic communications within an American corporation:

> Gradually, DIALOG [the electronic conferencing system being studied] participants began to realise that their enthusiastic use of the conferencing medium as a means of extending oral culture had seriously miscalculated the consequences of its textualizing power. Their efforts to use this remote electronic medium to construct and manage complex social exchanges had inadvertently reified and exposed the most delicate and sometimes questionable facets of their organizational lives.

One of Zuboff's (1988, 381) interviewees indicated that the users of the system had assumed, incorrectly, that electronic communications was no different than more traditional communications.

> We are used to face-to-face interaction where words disappear. We assume that over the phone, too. We don't stop to think that someone is recording what we say. How does electronic communication fit with the stuff we're used to? I assumed keyboard communications was like a letter or a phone call, but now I understand that it doesn't disappear. The social aspects of confidentiality and security haven't been thought through.
>
> The myth is that electronic communications is invisible. No one acknowledged the visibility of the medium because it was abstract. Input is abstract; output is concrete.

One of the little understood aspects of information technology, according to Zuboff (1988, 10-11), is that it is both an *automating* and an *informating* technology.

> As long as the technology is treated narrowly in its automating function, it perpetuates the logic of the industrial machine that, over the course of this century, has made it possible to rationalise work while decreasing the dependence upon human skills. However, when the technology also informates the process to which it is applied, it increases the explicit information content of tasks and sets into motion a series of dynamics that will ultimately reconfigure the nature of work and the social relationships that organize productive activity.

This section expands upon the discussion of change in the Introduction, particularly changes in information technology and their management. As female workers still predominate in health care, and the Faculty of Health Science is training health care workers, note has also been taken of the effect of computerisation on female employment.

Computerisation—An Inevitable Change?

Computers are not new to Australian institutions, particularly tertiary level educational institutions—they have been used as research tools and as a topic for technical study from almost the very beginnings of their commercial development. The wider use of computers for personal use is more recent, and has followed the same pattern of development as in other countries.

Mainframe computers were used to speed up financial and similar 'data' processing functions. In general, the larger metropolitan (or 'Capital City' in Australian terms) institutions first used automated data processing, followed by regional and smaller institutions as the perceived benefits became apparent. Developments in microelectronics gradually decreased the size and cost of computer facilities, resulting in a massive growth of uncontrolled microcomputer use, even within the arts and other people-oriented areas. The spread of microcomputers is uneven—the use of computers within healthcare institutions within Australia still primarily refers to the use of mainframe and minicomputers, and their attached terminals, for administrative use, rather than to productivity enhancing tools for front line workers such as nurses.

The literature of the early 1980s contained references to the Second Computer Revolution and the impact that microelectronics would have on the workplace and the worker. Predictions were as varied as the writers, especially with regard to the impacts upon female workers, usually clerical workers. Nurses, predominantly female, had not been significantly affected by computerisation although their institutions may have been. In Canada, Menzies (1981, 1982) wrote several books on the effects of informatics upon female [clerical] workers. Aside from noting that a third of Canadian hospitals were using data processing systems by 1978, she primarily indicated that 'the galloping growth' of jobs traditionally held by women had been checked and reversed by automation (Menzies, 1982). Likely indicative of the degree of computerisation in the health field, her case studies (Menzies, 1981) on women using microchip based equipment did not include health institutions. The first Australian anthology (Forester, 1980) to examine the economic and social implications of microelectronics also failed to include health or social services.

By 1980 hospitals and other health institutions in Australia had computerised some of their data-oriented functions and state health departments were beginning to realise the potential benefits from a standardised approach. The planning for a statewide hospital information system in

Queensland, for example, had begun, although political events were to prevent the system from being implemented until 1990.

The technology literature of the late 1980s had discovered the health sector. One typical anthology (Blackler and Osborne, 1987) includes articles which discuss the reasons why computers may not be accepted in the health field, the use of the computer as a health 'expert', and technology for assisting the disabled. Canada's Institute for Research on Public Policy and the Canadian Medical Association (Feeny, Guyatt, and Tugwell, 1986) jointly looked at the diffusion of health care technologies but were primarily preoccupied with costs.

To some extent the preoccupation with costs may reflect the limited impact of computers on the patient care side of the institution as versus administrative data processing functions. In Roger's (1983) terms, nurses and other health professionals are still primarily in the knowledge stage although there are a few who have moved beyond, especially in North America. The University of Victoria (Canada) as early as 1987 was hosting an annual conference to assess information technology in community health with topics such as 'Microcomputer Applications in a Community Health Unit', 'A FILEMAN-based Application for the Direct Entry of Oral Examination Data in Rural Alaska', and 'Hand-Held Computers and Environmental Health Inspectors' (Nusbaum, 1988). As well, there are an increasing number of books by nurses which address the impact of computers on nursing. Ball and Hannah (1984) and Cox, Harsanyi, and Dean (1987) provide two examples.

Australian nurses, however, are beginning to use computers, and are writing about their experiences for their professional publications. In some typical articles from Australasian nursing journals, Litchfield (1990) and Hausman (1990) discuss computers and their place in nursing from a New Zealand perspective, Byrne (1990) and Spratling (1990) look at computer assisted learning in selected Australian tertiary nurse education institutions (universities and colleges), and Gray (1990) assesses the value of personal computers to the Australian remote area nurse.

Australian nurses increasingly use computers and computer controlled equipment. Queensland nurses, as well as becoming more aware of the use of computer technology, became actively involved in the late eighties in the implementation of a major Hospital Based Corporate Information System (HBCIS). UCQ's Faculty of Health Science contributed to this growing awareness through the project under study and reports and articles arising out of the project (Young and Zelmer, 1992, Zelmer, McLees, and Zelmer, 1991, Zelmer, 1991, Zelmer, Zelmer, and Shannon, 1992, and Zelmer, 1992). Computer usage within the Faculty also contributed to a wider acceptance of the use of computers within the university (Chapter 6).

Managing the Change

Computerisation has not come easily to any sector of the workplace, perhaps because workers’ concerns over the potential loss of employment have seldom been satisfactorily addressed. In addition, advocates of computerisation have often failed to understand how humans react to innovations. Rogers (1962, 1983) theories on the slowness with which innovations, particularly technological innovations, are diffused were noted in the Chapter 1.

The subsequent rapid spread of personal computers could be used as a refutation of these theories, however, it could also be argued that desktop personal computers have still only made a major impact on the Fortune 500 companies and their worldwide counterparts. Many individuals do use microcomputers to assist with an ever increasing number of daily chores. Many more do not, and will not, either because they perceive the computer to be something that is too complex for them to understand, or something that they fear. This situation is not likely to change without an understanding of how individuals react to change. As Newman (1992, 41) notes, users were also slow to accept the value of telephones.

> The early phones were treated with suspicion. Phone subscribers felt sure that somehow the talking machines were conveying false information, and for many years after they were introduced, Canadians used telephones to make appointments to visit their friends in person.

Our concepts of change are also undergoing revision. The traditional models of change (Rogers, 1962, 1983) described in the Introduction were based on agricultural examples, specifically the adoption of new technologies with clear commercial benefits, and were often validated in third world settings. However, the applicability of these classical models to modern agriculture, including the classification of non-adopters and the stages of adoption, has been disputed (Buttel, Larson, and Gillespie, 1990, 61).

Although replacement theories are generally lacking, the barriers to adoption are seen as being more rational than previously. For example, Vanclay (1992, 455) reports that the relative complexity of the innovation is seen as having a definite influence on the adoption of an innovation, with the farmer quite rationally electing to adopt simple innovations over more complex ones:

> Complexity makes the innovation more difficult to understand… Farmers are acting quite rationally by preferring to adopt less complex innovations over more complex ones and by not adopting complex practices at all.

University academics, administrators, and health care workers should be no less wise than farmers in their approach to adopting technological innovations.

Reece (1990, emphasis in original, 17) introduces computer systems design, a technique for systemising and understanding the relationships between processes in complex computing systems, to the problems of computerisation in higher education. Arguing that all computing effort 'must *demonstrably* improve accessibility to the student', the underlying assumption in many of his points, applicable to computing projects as well as computer departments, is that of '*accountability*' .

> *Accountability* [is] a primary tool for avoiding problems. In the past, computer departments were treated as special units within the institution, with management accepting delays and slippage as due to the complex nature of computing in general. Fortunately, those days have pretty much disappeared, although in some education environments (notably distance education), it still crops up, possibly due to the relative novelty of computing in this area. However, the same accountability *must* be enforced with computer related endeavours as with any other university activity.

An American change consultant and academic (Mackenzie, 1991), provides a technique for managing organisational change which he calls the 'organizational hologram'. Based upon actual experiences working with organisations over many years, the concept of a hologram provides a three dimensional visualisation of an organisational structure that reinforces the interdependence of various aspects of the organisation. Each element of the hologram, containing all of the information required to display the hologram, reflects the total picture—the organisation in this case.

Mackenzie starts from the premise that successful organisations embrace change rather than simply react to stimuli, 'If it works, make it work better' (Mackenzie, 1991, vii). This management concept should be applicable to project-level activities as well as larger organisations, ensuring that projects are managed more effectively and are able to adapt to the changes generated by the project.

A university is a complex bureaucratic structure largely staffed with highly trained individuals working in their own discrete areas of specialisation. Australian Industrial Award structures serve to divide university staffs into management, academic and general. Building upon perceived university traditions and practices, the structure tends to encourage a reactive labour force. Proactive actions only come from management—the administration. Mackenzie (1991, 233) describes such traditional establishments as having workers who are 'floaters' and managers who are 'swimmers'. This, he says, must change.

> There is little doubt that in order to become more efficiently adaptable, modern organizations need to become populated by more 'swimmers' and less 'floaters'.

He goes on to indicate that training programs to get participation in decision making, in order to convert floaters to swimmers, have generally had limited impact. Managers of an organisation undergoing change must have a better understanding of how to get workers to 'buy into' decisions so that they will work for their implementation.

> The days of expecting employees to sacrifice themselves in order to enrich the owners is long gone (Mackenzie, 1991, 233).

Zuboff (1988, 394) advises that the new technologies for managing information lead to a need for new learning as systems as well.

> The… process moves away from a conception of information as something that individuals collect, process, and disseminate; instead it invites us to imagine an organization as a group of people gathered around a central core that is the electronic text. Individuals take up their relationship towards that text according to their responsibilities and their information needs…
>
> Under these circumstances, work organization requires a new division of learning to support a new division of labour. The traditional system of imperative control, which was designed to maximize the relationship between command and obedience, depended upon restricted hierarchical access to knowledge and nurtured the belief that those who were excluded from the organization's explicit knowledge base were intrinsically less capable of learning what it had to offer. In contrast, an informated organization is structured to promote the possibility of useful learning among all the members and thus presupposes relations of equality.

The organisation (University, Faculty or project) must also manage change rather than being managed by the change; it must recognise also that, as London (1988, 57) notes, 'Managers have a role in identifying the need for change, establishing the direction for constructive change, and then making change happen'.

Gillespie (1992b) quotes the folklore of change to emphasise the need to manage change. She indicates that the development of change projects is often a continuum leading from enthusiasm through disillusionment and recriminations to misplaced glory.

- Enthusiasm
- Disillusionment
- Panic
- Search for the guilty party
- Punish the innocent party
- Fame and honour for the nonparticipants

Lewin (1943a, 43) described the steps involved in the general acceptance of a new theory in much the same terms:

> At first the new idea is treated as pure nonsense, not worth looking at. Then comes a time when a multitude of contradictory objections are raised, such as: the new theory is too fancy, or merely a new terminology; it is not fruitful, or simply wrong. Finally a state is reached when everyone seems to claim that he had always followed this theory. This usually marks the last state before general acceptance.

Bernhard (1990, 26) expands on this topic. Noting that the costs of change include 'losses of power, competence, relationships, rewards and even identity', he suggests that more research is required into how participants in the change process react to the effects of the change.

> Much has been written about managers as initiators of change; but much more needs to be done for their roles as tacticians and communicators of change, as well as victims of change.

Gillespie (1992a) has also provided a warning for instructional developers and a list of factors for success in any technology project. Instructional developers, but more especially managers of instructional development, need to look beyond the simple mechanics of their work. We are all politicians, she said, and successful projects require political awareness:

- **P**lanning (including agreement on goals)
- **O**rganisation
- **L**eadership
- **I**ntegration (into regular program)
- **T**eamwork and Training
- **I**mplementation (How, Where, When, etc.)
- **C**ommunications and Coordination
- **S**ynthesis and Energy (the whole is greater than the parts)

  [Emphasis in original.]

Managing change results in organisational growth. As Bernhard (1990, 28) notes,

> The need to remain stable and the need to change exist in the same organisation and people on the same day at the same time. They coexist. We need to foster resilience in… organisations to get past the pain of over-investing in form. However, in stability we find the will to change.

Qualitative Research

Introduction

Before coming to UCQ the author had been responsible for conducting several evaluations (Zelmer, 1983, 1986, 1988) of the effectiveness of programs responsible to and serving the general public. Qualitative techniques had been used for these evaluations because they provided information about how people ‘felt’ about the service in a way that could lead to improvement. Participants, whether staff or service users, who took the time to participate in an open-ended interview, for example, often helped determine why the system being studied had lost attendance, circulation, et cetera, rather than just noting the change. Confronted by the problems that they themselves had identified, they were also often able to provide more effective solutions than could ever have done by an evaluator.

Nursing is a social process and nursing researchers use tools that allow them to investigate social processes. It is not surprising, therefore, that qualitative rather than quantitative research methodologies are increasingly a dominant paradigm for investigations of nursing care and process, interactions between nursing professionals and their clients, and the human aspects of nursing.

The use of computers is also a social process. The interaction between the computer user and the computer hardware, operating system, and application software has been extensively studied from a quantitative point of view. This has provided us with data on the best screen colours, the size and shape of monitors, keyboards, and mice, and the effects of low level radiation emissions. Increasingly, however, qualitative techniques are being used to test questions related to the user interface and ease of use.

For example, quantitative techniques are used to improve efficiency through determining the number of keystrokes required for a particular activity (structured observation or stroke counting by the computer itself) and for determining a relative frustration level for various procedures. While making improvements to procedures that are frustrating should improve efficiency, cutting keystrokes may decrease efficiency if the user feels that control of the procedure has been lost. Qualitative techniques can indicate both where the procedure is incorrect (incorrect screen information, for example) and cumbersome (too many keystrokes, commands out of sequence, confusingly similar commands, etc.), and the required design changes to correct the situation (comments from the participant observer), or how the ‘system’ fails to conform to reality (interview with users).

This case study examines the operations of one unit within a nurse education program. More specifically, it examines a social system—the relationships between nurse educators, nurse students, computer specialists, computer students, and administrators. Qualitative case study techniques provide the greatest potential for obtaining useful information to guide individuals and institutions undertaking similar activities in the future, particularly as they allowed the author to collect the data while working (participant observer) in the social system under study.

This section includes a discussion of some of the issues in the use of qualitative research, a brief look at the role computers can play in qualitative research, and an examination of the use of case study techniques.

What is Qualitative Research?

Qualitative research methodologies are reasonably new in a formal sense but they involve procedures that have been used for thousands of years in investigative and informal research activities. The difference now is that qualitative researchers acknowledge their own effect on the research setting and have the same concern for the human subjects that was evident in the human relations and similar movements of the sixties and seventies.

Pfeiffer (1972, 111), a publisher and human relations consultant, describes truth as coming from within the researcher.

> For each person what is true is determined by what is in him, what he directly feels and finds making sense in himself, and the way he lives inside himself.

Reinharz (1981, 416), quoted by Lipson (1991, 73), defines the qualitative researcher as an individual that can be changed by the process of the research.

> Researchers using these methods 'minimise manipulation of research subjects, limit a priori analysis or definitions of variables, and attempt to develop genuine relationships with the nominal subjects, leaving open the possibility that both will change in the process'

Qualitative researchers are therefore not unique. They have the same concerns for the individual as nurses, social workers, teachers, sociologists, or anthropologists as Lipson (1991, 74) indicates:

> The three most common qualitative designs used in nursing research—ethnography, phenomenology, and grounded theory—share the goals of describing the complexity of human experience in its context, with emphasis on describing daily events of peoples' lives using their own words. Each design emphasises learning from 'informants' rather than approaching 'subjects' with preset hypotheses.

Qualitative researchers are, however, studying the process, rather than being the provider of a service. As Jones (1983) indicates, they should declare their known biases, and acknowledge the effect of their presence on the event being studied.

> The researcher must adopt a suitable methodology to avoid damaging the actor's explanation. The task is to demonstrate that analysis is congruent with the interpretive schemes used by those studied, while recognising the researcher's own influence on the situation. The researcher's involvement in a situation, for example, influences the

> definition of the situation because the researcher brings theories and interpretive schemes both as scientist and member to that situation.

Qualitative techniques are sometimes criticised by 'hard science' researchers because they supposedly observe what is 'blowing in the wind' and therefore lack academic rigour. 'Nursing researchers [and presumably other qualitative practitioners] will adopt more statistical techniques as the nursing field matures' (Coll, 1992). The assumption seems to be that a qualitative analysis of interviews, observations of field (work) settings, institutional reports and correspondence, and similar sources of information is somehow less scientific than a statistical analysis of survey data, records of usage, and similar sources of information.

The qualitative researcher (usually) admits that the result of a research study is a 'story', albeit a truthful story, and that there may be as many different stories about a particular event or process as there are participants and/or observers. Our police and legal system are aware of this phenomenon and have developed procedures to determine a 'truth' in any particular situation. It cannot be otherwise when we are studying social processes and the activities, emotions and feelings of the participants in the social process.

The qualitative 'story', as Dunlop (1991, v) suggests, is true for the particular participants providing the data and provides an interpretation of the specific events under study that allows us to understand the events in context.

> So the story must be a story for its time—which does not mean that it is limited to the present moment of time (an impossibility anyway). To be true, it must make sense by drawing on our knowledge and understanding of the past, and interpreting that past for us in the present.

Traditional scientific research is heavily quantitative and involves the manipulation of numbers that are assumed collectively to represent reality. Qualitative techniques are very different, as Stern (1991, 149) notes; they manipulate word concepts rather than numbers:

> Our measurements in a qualitative study go beyond numbers into the realm of conceptual manipulation. The symbols we work with are words rather than numbers. We use words, clustering them, ordering them, and building them into a picture of reality. We map data and draw pictures about it, and we try to see how it moves and changes. Continuums, cross-tabulation, and phase-analysis are but three examples of qualitative analysis.

Tesch (1990, 2-3) continues the explanation, indicating that qualitative data have come to mean any data that cannot be expressed in numbers.

> Obviously, researchers invent a lot of things: concepts, instruments, interpretations, statistical confidence levels, theories, and so forth. They try to convince themselves

> and others that they have good reasons for concocting these intellectual tools, and the more systematic, truth-loving, and skeptical of their own processes and presuppositions they are, the more they are trustworthy. Ultimately, the process of research is a process of persuasion. You must believe what you find most convincing.
>
> When we ask questions about human affairs, the responses come in sentences, not numbers. We collect as ‘data’ narratives, or, as I like to call them, stories. Likewise, observations result in notes that take the form of a description of events; again, we deal in stories…
>
> In the wake of the new paradigm, these data have come to be called ‘qualitative’…
>
> Qualitative data, for better or worse, now means any data that are not quantitative, i.e., qualitative data are all data that cannot be expressed in numbers.

Tesch (1990, 55) categorises various qualitative research types, noting that ‘Strictly speaking, there is no such thing as qualitative research. There are only qualitative *data*’ [emphasis in original]. She suggests that quantitative and qualitative researchers simply inhabit different positions on a continuum, and her Graphic Overview of Qualitative Research Types (Figure 2.4) demonstrates one view of the continuum within qualitative research itself. As she explains (1990, 71), the overview provides one way of mapping the techniques available to assist the qualitative researcher in making a credible discovery:

> The map [Figure 2.4] has a flow from those kinds of research on the top that have certain resemblances to natural science research to those at the bottom that have certain resemblances to the arts. It all looks beautifully orderly.
>
> However, this graph is but one way of seeing qualitative research. Another way would be to see research through a metaphor. Think of a painter's palette. There are certain basic colours. They can be mixed to form an unending variety of shades. Every individual researcher could do a study of a unique ‘shade’. …But basically, there is only one requirement for research: that you can persuade others that you have indeed made a credible discovery worth paying attention to.

The Participant Process

The qualitative practitioner recognises that the researcher's personal characteristics will affect the research situation, and may bias the data obtained. For example, the choice of questions, and the options available for responding to the questions, as well as the setting for asking the questions, bias the results of any study. The researcher must therefore be very aware of ‘self’ and its (real and potential) effect upon the informant and the social situation being examined. Lipson (1991, 88) indicates that researchers,

> Should become progressively more aware of how [their values and personality] affect the field setting. Ongoing efforts to bring the person of the researcher into consciousness, noting both inner and outer data, is like developing musical expertise. …The ethnographer as a research instrument is capable of progressively finer tuning with effort and time.

The definition of the researcher's role will determine how the research is conducted and the results obtained from the study. The potential oxymoron within the term 'participant observer' is obvious from *The Macquarie Dictionary* (2nd edition, 1991) entries for the individual words:

> **observer** n. 1. one who or that which observes. … 3. one who attends a meeting, etc. but does not take any official part in its activities.
>
> **participant** n. 1. one who participates, a participator.

Combining the two terms, a participant observer is an individual who has access to observe a situation, *and* who participates in that situation. The potential ability for the participant observer to leave the situation could be implied from this definition. A situated participant, on the other hand, is an individual who has already accumulated the understandings and meanings of the situation that can only come from being part of the situation, without the ability to leave the situation. Dunlop (1991, 139) suggests that 'It is the part of the participant observer to gain access to the understandings and meanings which a situated participant already has.'

The participant observer, and the reader of the resulting study, need enough information to understand the situation being studied, but neither can ever have as much knowledge as the individual involved from the beginning to the end of the situation being studied. In describing the ridiculousness of trying to fully recreate her own situation for the reader of her thesis, Dunlop (1991, 140) noted that the participant has some special problems in writing; 'Researching the area from scratch would have been less problematic, because I would have access to a much more delimited set of material.'

Field and Morse (1985, 76-77) describe a range of roles, from the 'complete participant' to the 'complete observer'. The former 'enters the setting as a member of the group and conceals the research role from the group', leading to potential violations of ethical standards from having failed to obtain the consent of the group. The latter is a passive observer, loses the ability to gain data from interaction and clarification, and has the same ethical dilemma. The 'participant-as-observer' fits between these two extremes, usually negotiating responsibilities and limits as part of gaining entry to the study setting. The participant-as-observer thus overcomes the ethical dilemmas of the other models, but often experiences conflicts between the two roles.

An individual can also affect the situation merely by being present and identified as an observer. In the most extreme case, the other participants may 'show off' or try to attract the attention of the observer with 'bizarre' behaviour. Even the most casual viewer of television news is aware of staged demonstrations and the effect of the presence of TV cameras. Participant observers must be aware that their presence can potentially have a comparable effect.

In describing this study, to the participants and others, the author has used the term 'participant observer' to describe both himself and the other individuals involved. While involved in the development of the computer-based activities within the School of Health Science the author was seconded from the Department of Mathematics and Computing, and therefore theoretically was able to leave at the completion of the study. Similarly, the students, educators, and administrators could move in and out of the School as their careers dictated. The reality may be quite different for several of the participants, the author included. Having been involved so intensively for an extended period of time, some participants may be more 'situated' than they care to admit.

The problem of maintaining objectivity is compounded by the need to break down communication barriers between the study participants (researcher and others) in order to be effective at both completing the task (CAL development in the case of this study) and the participant observation. As Fetterman (1984, 214) observes,

> The stereotypical concept of an evaluator as someone looking for problems or deficiencies effectively blocks many communication channels. As the ethnographer is interested in finding out how the system works from the insider's perspective, such barriers to communication must be broken down.

Fetterman (1984) goes on to discuss a number of ethical issues that confront the researcher, including role conflicts, becoming aware of illegal activities, having 'dirty hands' from being involved in such activities, and the uncensored use of fieldnotes. The researcher in a 'neutral' situation such as a university project faces the same ethical dilemmas, and the same need to maintain objectivity and 'distance' from personal problems, as the qualitative researcher in any other field situation.

Watson, Irwin, and Michaleske (1991, 510) describe the necessity for the researcher to establish a personal relationship, the 'researcher as friend', but emphasise that

> It was important for us to exercise discrimination when interviewing 'our' respondents in order to avoid being too credulous or sympathetic, thus destroying our credibility.

An individual normally ignores much of what occurs while engaging in the activities of a daily routine. This compartmentalising of 'reality' may well be essential to the conduct of daily life, as with a senior executive of a major state undertaking in India, who explained to the author some years ago that he had to ignore the poverty around him—concentrating instead on problems of the several thousand employees under his care—as anything he was able to do

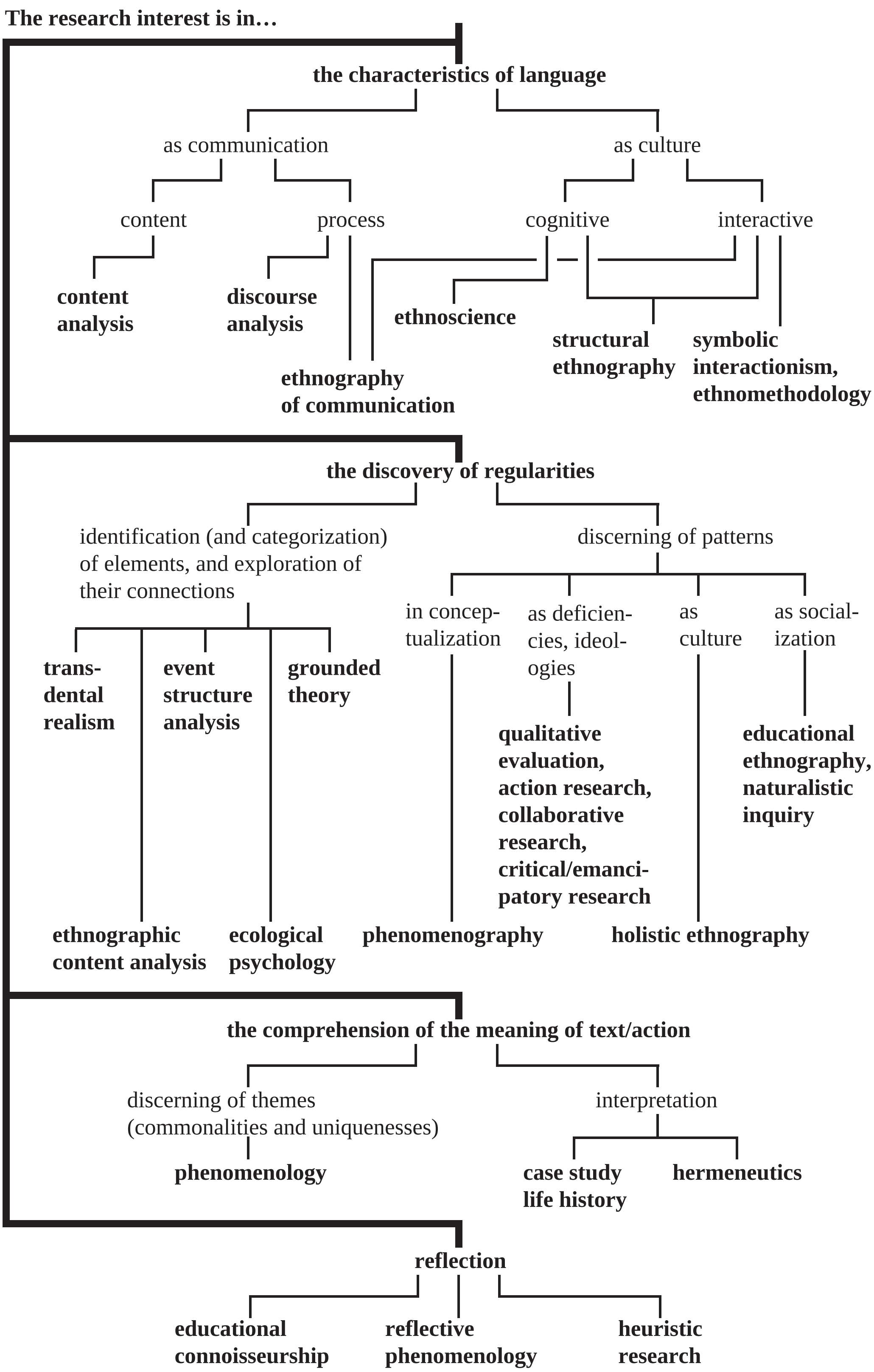


Figure 2.4

Graphic Overview of Qualitative Research Types.

From Tesch, 1990, 72-3

within the context of his job regarding the poverty of India's millions would be non-functional. Spradley (1980, 55) makes a similar observation:

> If all human beings actively tried to remember and catalog **all** the activities, **all** the objects, **all** the information they could perceive, and if they did this **all** the time, they would experience what some scholars have called over**load**… We all adapt to the potential threat of overload by paying less attention to information we do not need or want [Emphasis in original].

The qualitative researcher must be more open to observing all the activities that make up the setting being studied. Spradley (1980, 55) continues, ‘The participant observer, in contrast, seeks to become explicitly aware of things usually blocked out to avoid overload.’, and notes that the researcher's task is not easy: ‘for you must overcome years of **selective inattention**, tuning out, not seeing, and not hearing’ [Emphasis in original].

Van Maanen (1983, 251) warns that there is a danger for ‘outsiders’—qualitative researchers in an obvious observational role—in losing their perspective while studying a situation,

> There is always the danger that researchers will lose their uniqueness and distinctive mission and become (if only temporarily) little doctors, cops, or bureaucrats instead of the sociologists, economists, or psychologists they set out to be in the setting studied. There may be some field worker's pride in such a transformation, but rest assured, there will also be some academic shame.

The potential problem is no less problematic for the participant researcher. The author, for example, found it particularly difficult at times to separate operational and observer roles. Since operational commitments almost always took precedence over observation, anecdotal and evaluative data which might have been useful were not always recorded. The computer-based log used for recording the author's reactions to events, and the author's rationale for decisions, for example, has periods of several months where there are no observations. Information about the events, and the author's public reactions to those events, is available through other documentation. Unfortunately this documentation may lack the immediacy and intimacy of the personal log. While some practitioners, Ericsson and Simon(1980, 216) reports, caution against the use of such records: ‘Introspection, it has generally been agreed, may be useful for the discovery of psychological processes; it is worthless for verification’, in a detailed examination of research into the use of introspective reporting Ericsson and Simon (1980, 247) concluded:

> Verbal reports, elicited with care and interpreted with full understanding of the circumstances under which they were obtained, are a valuable and thoroughly reliable source of information about cognitive processes…They describe human behaviour that is as readily interpreted as any other human behaviour.

Log entries sometimes posed other difficulties—the author excluded several management incidents from the study results because the log notes form the only record of a situation that could be embarrassing or professionally damaging to the individual(s) involved. The ethical issues involved are discussed as part of the study results.

One researcher, Dunn (1991, 388-91), observes that the novice researcher, herself included, is usually not prepared to deal with the stresses involved in conducting qualitative research, and that it was only in retrospect that she realised that the researcher required special support services.

> The novice researcher is usually taught that the research process is orderly and straightforward. But just the opposite proved to be true in a personal qualitative research experience, which shows that novice qualitative researchers must be alerted to the actual pain that they may experience…
>
> During the months of data collection and analyses, I encountered numerous physical and emotional disorders. However, I was unaware of the connection between the responses and the study until I was completing the final report…
>
> Retrospectively, I noted that the physical and emotional responses I experienced were parallel to those expressed by the subjects in my study…
>
> As I reflected on these responses, I realised that I had unconsciously sought social support from family members, colleagues, and other health professionals… I reflected on how social support had been helpful to me in dealing with these responses, something that many of the informants were lacking.

She quotes Punch and Van Maanen (Dunn, 1991, 389) as encouraging the recording of such experiences as part of the data collection, especially as the physical and emotional reactions may affect the interpretation of qualitative data.

The need to preserve anonymity can pose its own difficulties. Morse (1991a) examines the terminology used when referring to those individuals who assisted in the research. 'Subjects', she notes, is a particularly passive term associated with 'real' science; 'respondents' is used by sociologists for individuals who answer, usually without amplification, structured and semi-structured questionnaires; 'informants' derives from anthropology where the researcher is instructed in the cultural setting; and 'participants' are more actively involved in the research, although the degree of equality between researcher and researched may vary.

Typically, the researcher guarantees anonymity, and in so doing removes several advantages that might otherwise accrue in a situation of equality. Anonymous participants, for example, do not receive academic credit, usually provided in the form of authorship, for their contribution. The researcher, on the other hand, usually gains considerable academic credit from the process, even though, as Morse (1991a, 405) indicates, ‘I am very conscious that “my transcripts” of our conversations are not “mine” at all.’

The participant observer process, as defined in this study, also raises questions about the inclusion, or exclusion, of specific individuals, especially when information is gathered through an interview process. Paterson and Bramadat (1992) argue for extensive preparation prior to an interview, including a process whereby the interviewer can exclude unsuitable individuals. While extensive preparation is required, particularly to ensure that interviewees understand the purpose of the interview and their rights, and to ensure suitable interview conditions, the participant process precludes the exclusion of some participants from an interview-based data collection process. As well, it is almost inevitable that their input to the overall project will also appear in the paper and electronic records of the project.

Involving all the participants also ensures the integrity of the data collected. Hinds, Chaves, and Cypress (1992, 69), suggest that unless the researcher interacts with the other study participants, the research will lose its context.

> A researcher could describe a specific context by carefully, even painstakingly, noting all aspects that are obvious and therefore relevant to him or her. But without interacting with others in the context, the researcher may miss what is relevant to the others. Without the purposeful attempt to interact with the context of others, meaning will be more grounded in the researcher's contexts than those of the phenomenon under study.

The participant observer must also plan to exit from the study—perhaps totally leaving the setting for another activity, alternatively discarding the researcher portion of the role to continue as a participant within the activity previously being studied. The writing process, as Van Maanen (1982, 139) indicates, requires some distance between the researcher and the project.

> To write an ethnography is to distance oneself from the people studied. It also means leaving the field in some form or another, and this process may prove difficult for the fieldworker. Easing out and letting go of a field project is not merely a technical matter, something to be marked on the calendar. Involved are such problems as cutting and altering personal ties, properly observing the local norms of leave taking, and handling the conveniently belated recognition that the ethnographer is really what he says he is and may well actually write a report.

The Case Study

The case study, with its varied history as a tool in the natural and social sciences as well as business and education, has an equally wide variety of definitions and uses. McCorcle (1984), defining case study for the purposes of planning and evaluation, quotes Becker (1970) and the meaning of a case study in the medical and social science traditions:

> [Case study] refers to a detailed analysis of the individual case that explicates the dynamics and pathology of a given disease; the method supposes that one can properly acquire knowledge of the phenomenon from intense exploration of a single case…
>
> The case studied in social science is typically not an individual but an organisation or community.

McCorcle (1984) further notes that an emphasis on 'detailed description, process, and context' is required and suggests five criteria for an acceptable case study.

- It is important to choose the *right* case, the *right* situation. This can include failures as well as successes.
- The case must be rich in detail, avoiding jargon and technical details.
- The case should be a description, maintaining a separation between data and analysis.
- The case must focus on the processes and their contexts, not the methodology or the mechanisms to screen out the external factors.
- The case study should tell a story, often employing a chronological or similar format. The resulting narrative should be about human beings who have feelings as well as performing actions.

The case study focuses on a single set of experiences which, it is hoped, will provide a better understanding of a broader situation. The case being studied is, therefore, a substitute for the broader situation, just as a quantitative sample substitutes for the broader population.

How to study the case is a significant question. Day and Stake (1978, c:19), describing the methodology they used for a major series of science teaching case studies, noted that seemingly small decisions, sometimes unconscious decisions, about procedure often produced significant changes in the case results.

> Only later did we realise this to be a major choice point in our design. In so doing, we committed ourselves largely to [a non statistical, descriptive] orientation… But the choice point was earlier still. At the time we selected the first of [the field researchers] we apparently had unconsciously foregone the [statistical] approach, for few of them were interested in [using techniques that resulted in data amenable to statistical analysis].

The problem was broader still, as the science teaching materials study (Day and Stake, 1978, c:2) suggest, the researchers must be agreed on whether they are attempting to 'see' or to 'measure'.

> The difference between seeing and measuring seems small when Experience is the heat of the day and Measurement is the column of mercury in a thermometer. It is because of the commonness of looking at the thermometer, or hearing its amount, and realising the correspondence to our feelings.
>
> For most of our measurements in education we do not have such a correspondence.
>
> Measurement is not just holding a ruler to see what we see, but seeing something to hold a ruler to.

Bennis (1968, 227-231) introduced a series of case studies of behavioural science intervention with a plea to receive case descriptions other than those focussing on interpersonal interventions. As he indicated, 'the most pivotal changes in society are political, legal, and technological'. He condemned many of the then current case studies as being 'fairly static, dull description[s] of a company', followed by an interpersonal intervention and 'another static and dull description of how peoples' attitudes changed'.

He argued that case studies should 'provide more possibilities for generalisation', noting that Freud and Darwin developed their theories from case observation (Freud, 5 cases, and Darwin, one 'grand tour') which they were then able to 'generalise and weave into a theoretical tapestry'. Such case studies, 'capable of influencing theoretical developments', should describe the process, rather than the product. Case studies, Bennis (1968, 231) suggests, by-pass the need for experimental models.

> The reason we require 'control groups' in experimental science is that the processes presumably go on in the famous 'black box'. So we cannot observe the significant middle state of 'through-put'. We can only ascertain the input and measure the output. But where it is possible to observe the through-put—the process—then the need for a crude experimental model is by-passed.

Lewin (1943b, 158-9), discussing the problems of research in social psychology, noted that the same laws of observation apply to both physical and social phenomena. The observer must be trained, both in observation techniques and in classifying the observations, and must observe the situation for a sufficient time to determine the placement of units within the social setting. The researcher must not be distracted by 'superficialities' such as 'the grammatical form of a sentence' or 'the physical form of behavior', but must 'recognise that the social meaning of an act is no less objective than its grammatical meaning'. The implications for the researcher include the necessity of reporting actions and words in context. As Lewin observes, 'the good leader is able and ready to perceive more subtle changes in social atmosphere and is more correct in observing social meaning'. The researcher has the responsibility to achieve the same level of observation.

Dawson (1990) has developed a four categories of observation—direct and neutral, direct and participative, indirect, and self-report. Since people often modify their behaviour when they know that they are being observed, he cautions that the researcher must 'acknowledge that his initial findings are unreliable', and anticipate a 'long and arduous preparatory period' to allow the enterprise to stabilise. He warns that the use of a participant observer has both advantages and dangers, often resulting from the fact that the observers themselves experience emotions. They can report on those emotions, but in so doing lose all pretence at objectivity, and have to deal with considerations of trust.

Ball (1982, 35) argues that participant observation is a technique that 'involves a sharing by the researcher of the social and cultural worlds of those subjects or that social grouping which he seeks to understand'. This sharing and observing is a technique that has long been applied in anthropology and sociology. The participant observer believes that 'the social life to be studied is a reality that can be understood by sharing in the meanings given to it by the actors involved'.

The circumstances of the participation will vary for the social situation being studied. The potential participatory roles for an adult studying a school system, for example, may be limited to teacher or administrator as the clerical and parent roles will likely be too limiting for most research and adults cannot normally assume a student role. The potential roles within the tertiary education sector, on the other hand, should be much broader—student, lecturer, clerical or other support staff, administrator, or researcher.

The role selected, however, may constrain the activities of the participant observer just as fully as an age-based role would within a school system. The participant observer must develop enough rapport with the other participants to permit the collection of relevant data, but not so much as to impede action or data collection. As Ball (1982, 63) notes, 'over-rapport with one "group" in the research may mean a lack of rapport with other "groups"', with the result that the research may ignore the values, definitions and feelings of other 'groups'.

As a case study, particularly an involved participant case study, often produces more questions than answers, it is not an appropriate tool in circumstances where explanations are required. The case study is more useful for providing understanding. As Stake (1978, 74) explains,

> When explanation, propositional knowledge, and law are the aims of an inquiry, the case study will often be at a disadvantage. When the aims are understanding, extension of experience, and increase in conviction in that which is known, the disadvantage disappears.

Kemmis (1980, 103) describes the development of the limits of a case as an object of the imagination, indicating that while the researcher 'invents' the study, defining the limits of the investigation and the extent to which the actions of the participants will be reported, the researcher must be self-aware and critical to ensure that the process is deliberate, reflective and methodical.

> In order to cast the world under study as an object of the imagination (a case) at all, the case study worker must immerse himself in it as a cognitive subject. This immersion *is* the study. The praxis is in action; that is, in doing the study and construing the case. The notion of the 'invention of the study' is intended to convey that this immersion must be a deliberate, reflective, methodical process. The researcher must be as self-aware and as self-critical as possible about the observations he choses to make, the hypotheses he pursues, the interpretations he communicates, the timing of reports, and other such matters [Emphasis in original].

Kemmis (1980, 104) goes on to state that all knowledge is the product of observation and imagination—'we weave the world through our experience and imagination; we *imagine* reality (as well as the illusory or fantastic)' [Emphasis in original]. It is the responsibility of the researcher, therefore, to report the study in such a way that the reader can share the experience, as imagined and structured by the researcher.

> It follows naturally enough that reports of case studies should create the conditions under which the reader can recreate the case in imagination. Rich description of action-contexts creates the conditions for imagining what cannot be stated propositionally: it allows the reader to imagine himself in the social world of the case studied.

The reader's own experiences are used to process and validate the study data. While the experiences of the reader and the researcher have not previously been shared as such, the combined experiences of the reader, researcher and study participants all interact to generate new knowledge. Kemmis (1980, 105) continues,

> The aspiration of case study reports, then, is to create authentic knowledge for the reader. It is authentic in the sense that it is grounded in the circumstances of the reader's life and validated by his own experience. Of course it strives to be authentic in terms of the insights and perspectives of the participants too: indeed, participants in the situation will often be the primary audience for the report, and it can only be under the most extraordinary circumstances that they will be denied access to it.

In the situation where the researcher has been a continuing participant in the process being studied and the results are reported back to the participants themselves, it should be impossible for the researcher to fake data, whether it be quotations from supposed interviews or extracts from documents. Unfortunately, the perceptions of all the participants, not just the researcher, change over time and may vary from what would be demonstrated by a literal record.

As Walker (1982, 60-61) reports, even sending participants copies of a transcript and asking them to make corrections is not sufficient for ensuring that the story reported is the story intended. Memories of what was said may differ significantly from the transcript and the situation as 'remembered' by the researcher may actually seem more acceptable to another participant than the transcript. Meaning from a shared experience is ultimately subjective.

> Often we would meet people again and it was quite common for them to comment on how differently the transcript read from their recollections of what was said. Some were quite disturbed by the different impressions formed by the transcript as opposed to their own memories of what was said. Sometimes too I have found it hard to fit the two things together and hesitated about which reality to treat as dominant…
>
> In other research projects… I have sent a recollection written from recall. With a little practice it is surprising how easily you can train yourself to generate large amounts of 'remembered' material. When I first began to do this I expected to get an increase in the flow of comment and disagreement from people; I was surprised when I found people generally more ready to accept my reconstructions of conversations than transcripts…
>
> There is a difference between what we *say* and what we *mean* to each other. The tape recorder is too literal, it captures words but not meanings… To achieve meaning requires the intervention of subjectivity, either in the reader as (s)he turns to the archive, or in the writer [Emphasis in original].

Analysing the data collected has additional problems, even assuming that all the participants have agreed on the 'truth' of the data. Yin (1984, 99-101) indicates that the analysis of the case data is 'one of the least developed and most difficult aspects of doing case studies', forgotten by many researchers until the data has been assembled, although the analysis format should have been developed at the proposal stage. While recognising that some researchers suggest either a quantitative (code events into numeric form) or technique (arrays, matrices, frequency tabulations, etcetera) approach, he proposes two strategies. The first follows 'the theoretical propositions that led to the study', the second uses a 'descriptive framework for organising the case study'. While the former is appropriate for a study that arose out of a problem, the latter approach is more appropriate for an exploratory or descriptive study.

Bartlett (1989, 125-126), in summarising the writings of Kemmis and others, concludes that all case study perspectives have four features.

- Case studies are conducted in 'naturally occurring settings', they are informal and field-based.
- Case studies are interpretive; they 'unfold or reclaim the subjective meaning of participants'; they are 'self-reflective'.
- Case studies involve an iterative process or 'truth-testing' wherein case boundaries may be redefined to account for changes in the situation being studied.
- Case studies are 'politically reactive'; they serve to define the situation being studied, with the result that 'some meanings are reinforced, others neglected'.

Bartlett (1989) goes on to caution that the researcher, therefore, needs to ensure that the rights of every individual in the situation are protected democratically. This is not, however, easy to accomplish and has been a concern of researchers, filmmakers, and similar recorders of social situations for many decades. In addition, the best process in the world can still lead to unforseen results, as Bartlett (1989, 126) notes:

> Even with ethics and justice observed in research procedure, serendipity and ambiguity are always present as actual or potential interventions in the research act.

Finally, Walker (1983) describes three reasons for *not* using a case study for collecting research data. He argues that 'case study research is an intervention, and often an uncontrolled intervention, in the lives of others', that case study research provides 'a distorted picture of reality', and, that it is an 'essentially conservative' process. Never-the-less, he concludes that case study research has sufficient potential to overcome these deficiencies, provided that we 'make every effort to learn from our mistakes' and realise the limitations of the process.

Writing the case study solidifies the situation and makes it part of the corporate mythology, Walker (1983, 163-165) notes, but the people described continue to change, even as the case is being written.

> The very process of conceiving, writing and publishing a case study solidifies and crystalizes a reality in the minds of readers and writer which is, initially tenuous, fluid and dissolved in another medium. The act of case study (and perhaps any research) is to describe reality in order to create it… Once fixed, the case study changes little, but the situation and the people caught in it have moved even before the image is available …
>
> [The case studies] may offer certain claims to truth, depending upon the nature of the evidence they provide, but they are always partial accounts; constructions of reality; representations. Though… they may well become part of the culture they describe, in

> that they provide shared memories and perceptions for their subjects, and so are likely to become part of institutional mythology.

Computers and Qualitative Research

The computer can potentially play an important part in the analysis of qualitative data. Just as with quantitative studies, the qualitative researcher benefits from the computer's ability to perform calculations quickly, reorder data rapidly, and efficiently search large amounts of data. Researchers routinely use computerised text searching tools to find all the occurrences of a particular event within a series of interviews, highlight and copy the surrounding text to a new file, and reorder the resulting selections into chronological order for better analysis. Before the computer, a researcher would have used relatively slow manual 'cut and paste' techniques with a high probability of introducing errors through retyping the several drafts required.

Tesch (1991), in reviewing computer programs specifically designed to assist qualitative researchers, notes that all of the currently available programs have been 'created by scholars for their own research and then were packaged for use by others'. Qualitative analysis programs therefore tend to be more idiosyncratic than the most successful of the commercially available mainstream computer applications—although probably no more so the several hundred commercial, semi-commercial and public domain text/word processing programs.

Specialised analytical tools have many advantages—provided the researcher can adapt to their idiosyncrasies. Many researchers cannot adapt; just as some quantitative researchers use spreadsheet programs, complete with their user-friendly graphical presentation tools, in preference to more sophisticated but less friendly statistical programs, many qualitative researchers continue to use word processors and database managers for their analysis (Morse, 1991b).

This description of a collaborative study that used *The Ethnograph* software package is typical of one analytical process using the computer:

> Immediately after the interview, the community health nurses dropped their tapes off for transcription directly onto the computer… The transcribed interviews were immediately returned to the interviewer who scheduled another appointment with the key informant… to review the transcription for accuracy and completeness…
>
> [After they] listened to the tape while reading the transcript… [to identify] any errors in transcription or portions of the interview that were unclear or incomplete…[The coding groups] reviewed the transcripts and developed major categories… sufficiently detailed and mutually exclusive to allow for coding of all data…
>
> The first step in the computer analysis was… to format the transcribed files down to lines that were 36 characters in length and sequentially numbered. Copies of

> [resulting]… transcripts were then ready for… writing in the codes on the blank right-hand side of the page… [These codes were subsequently] entered into the computer.
>
> The next step of The Ethnograph was directing the computer to sort through each [coded] transcript for every occurrence of any given code.
>
> The research team… [then] examined the major categories and could make some preliminary statements about the data that had implications for clinical practice.
> (Boyle 1991, 284-288)

A decade ago the amount of data generated by a qualitative study, the full text of several hundred hours of interviews, for example, required the storage capacity and speed of a mainframe computer. Just as full-function statistical software now is able to run on a suitably-equipped desktop computer, packages have been available since 1984 for the qualitative researcher on desktop computers. Whether the computer tools are effective at meeting the researcher's expectations is still unresolved; one software developer (Richards and Richards, 1991, 235) cautions that computers aren't just making the researcher's job easier, they are transforming qualitative methods. Noting however that there has been little debate on what the computer does to the data, they warn:

> Expectations often exceed reality; increasingly researchers seem to take for granted that the computer can take over analytical tasks. But taking such developments for granted is a serious research hazard.

In Summary

This is a multi-disciplinary study of technology and change in a tertiary institution using a qualitative research methodology. The results of the process, the experiences of an new Faculty attempting to define its own role as well as the resources to be used in accomplishing that role, form the body of this thesis.

The decision to adopt CAL/CML in a Faculty of Health Science provided the opportunity to examine the consequences of adopting a new educational technology in a tertiary institution. Two of the major approaches to instructional design have been examined here to provide a framework for understanding the CAL/CML developments within Health Science.

The change process, and the necessity to manage change, has also been examined in the same context. Particular attention has been paid to the factors for success or failure in technology projects.

Qualitative research definitions, and the procedures for a qualitative case study, are still being formulated, particularly within an emerging research discipline such as nursing. Qualitative researchers need to be constantly aware of the effect of their actions upon the situation being studied, and realise that the result of their work, while static, is simply a snapshot of one particular point-in-time from a single viewpoint.

Chapter 3

Study Procedures

> If you can talk brilliantly about a problem, it can create the consoling illusion that it has been mastered. (Attributed to Stanley Kubrick)

This chapter summarises the procedures used in this study—a participant analysis, a case study of an organisation undergoing change. The procedures used were primarily qualitative and arose from the theoretical framework delineated in the previous chapter.

This study had two primary sources of data. The first source of data was a series of fifty-nine interviews with students, staff, and other project participants. This was an active data collection process with many of the interviews collected specifically for the purposes of this study. The remainder were collected as a record of ongoing Health Science CAL/CML project activities and to assist in the management of that major change initiative.

The second source of data was the documentation generated by the operation and management of the project being studied. This documentation included formal project papers and reports as well as the day-to-day memorandums, electronic mail messages and other correspondence, formal and informal, that were generated or received by the author during the course of the study.

Study Participants

The study includes interviews with almost all of the staff and project students engaged in the first two years of the Health Science project. Interviews were conducted with twenty academic and general staff working in the Faculty of Health Science from 1988-1991 and three of the participating Computing Project students from the Department of Mathematics and Computing. Interviews were also conducted with two nursing students from the pre-registration program, four staff and administrators from other areas of the University, and four individuals involved as computer suppliers and consultants to the Project.

The author, a Lecturer within the Department of Mathematics and Computing, was the consultant for the initial feasibility study (Zelmer, 1989, and Appendix B) which resulted in the two year National Priority (Reserve) Fund (NPRF) project (see Appendix C) and was seconded for three years (1990-92) on a one-third time basis to Health Science, initially to manage the NPRF project, and later to manage the non-academic aspects of the Faculty's computer activities.

Interviews

This study relies heavily upon a series of semi-structured interviews with Health Science staff involved in the Faculty's computer-related activities—

- authoring or otherwise developing CAL courseware,
- developing, supporting or using the Faculty's computer facilities,
- or developing, testing or otherwise supporting the Faculty's CAL technical developments.

Longer serving staff were interviewed more than once.

Most of the interviews with the Health Science staff were conducted by two ‘neutral’ research assistants, individuals who were not directly involved in the CAL developments at the time of the interviews. These research assistants, different individuals for the two major sets of interviews, attempted to overcome the fear that responses might not be as open and honest if the interviews were conducted by the author, given the author's dual role as Project Manager and researcher.

While the research assistants (interviewers) had not previously conducted a taped interview using an interview schedule, they were mature individuals who had the confidence of Health Science staff. They received a briefing from the author before conducting their first interview with the Dean, who provided support and encouragement as well as feedback on their interview technique. Subsequent interviews were arranged by the research assistants at a time and location that was convenient for the interviewee. Typically the interviews occurred during working hours in the office of either the interviewer or the interviewee.

The interviewers employed an interview schedule prepared by the author, and were encouraged to let the interviews range beyond the prepared questions. Interviews ranged from a minimum of five minutes to a maximum of an hour and one-half, with a typical interview lasting approximately twenty minutes.

The interviews conducted by the research assistants seldom took longer than twenty to thirty minutes, however, the author's interviews seldom took less than forty-five minutes and one continued for more than two hours. Analysing the tapes, the major difference in the interviews was the author's use of follow-up questions to explore issues raised by the interviewee. The research assistants, on the other hand, seldom ventured beyond the interview schedule, even when prompted by the interviewee.

Appendix D contains the letter describing the interview schedules for the first round of interviews in 1990 and the corresponding letter for the second round of interviews in 1992. The first interview examined the interviewee's involvement in computer and CAL use, participants aims and expectations, and difficulties to date. The questions in the second round of interviews expanded beyond the interviewee's CAL involvement to examine specific issues such as the use of electronic mail and the level of clerical support.

The interviews were audio taped to avoid the distraction of note-taking and to ensure accuracy. Most interviewees did not express any concern about the use of the tape recorder. In general both interviewer and interviewee ignored the recording process, with the result that some interviews became quite frank discussions of the project and its difficulties. Interviewees were assured that tapes would be transcribed by a typist from outside the Faculty to assist in maintaining confidentiality.

The staff interviewees were advised that their comments would not, in general, result in any immediate changes of operational policy or procedures, and that any specific concerns should also be communicated directly to the appropriate individuals if prompt action was required. It was explained that this procedure was necessary to maintain some separation between the author's roles as Project Manager and researcher. In addition, since many of the interviews were to be conducted by the neutral observer, it would be some time before the interviews would be transcribed and communicated to the appropriate decision maker. Unfortunately, some interviewee's later felt that their concerns had been left unanswered when the issues discussed in the interviews did not get communicated directly to decision makers.

Other interviews were conducted, generally by the author, as part of the 'on-going evaluation of the CAL Project' and ranged from student debriefings at the end of their project activities to specific taping sessions, conducted with Health Science staff and others, both to provide a record of actions and motivations, and to 'brainstorm' future developments. Many of these interviews followed the basic interview schedule for the staff interviews, adapted as appropriate to the interviewee's involvement with the project.

The interviews with individuals from outside the Faculty of Health Science were particularly useful in determining the impact of the CAL/CML activities in Health Science upon the rest of the institution and upon other institutions.

The interviews provide both a record of the CAL activities and an assessment, from the point of view of the participants, of the effectiveness of those activities. Individual interviews highlighted the activities and interests of the specific individual being interviewed. A conscious decision was made by the author to allow the interviews to range as broadly as the participants desired to permit exploring all aspects of the Faculty's computer activities. While at times this led to non-productive data, it often generated rich data for assessing the CAL Project and related computer developments within the Faculty of Health Science.

In discussing the purpose of the interviews and other inputs with participants, the author emphasised that the information provided would not knowingly be used to violate any individual's privacy or confidence. Interview participants are only identified by category and the date of the interview; the identity of the source of a particular quote has been further disguised as more than one interview was often conducted on the same date. Furthermore, as is noted in the section below on Validation of Health Science Staff Interviews, and by researchers such as Walker (1982, 60-61), quoted in Chapter 1, even the individuals involved may not recognise their own contributions after they have been transcribed.

Ultimately, however, it is impossible to maintain absolute anonymity in a project report such as this. Knowledgable participants and observers can identify certain individuals from their comments. Other individuals can be identified by their role or job designation—the author, for example, is easily identified through the designation: Project Manager. Similarly, there was only one Dean and one Associate Dean during the time of the study. Such individuals have been identified as the source of specific quotations when it is more important to understand the source of a comment than it is to preserve absolute anonymity.

Interview Transcriptions

All the interview tapes were transcribed into computer readable files by typists from outside Health Science. As the interviews occurred over a period of almost three years it was impossible to use the same typist for all the interviews, but all received a briefing on the style of transcript required and a caution about maintaining confidentiality.

The transcripts were then read by the author and spot checked against the original tapes to ensure reasonable accuracy. All of the typists had some difficulties transcribing the subtleties of verbal exchanges, particularly the oral equivalent of sentence and paragraph breaks. Some transcripts required extensive reference to the original tapes and text formatting to achieve a clear meaning.

The author originally intended to abstract the relevant data and structure the final presentation using computer software designed for the analysis of qualitative data. The software being proposed was designed for coding and manipulating interview data, and would have allowed responses to be grouped by themes, but proved to be too time consuming for the volume of data represented by the transcripts. Inconsistent spelling and typographical errors, particularly the inclusion of extraneous space characters within the typed transcripts, added significantly to the processing difficulties and resulted in the decision to abandon the qualitative analysis software.

The data was ultimately analysed using a text searching program (GOfer™, Macintosh version, from Microlytics, Inc.) that enabled selected text to be inserted directly into a word processor document. The transcript files were searched using key words or phrases as the search criteria and the selections made manually. For example, the truncated search term ‘mail’ might have been used to search for all occurrences of ‘electronic mail’ or ‘email’. When the term was found in one of the specified files, the author scanned the text surrounding the term and, if appropriate, selected a portion of the text for inclusion in the study file currently being assembled. The source of the quote and information such as the interview date were then inserted manually. Typographical and other errors were corrected at this time with reference, if necessary, to the original interview tapes.

Validation of Health Science Staff Interviews

Participating staff of the Faculty of Health Science were assured that they would have an opportunity to respond to the first draft of the results of their interviews. The seventeen participating staff members still working at that time within the Faculty of Health Science, plus one other staff member temporarily working at another institution, were given the opportunity to read the first draft of what is now Chapter 5 in September 1992. Appendix D contains the electronic mail message sent to the participating staff members and the response pro forma circulated with the draft chapter. Five written responses were received from academic staff (none from support staff) as well as several informal verbal comments.

Two of the respondents were involved since at least 1989, and expressed satisfaction with the draft chapter—‘fairly concise and broad, representing most staff views’ and ‘Read in detail, nothing to add’. Two of the more recently employed respondents (involved since 1991) expressed the concern that ‘I can't really remember what I said’, and that ‘…as it is some time since the interviews were conducted, it is likely that people have forgotten what they said to the interviewer’. As well, one had some concerns with both the format—‘I find the quotes in the chapter confusingly out of context’—and both had concerns about their views not being expressed—‘My comments were more clinically related’, and

> There is no indication of the difficulties the Academic Staff encountered when first beginning to write CAL materials in the format as expressed as the preferred one; i.e. CAL Maker.

These comments were taken into account when revising the chapter to more accurately express the viewpoints of all participating staff.

The final respondent, also involved since 1991, was more generally satisfied.

> As I was not here during the early days I cannot comment on the background. In terms of content as an introduction to the debate on using CAL with all the associated difficulties, this looks fine.

Written and Electronic Documentation

One of the most difficult aspects of preparing this thesis was deciding what documentation to include from among the three filing cabinet drawers and over sixty megabytes of computer files that formed the author's documentation for the CAL/CML activities within Health Science. This documentation included:

- original consultant's reports establishing the project (see Appendices A and B),
- progress and other reports for the NPRF and university reporting requirements (see Appendix E),
- student records, particularly progress in computing activities and their reactions,
- electronic mail messages, word processing files, and similar records of activities and decisions (see Appendices A and I),
- author's diary and log notes,
- Health Science's financial and computer hardware and software records (see Appendix F),
- minutes and similar records for Health Science and UCQ activities,
- documentation for courseware developed (see Appendix J),
- documentation for computing student projects,
- staff training materials (see Appendices G and H), and
- conference presentations and journal articles resulting from the CAL/CML activities (see Appendix E).

The documentation provided most of the material in the appendices, specific items to illustrate issues raised by the interviews, and explanations of the author's own activities and responses to issues. The author's diary notes are the only materials which did not also exist in Faculty or University files, since the documents and reports were copied from Health Science files and electronic mail messages are archived by the university's computer system.

The author maintained both paper and electronic records in journal form during the study. The paper-based journal was a continuation of the author's practice for many years and included rough drafts of minutes recorded during meetings, notes and ideas for action to follow meetings, references, draft budgets, lists of potential purchases, inventory notes, verbatim quotations from colleagues, and the author's reactions to events. The electronic journal entries, usually prepared in a single session following a meeting or other activity, were more likely to be 'notes for the record' or reactions to incidents that had occurred.

Conflicting Priorities

Establishing the relative priorities of study and Project activities when conflicts occurred between the author's roles as researcher, project participant, Project Manager, and Lecturer was one of the hardest tasks in this study.

Where a conflict occurred, in general, the needs of the Health Science students received the highest priority, followed by the needs of the CAL/CML development activities, with the author's research needs receiving the lowest priority.

Style Guides and Literature Reviews

The project that is the focus for this study was initiated at a time when Health Science, and Health Science resources, were small. The Faculty, and the University, did not have adequate resource materials on instructional design or qualitative research.

The University's distance education unit (currently the Division of Distance and Continuing Education—DDCE) provided a style guide for authors (Department of External and Continuing Education, 1987, 1988) as part of their support for authors of distance education materials but the guide was oriented towards printed course notes and had little relevance for authoring computer-based materials (courseware).

The author collected, and encouraged both staff and project students to collect, articles and other materials on topics specifically related to the project. The files containing these materials were available during 1990 and 1991 in the CAL/CML offices but during 1992 they were moved to the author's office in another building since the Health Science CAL/CML staff did not have the time for file maintenance and updating.

The author prepared several drafts of a style guide for CAL materials using CAL_Maker, the CAL authoring tool developed through the project (Appendix J). Although never completed to a publication quality, the several drafts were circulated to Health Science staff and others interested in the Health Science CAL materials. Circulation outside the university was generally a result of conference presentations on the project.

The author also prepared background papers on instructional development, change, and qualitative learning for use by the Health Science CAL/CML developers and researchers. Drafts of these papers were circulated through the Faculty and the university as part of workshops and staff training activities. The instructional design materials currently form part of the readings for Computer Applications in Learning and Training, an honours level subject within the Department of Mathematics and Computing, and the change materials have been published in conference proceedings. Chapter 2, the Theoretical Background to the Study, is derived from these materials.

Intellectual Property

The University's policies on copyright and the ownership of intellectual property proved inappropriate for CAL/CML development. The policy had been written when the university was still an Institute of Advanced Education and staff were generally not involved in research and scholarship. The policy (Appendix I) did not adequately recognise the differences between normal literary works, specifically books and journal articles, computer programs and CAL/CML courseware, and required a cumbersome approval procedure by university authorities.

As will be seen in Chapters 4 through 7, the project provided some pressure for changes in university policies regarding intellectual property as the Project Manager and the Dean of Health Science attempted to get clarification of the rights of staff and students involved in the development of CAL/CML courseware.

Research Incentive Fund

To encourage staff to begin research and other work in CAL/CML development, a small amount of project funds were transferred to the Faculty's Research Incentive Fund and administered under the Fund's guidelines. This provided up to $500 per Health Science academic staff member for project planning, pilot projects, library searches, and other exploratory CAL/CML studies. While few staff members utilised these funds during the two years of the NPRF funding, several staff members have now engaged in advanced study in related areas.

Project Promotion

Finally, because of the requirement for dissemination of information about and resulting from NPRF activities, a small amount of monies was allocated for Project promotion. The author had access to these monies for a limited amount of travel, primarily related to conference presentations promoting Health Science CAL/CML activities. The necessity to prepare these presentations also provided the motivation for similar presentations on campus and in UCQ publications. An indication of the extent of these activities can be found in Appendix E.

Summary

In summary, this case study used qualitative research techniques to examine the effects of a two year National Priority (Reserve) Fund financed computer-based learning project within a new Faculty of Health Science in an emerging Australian university. The study relies on fifty-nine semi-structured interviews with students, staff, and other project participants and both formal and documentation generated by the project.

Chapter 4

CAL/CML in Health Science—Timeline of Events

> It is common sense to take a method and try it. If it fails, admit it frankly and try another. But above all, try something. (Franklin Delano Roosevelt, 1932, quoted in Brooks, 1982, 115).

This chapter provides a chronology of selected CAL/CML activities within Health Science between 1988 and 1992. Recording every event in the NPRF project and related CAL/CML activities is beyond the scope of this study. Faculty and University files have a more complete record of events that were the subject of official correspondence, and the UCQ Finance Section has complete financial records detailing purchases and their purpose.

This chapter provides sufficient detail to understand the chronology of events discussed elsewhere in the thesis, and is supplemented by the inclusion of selected documents in the Appendices, particularly Appendices A and I. In general, there is more emphasis on the earlier months as they often provided the basis for later decisions; an action, once taken, is harder to reverse than it is to avoid a new action. Unless otherwise indicated, the events are taken from University and Faculty minutes and Newsletters, staff memorandums and the author's diary notes.

1988

July-December: New Head of Department (HoD) was appointed for the fledgling Department of Nursing in UCQ's School of Applied Science.

The HoD, with previous experience in the administrative use of computers, requested assistance in designing a teaching support program. Business computing students in the author's classes at Grant MacEwan Community College in Canada used the new program as a case study for one of their assignments (Appendix A).

The assignment indicated that Nursing had two semi-compatible IBM/MS-DOS microcomputers and printers, used for word processing. The University (then an Institute of Advanced Education) had a VAX system used for internal electronic mail, limited external communications, and the Library catalogue. A separate system was used for financial, personnel and student records.

> The existing staff of the Dept. (4 nurses plus Head and secretary) have some interest in the use of computers. The Head is a reasonably knowledgable IBM micro user and one other staff member uses an Apple II at home for word processing (Student assignment, 28 October).

The author responded on two separate occasions (Appendix A) with specific technical suggestions, emphasising that Nursing had a 'reasonably clean slate' and could ignore current facilities in looking at solutions to the new needs. The student assignments, while not as directly applicable to the situation due to the students' relative inexperience, provided a number of different, but reinforcing, viewpoints.

Additional comments and suggestions were solicited, and received, from individuals within existing nursing programs in Australia and Canada.

1989

April: The HoD, Nursing, requested assistance from the HoD, Department of Mathematics and Computing to recruit a staff member who would assist Nursing to 'Australianise' existing CAL materials, produce new materials such as the 'Hospital in a Box' (Appendix A), develop a student record system, and teach Nursing's computing subjects. It was proposed that this staff member would be within Mathematics and Computing to maintain '"roots" within the computing field'.

May: Nursing obtained approval for a consultancy, initially budgeted at $15,000, through the Department of Mathematics and Computing to assist with reviewing available CAL materials, curriculum priorities, a draft plan of action, and resources required.

The first draft of a request for a National Priority (Reserve) Fund (NPRF) grant was prepared.

Nursing and Mathematics and Computing met to discuss common research and development issues (see Appendix A).

June: The author was contracted by Mathematics and Computing as short term CAL/CML consultant to Nursing.

Discussions were held with Queensland Nurse Academics and a Brisbane-based firm regarding a proposal to the Commonwealth Teaching Companies Scheme for the provision of technical support staff (CAL courseware developers). Rockhampton would be the 'industry' base. The proposal was submitted by Health Science as a means of obtaining technical staffing, but funding was not received.

The UCQ CML Working Party was appointed and had its first meeting.

> The aim of a university-wide CML system was to improve efficiency and effectiveness of teaching whilst maintaining overall academic standards.
>
> System will require in the short term
>
> - funding.
> - commitment from management.
> - time and involvement (staff).
>
> but in the long term will save staff time so they can devote this time to research. (1989, Minutes of the CML Working Party, 16 June)

Mathematics and Computing received the first request from Health Science for students to undertake 'field placements' [Projects] with the CAL/CML Project.

July: The first computing Project student began with Nursing. His task was to develop specifications for a program to schedule student clinical practice.

Rockhampton vendors were invited to submit expressions of interest in solving Nursing needs for a computer-supported learning system. (Appendix A)

The draft Consultant's Report was tabled for discussion. Major changes to the terms of reference included the possibility of delivering the first year nursing program on the Mackay regional campus (334 km from Rockhampton) and the plans for third year students to spend part or all of their third year away from Rockhampton in order to maximise their clinical experiences.

A Local vendor loaned three Macintosh computers (2 basic machines and a file server) to demonstrate a local area network with electronic mail system.

August: The prevailing mythology that any centrally administered computer laboratories would have to be IBM/MS-DOS based was debunked—there was 'no Institute policy in this regard' (Zelmer, A. C. L., 1989, correspondence, 7 August). Consultant continued evaluation of authoring software, including TenCore and Authorware.

The CML Working Party endorsed Health Science's application to the NPRF as a 'Pilot Project', acknowledging that a university-wide CML proposal was not ready and the Health Science project would 'provide experience and a bridge for future work' (Chair, CML Working Party, 1989, memorandum to Head, Department of Nursing, 28 August).

The Brisbane AppleCentre loaned a development work station (Macintosh IIx, CD-ROM drive, Scanner, etcetera) for the evaluation of hardware and authoring tools.

September: Health Science submitted a NPRF grant request for $423,800 over two years.

October: The final version of the Consultant's Report was delivered to Health Science. This report recommended the adoption of a Macintosh computer platform for courseware development, staff, and student use. The report also recommended against the immediate purchase of a CAL/CML authoring system (Zelmer, 1989, and Appendix B).

The CML Working Party delivered the final Report on the Adoption of Computer Managed Learning Systems at Capricornia Institute to the Vice-Chancellor.

November: The author met with Apple Computer Regional office in Brisbane to discuss software tools, and visited the School of Dentistry at the University of Queensland, where an academic staff member had used HyperCard to develop multi-user CAL courseware with much of the functionality desired by Health Science.

1990

January: The Capricornia Institute of Advanced Education became the University College of Central Queensland, and the Department of Nursing became the School (and later Faculty) of Health Science with its own Dean.

A NPRF grant was approved for $150,000 for the first year, with a commitment for second year funding ($150,000) contingent upon progress. The government's expectation that 'the institution will accept a greater share of the proposed costs' included as a condition to the grant (Dean, Health Science, 1990, memorandum to Vice-Chancellor, 25 January).

February: The author was seconded one-third time from Mathematics and Computing to coordinate the NPRF project. A Computer Centre programmer was seconded 60% with Health Science (and 40% with Mathematics and Computing) for

> 'ensuring that both the student lab and the faculty use computers are installed and "networked"… then developing the software to keep everything running.' (Zelmer, A. C. L., 1990, memorandum to UCCQ Colleagues, 28 February)

The first intake of 100 on-campus Health Science (nursing) students commenced, and two computing students began individual full year projects with Health Science. One project was to design and develop a HyperCard-based authoring tool; the other project was to install graphics hardware and software, including a flatbed scanner and an optical mark reader. Students in the Health Science subject, Nursing Projects, were also recruited to prepare background information for specific curriculum topics.

The CAL/CML Advisory Committee was established with Health Science, CML Working Party/Mathematics and Computing, and Apple Computer representation. The Committee set 1990 priorities, including further development of the student management system for clinical placements, ordering equipment and software, physical set-up of teaching laboratory and development of related training materials; restructuring the project to take into account the changed parameters; and developing materials for second semester teaching (CAL/CML Advisory Committee 1990, notes from the meeting of 2 February).

The first hardware (10 Mac Plus computers) and software was ordered under the project funding; the order included a dedicated network server and a network version of an integrated application (word processing, database, and spreadsheet) for staff use. Four dot matrix printers were supplemented with a laser printer, obtained at no cost due to a vendor promotion.

The first promotional materials, a simple brochure and memorandum introducing CAL/CML staff, were circulated to all UCQ staff. A joint vendor/project press release was also distributed, resulting in several media requests for interviews with the Dean.

March: An Administrative Assistant (Laboratory Supervisor) was appointed to provide full time support for Health Science users and the dedicated laboratory.

A Health Science academic attended a short workshop on the use of Authorware Professional, recently purchased at a cost of $30,000, plus hardware, by the Division of Distance and Continuing Education (DDCE).

UCCQ Computing Services began promoting the use of the AARNet (Australian Academic and Research Network) and both on- and off-campus electronic mail through a series of informal seminars.

Health Science, with 9.0 full-time academic staff, continued looking for up to 5.1 additional academic staff.

The licensing costs for the Authorware courseware development system, one of the courseware products being considered for possible purchase by Health Science, dropped from approximately thirty thousand dollars to $11,500 plus required staff training and annual support costs.

The author prepared a set of instructional videotapes on computer basics (Amiga, IBM/MS-DOS and Macintosh platforms) for tutorial use by students. This was the first of over a dozen tapes produced with the assistance of the Educational Media Division.

Student work benches were installed in the centrally controlled 24 hour access computer laboratory in the Health Science building.

April: The Dean made a presentation and distributed brochures on the project to the Australian Nursing Federation, Queensland Branch, Computers in Nursing Special Interest Group, in Brisbane.

Health Science moved into the new purpose-built nursing education building. Computer Centre technicians were unable to find the local area network (LAN) cabling that had been installed in the new building during construction.

Health Science staff had computers on their desk or in the common room with shared printing facilities. All Health Science staff received accounts on the central computer system to enable them to send and receive electronic mail.

Computers and printers were installed on student desks in the dedicated Macintosh laboratory although computer work benches and power lines were not yet installed.

Additional computers to complete the complement in the dedicated student CAL (Macintosh) laboratory and a higher capacity network server were ordered.

May: The dedicated Health Science CAL laboratory opened to students. Network training was provided to staff, and all staff using computers as a normal part of their work were connected to the Local Area Network (LAN).

A draft license agreement for software developed by Health Science staff and sold or otherwise provided to other institutions was forwarded to the Bursar for approval. A draft policy on intellectual property rights of Health Science staff members was also prepared and discussed before forwarding to the central administration.

The first version of the standardised ‘stack’ (HyperCard unit) for courseware preparation (Appendix J) enabled six case studies to be completed for student testing. The first draft of a guide to staff for the preparation of materials using the standardised stack was begun.

Health Science began planning for a second dedicated CAL laboratory facility in the 24 hour room, occupied by the centrally controlled IBM/MS-DOS teaching laboratory, scheduled to be vacated by the end of 1992. [In early 1993 it was apparent that this laboratory would not be vacated before early 1994.]

Health Science implemented several ‘bulletin boards’ on the common use area of its LAN file server for upcoming events and research support.

Continuing network problems, primarily slow response times and dropped lines, frustrated the Dean and staff; FTP (File Transfer Protocol, a means of accessing remote computers) and other network services became available using an Ethernet link.

The main administrative computer for the University was upgraded to have a 670 megabyte drive as the ‘system disk’, but shut down all student records, the library records, and administrative electronic mail for the installation [administrative electronic mail continued to be plagued by difficulties, sometimes not being available for weeks at a time].

The Australian Nurses Journal published a promotional article on the Health Science CAL/CML activities.

June: Work benches, temporary power and data lines were installed in the Health Science dedicated CAL laboratory.

The Draft Guide for the Preparation of Materials Using the SHS Standard HyperCard Stack (Appendix J) was circulated to all staff involved in the Health Science CAL/CML development. The section on copyright was incomplete as details were being discussed in university committees.

Some Health Science staff gave formal notice that they wished to retain copyright on materials prepared prior to their employment at UCQ and indicated that they reserved the right to retain copyright on materials prepared for Health Science.

Mathematics and Computing initiated discussions with DDCE regarding the use of ‘disk-based study materials’, particularly regarding quality control of the materials (Mathematics and Computing lecturer 1990, memorandum to the author, 20 June).

Locking devices began to be placed on common use computers in Health Science.

Orientation programs on Health Science CAL/CML development were held for Health Science staff not directly involved and the university-wide UCQ CAL Interest Group.

Conversion of VAX-based CML materials for the Nursing Refresher course, purchased from a similar program overseas, was begun.

An additional $30,000 from central funds was allocated for the purchase of equipment to support Health Science CAL/CML activities to complement the NPRF funding.

The new Health Science building was officially opened as part of the *Health for All* international conference hosted by Health Science. The CAL activities were a highlight of the exhibits area, which included vendor displays of CD-ROM based learning materials, simulations and hypermedia products.

July: Health Science staff made presentations on the project to the Higher Education Research and Development Society of Australasia (HERDSA) 1990 Conference Teaching for Effective Learning, Brisbane, the Australia and New Zealand Association for Medical Education (ANZAME), Sydney, and the World Congress on Computers in Education (WCCE), Sydney.

An academic staff member who worked almost full time on CAL development during the month, researched and drafted two new units and researched another, and demonstrated that academic staff could be productive with released time for development and adequate technical support.

The Apple Major Account Support Agreement (MASA) for the supply of Apple products at a substantial discount was signed by the university.

The IBM/MS-DOS centrally controlled computer laboratory in the 24 hour room in the Health Science building became functional with computers booting off the network connection.

The university took delivery of an Optical Mark Reader for machine marking of test sheets; a computing student installed the equipment as part of his Project activities for Health Science. Eight more computing students joined Health Science for their second semester Project activities which included documenting laptop computer use by Health Science staff, developing and documenting a CML test bank system, and HyperCard development.

The CML Working Party developed a $300,000 three year project to implement CML across the university. The costs involved were seen as unachievable and the Working Party subsequently prepared a lower cost 'pilot' proposal.

An additional 10 Macintosh Plus computers purchased to replace computers 'borrowed' from the student laboratory for staff use.

A special Health Science staff meeting agreed that all staff needed to check their electronic mail at least three times per week [electronic mail use was becoming common].

August: The Academic Development Committee's suggestion to form a working party on copyright was submitted to the University Council for approval.

The purchase of a powerful Faculty-owned file server to lessen the dependence upon central computing facilities was initiated.

The use of the 'common area' [common use area on the hard drive] on the network for meeting notices, minutes of Committees, et cetera, was expanded.

The CAL staff held 'Open In-House' sessions, faculty by faculty, to explain the project and demonstrate results. Training sessions on staff identified computer skill needs were initiated.

The Associate Dean demonstrated a pre-release version of the clinical scheduling software developed by the CAL/CML staff and sold three copies.

September: The almost defunct Central Queensland Computer Users Society was reformed as a special interest group of the Australian Computer Society, Queensland Branch, to provide support to computer professionals and computer users in the community. Health Science was involved through the Project Manager's participation as a member of the management committee and editor of their monthly newsletter.

A DEC Station 2100 and ancillary equipment, including bridging and routing hardware, were purchased for the Health Science local area network to remove Health Science file activities from the central computer.

Health Science staff now had access to three quality printers and several draft printers. All but two laser printers were located in their work areas.

A new version of the HyperCard software was announced with new and additional features. The ability to restrict user access to underlying code was seen as being more useful to Health Science than colour capabilities.

The Queensland Open Learning Centre (OLC) network, with 25 centres open for distance education students, was planning to expand to 35-40 centres by the end of the year. It was understood that Macintosh computers in the OLCs would be available for delivering courseware prepared by Health Science [the Macintosh developer-level computers were later withdrawn from the OLCs, and then subsequently replaced with Macintosh models containing CD-ROM drives in 1993].

October: The two full year computing students made presentations on their Projects in Health Science to the University's CAL Interest Group.

The release of the new version of HyperCard was delayed 'indefinitely' when Apple devolved its software sales to a subsidiary company, Claris.

A charge back schedule was adopted to recover some of the costs of service work (Macintosh disk copying, laser printing, OCR and graphics scanning, and user support) performed for other Faculties and Departments.

Both the Faculty and the CAL/CML Advisory Committee continued to attempt to get the university to clarify the copyright situation for staff produced courseware and other CAL/CML materials.

The permanent electrical circuits in the dedicated Macintosh laboratory and the built-in furniture in the CAL/CML project offices were finally installed.

Apple confirmed the extension for another year of the loan of a developer-level computer to the project.

All staff received upgrades to the software for electronic mail and mainframe computer communications [most of the subsequent changes have not been recorded, but they occurred every 4-8 months]. At the same time the printer drivers on their boot disks were upgraded and they received virus monitoring software.

The Australian Nurses Journal published another promotional article on the Health Science CAL/CML activities.

A draft AVCC (Australian Vice Chancellors Committee) discussion paper on intellectual property was received for comment by the university.

Documentation for operating the Optical Mark Reader (OMR) system (computer operation and user materials, prepared by the computing Project student) was turned over to the Computer Centre to provide on-going support.

November: Health Science staff held a day long workshop to review the CAL materials in use at that time.

United Kingdom HyperCard programming specialist visited the project for a week and advised on authoring system development and hypermedia navigation issues.

The first of approximately three meetings of the Computer Users Advisory Group were held under the auspices of the Division of University Computer Services (DUCS—the Computer Centre, now the Division of Information Technology) to resolve conflicts in the use of central computing resources. [Meetings were discontinued once users became critical of the Computer Centre.]

Health Science initiated request for power protection for its local area network file server because of power fluctuations, power outages, the damage done to other university equipment by these problems, and the loss of time resulting from these problems. [An uninterruptible power supply (UPS) was subsequently purchased, but it took several months for the Computer Centre to install, and the automatic 'shut down' features were never implemented. Computer Centre technicians were overloaded with other work.]

Copies of the Health Science-developed clinical scheduling software were shipped. The documentation explicitly indicated that Health Science was not providing a warranty.

The university signed an agreement for the use of software prepared by one of the Health Science programmers prior to his employment by the university. The university lawyers prepared a draft non-exclusive software license agreement for use by academic and other staff preparing software/courseware for Health Science.

December: The feasibility of developing a nursing care simulation was examined during an intensive programming session by one of the academic staff and a computing student hired for the purpose.

Health Science was advised that the 1991 NPRF funding had been received.

The new in-house network server was still not yet connected and the existing mail handling facilities were not functioning properly.

Health Science purchased Atari Portfolio (handheld) computers for testing purposes and applied for developer status.

1991

January: The student whose final year Project had been the development of the Health Science HyperCard-based courseware authoring system joined the Health Science paid staff as a programmer.

Two new computing students began their Projects with Health Science, one to serve as a manager of the Health Science LAN, the other to develop a prototype for the nursing care plan simulation begun in December, 1990.

An undergraduate exchange student from Canada began a three month work term assisting with the administration of the CAL/CML activities.

A 1990 over-expenditure of approximately $2,500 was carried forward into 1991 accounts. The CAL/CML staff were pleased at the relative conformance to budget as the University financial system did not permit easy tracking of actual expenditures (vendors were allowed variations of up to 10% on their quotes, shipping costs were often not quoted on purchase orders, and many items purchased were not delivered or accounted for within the financial year), and an under-expenditure would have required unexpended funds to be returned to the NPRF.

Queensland Apple vendors were reorganised through bankruptcy and the local vendor initiated moves to become a locally-owned business.

A newly appointed nursing staff member, with some previous computer experience and an interest in computer-based education, was designated as Academic Coordinator of CAL/CML activities (and member of the Advisory Committee) on a part time basis to assist with the increasing CAL/CML administrative workload.

HyperCard 2 software (the new upgrade, as yet unavailable through Australian vendors) became available through overseas connections and solved some user interface problems with the Health Science courseware.

CAL/CML programmer began following-up problems with clinical placement software sold to other Queensland universities.

February: A two day 'team-building' exercise for Health Science staff included strong criticism of the operation of the CAL/CML Project, the purported isolation of the CAL/CML Project team because the technical staff were not nurses, and the number of non-Australians employed by the Faculty.

Health Science formally dropped the word 'project' when 'referring to Computer Aided Learning, unless reference is being made specifically to the funding aspect… This area will be known as "CAL"' (1991, Minutes of Staff Business Meeting held on Tuesday, 5th February 1990 [sic], 11 February).

The author made presentations on CAL developments in Health Science to the ITTE '91 (Interactive Technology for Training and Education) Conference, Brisbane.

The electronic mail use by the Health Science staff was sophisticated enough to require both elementary and advanced training sessions for continuing and new staff. Other computer skills training sessions over the next twelve weeks included word processing, spreadsheet, database, and statistical applications as well as the preparation of CAL resources.

Health Science met with Business and Mathematics and Computing to begin designing a Graduate Diploma in Information Systems for implementation in Semester 1, 1992.

March: The CAL staff installed security cables and locks for all Health Science computing equipment not previously secured. This included the desktop computers and printers in academic staff offices. Staff had keys to their assigned machines to enable the machines to be taken away for out-of-office work.

The clinical scheduling source files were in disorder; it required a special effort to produce an 'original' set of source code files for archiving.

The university considered making the centrally controlled DOS-based computer laboratory on the lower level of the Health Science building a 24 hour facility. Security problems provided the greatest difficulty. This laboratory was the main facility for first year students, including Health Science students, taking introductory computing subjects.

April: Two TAFE graphic arts students began a field placement to help academic staff design and prepare graphic materials for the CAL case studies they were then developing. The academic staff [and perhaps the TAFE students as well] preferred the students to prepare posters and similar materials for a Faculty display in one of the local shopping centres.

The high density external floppy disk drives, ordered in 1990, arrived without power adaptors. Eventually it was discovered that they would not read and write both normal and high density diskettes as advertised and were returned.

An agreement was undertaken with the local Apple vendor to trade out-of-warranty computers for new machines with the local vendor reconditioning the used computers for resale.

May: The Health Science support staff were increasingly being asked for support by students in the IBM/MS-DOS-based laboratory located in the Health Science building (not the Health Science Macintosh laboratory). The students, and academic staff, using the centrally controlled laboratory seemingly assumed that Health Science should provide support since the laboratory was located in the Health Science building. The Computer Centre's restricted hours (classes operated in the laboratory from 0800 to 1900 hours, but the Computer Centre was only open from 0845 to 1645 hours) and the lack of supervision and maintenance, particularly of printers, created confusion and extra work.

The projection system in the Health Science lecture theatre was upgraded to permit lecturers to display materials from a Macintosh computer.

Eight new 'Classic' computers were distributed among Health Science staff, necessitating a computer 'shuffle' with the heaviest computer users getting the newer, more capable, computers. The mismatch between the number of staff and the number of computers available to staff (as against the number of computers available for student use) required the four staff reporting the least use to share three computers. This permitted student computers to be located in the student study room as well as the computer laboratory.

During a Health Science Staff Meeting discussion of the Faculty's experiences with computerisation, an academic staff member indicated that information [electronic mail, draft documents, papers, et cetera], once placed in the computer system, was perceived as being 'set in stone'. This perception caused some problems with group projects where staff members were expected to exchange draft materials, by electronic mail or electronic file sharing.

June: The author visited CAL/CML projects and academic CAL/CML development leaders in Canada. The UCQ Health Science activities were discussed and compared favourably with Canadian developments.

July: The Project Manager met with the Computer Centre staff to discuss a number of current problems and their proposed solutions. Rewiring of the student lab to upgrade the local area network service, the installation of the UPS, received some months previous, and the installation of a network connection to a room used by the Mathematics and Computing Project students had been forgotten or delayed.

The first sets of pharmacology courseware were reportedly working well after considerable 'bug' fixing and another set was in preparation. The Academic Coordinator undertook to prepare a formal policy on incorporating computer use into the Health science curriculum [not yet presented at the end of 1992].

August: A computing student started an inventory and a database of existing Health Science application software and CAL/CML courseware. [The database was never completed, the student was one of the very few who failed to satisfactorily complete his agreed computing Project with Health Science.]

Software difficulties, both within the Faculty's network and between the Faculty and University networks, continued to cause electronic mail problems. Multiple copies of some messages were being sent while others were not sent at all; some electronic mail identity 'masquerade’ was also reported.

The future of the Atari pocket computers, originally purchased for trial as clinical data entry units, was discussed. Since very few staff were using the units, it was agreed that an attempt would be made to recruit a computing Project student in 1992 to develop software for a field trial. [There were not enough computing Project students recruited in 1992 for this to happen.]

The need for a full-time computing support staff member to assist academic staff with their computing skills was discussed. It was noted that academic staff did not see at least one of the presumably more skilled secretarial staff as being appropriate for assisting academic staff with their computer problems, and that the role of the specialist computing staff had become blurred with academic staff reporting difficulties in gaining access to the staff programmer [to obtain assistance with basic application problems, not normally part of that individual's job description].

The student manager of the Health Science network reported that some of the problems experienced with the network file server had been reported in other installations worldwide and were not unique to UCQ. Another critical piece of hardware for the network that had been sent off early in the month had been lost in transit and was being traced.

The Computer Centre advised that Health Science staff and students alike would probably be denied full access to UCQ's ‘mainframe’ computers because of a potential security problem resulting from the computing Project students having access to the staff segment of the Health Science network. Computer Centre policy did not allow any students to have access to staff segments of any UCQ local area networks as it was possible to obtain password information by monitoring network traffic using commonly available network management software—unless all staff traffic was encrypted.

September: The academic staff member working with a computing Project student on a nursing care courseware package stated that ‘making computer learning materials *enjoyable* is the bane of my life’. His unrealised goal was to satisfy student needs *and* make the courseware intuitive to use.

October: The UCQ Security Committee discussed the University Auditor's report that disaster recover plans were non-existent for the UCQ computer system and the Auditor's request for a back-up plan for the stand-alone ‘PCs’ [desktop personal computers]. Health Science was one of the few university units with a back-up system for desktop computer data files.

One of the purchasers of the clinical scheduling (later renamed Clinical Placement) software was discovered to be having problems using the new Macintosh computer purchased specifically for use with this software. The Project Manager was scheduled to visit their Brisbane campus to assist.

The clinical scheduling software programmer confirmed that the software would be ready for use for the 1992 student placements. [The software was finally ready for use during the first semester, 1993, and the ‘minor’ bugs remaining were being fixed in July, 1993.]

November: Approval was given for network and printer upgrades using the remaining 1991 budget monies plus funds anticipated in the 1992 budget. Significant financial support for continuing the CAL/CML activities was included in the Faculty budget.

December: Health Science received $42,000 for 1992 research activities from internal UCQ funding ($1,830,000 total for University). The purchase in early 1992 of several ‘notebook’ style Macintosh Powerbook computers, an upgraded laser printer, a second (gray scale) scanner [order subsequently cancelled by Computer Centre], and various general and specialist software packages were approved for use by academic staff involved in Faculty research activities.

1992

January: The University College of Central Queensland became the University of Central Queensland.

Epilogue

On Friday, 29 May, 1993, the author delivered the latest update of Health Science's Clinical Placement software, the first version to be able to automatically ‘place’ staff and students in their clinical assignments as well as maintaining a record of those placements, to the southeast Queensland university which had enthusiastically greeted the premature announcement of the software and had waited so long for a functional version. Due to the time delays, staff changes, and perhaps the limited computing skills of the personnel involved, the institution has reverted to a non-Macintosh computer platform, and will likely not use the software for maintaining their student placement records.

Of consequence to future CAL courseware and software developments by UCQ staff, by mid-1993 the University of Central Queensland had still not revised its policies on the intellectual property rights of its staff. Such a revision had been repeatedly requested by Health Science and others to replace the outdated copyright ownership policies adopted by the then-Institute Council in 1978.

Chapter 5

CAL/CML in Health Science: The Participants' Views

> People ask you for criticism, but they only want praise
> (Somerset Maugham, 1915, in *Of Human Bondage*, 50).

This chapter contains extracts from interviews conducted between February 1990 and July 1992 with individuals directly involved in the Health Science computer activities. The interviewees include Health Science staff, other UCQ staff and administrators, students and other individuals involved with the Faculty's Computer Assisted Learning (CAL) activities.

Background

In 1989 the Faculty of Health Science (FHS) at the University of Central Queensland (UCQ) made a major commitment to computer based learning for the delivery and management of undergraduate teaching. The Faculty had hired a consultant to determine the feasibility of using Computer Assisted/Managed Learning (CAL/CML) as a major component of the instruction for what is now the Bachelor of Nursing degree. The consultant (Zelmer, 1989) found that

- the staff of the Faculty were very willing to use CAL/CML, but that
- commercial sources of appropriate materials were very limited (lacked Australian terminology, particularly in pharmacology, weights and measures, and procedures).

In addition, most of the available CAL/CML development tools would require a strong (and expensive) team of instructional designers and computer professionals to be successful.

The Faculty wished to keep its CAL development at a level that would be manageable within the Faculty itself and decided:

- to utilise the resources of students (computing students in particular) and staff within the Faculty and University, and
- to develop materials locally.

Through the consultancy, the Faculty decided to use entry-level Macintosh computers for staff and students. It was recognised that more sophisticated computer facilities would be required for development work (courseware, image scanning, programming, et cetera) but that good access to basic, easy-to-use, computing facilities by all staff and students was essential to the success of any CAL activity.

The Faculty subsequently received $300,000 over two years from the National Priority (Reserve) Fund for the development of the CAL/CML materials. This funding accelerated the development of courseware and the acquisition of computing resources, but did not change the Faculty's basic development philosophy (Zelmer, 1991, and Zelmer, McLees, and Zelmer, 1991).

A New Model of Computing

In the past five years the demand for computing facilities on the UCQ campuses has been explosive. Originally the preserve of the Department of Mathematics and Computing and the Computer Centre, computer usage is now an integral part of every Faculty. The university still provides central computer resources, but increasingly individual Faculties and Departments are obtaining their own dedicated facilities and are demanding input into the decision-making process for the selection of central facilities.

These changes have not come about without difficulty, and have required staff, at all levels of the university, to adapt their ideas, policies, and practices to the new computing realities. A senior administrator of the university described how he, and by implication the institution, reacted to these changes. The discussion started with the author asking a question about the administration's reaction to Health Science (nurses) using computers and whether UCQ attitudes had changed.

> I've been in Science all my life… numbers and natural phenomena are things that I understand and live with, and I can very, very easily understand why a physicist would want to spend a hundred thousand dollars on a NMR, or something of that style… But the first time that an Arts Head came up to me and said 'I want to spend'—I've forgotten the figure but let's say five thousand dollars—'on a 35mm camera so that my students can take photographs as part of their communication degree/mass communication subject', I immediately said, 'What the hell do you want to spend $5000 on a camera for—you can buy a 35mm that's perfectly adequate for $50 down the road.'…
>
> And so when those sort of questions came to me, and those responses were sort of immediate to me, and I sat down and talked with the people concerned to understand why they were saying those things, you know, it very clearly came to me—'you're going to have to look at things differently'.
>
> And that's not easy to do—after many many years of doing it I still sometimes automatically, within myself, respond 'What the hell!'—and then you stop yourself,

…[and ask] why are they asking this, etc., etc., and you come forward with a much more reasonable proposition.

Computing, to the minds of those associated with Mathematics, Physical Sciences and the Applied Physical Sciences like Engineering, is for number crunching and modelling in a mathematical sort of quantitative way. I can remember… a long time ago, reading a Penguin book whose title I now forget but it was something to do with Science. There was an article in that scientific book, or book relating to Science which talked about the analysis of the Bible in terms of word usage, using computers, and as I remember it, that was the first time that it sort of struck me, and that was in my student days, so it was a fair way back, it struck me that computers may be something other than number crunching.

It is difficult for someone to view things outside of their normal context, and why the hell a nursing educator would want to use a computer—because they don't do these number crunchings—is probably the sort of reason behind the response such as the question you asked.… [The Vice Chancellor] used to go out saying that this Institution leads the Business Schools in Australia in their application of computers to business. Mind you, he was probably still thinking of accounting and number crunching in a slightly different way—rather than as a management tool for example…

And you know it's a hell of a change from what it was three years ago… I suspect I'd be right in saying that the change in academic staff members' offices in the last three years in terms of computing has been dramatic. You wouldn't see a micro three or four years ago but now they're virtually on everybody's desk or they're in the little bag that they carry along with them.

We had previously, when people did consulting or whatever, and the funds went into a trust account so they could use that money to go to conferences and things like that, the money now is being used to buy micros, and software for their micros, and printers for their micros, and modems and portables, and what the hell have you. Everyone now finds that, and I guess micros are not numbers crunchers, they're information manipulating machines and whether the information is numbers, or bikkies, or smells, or signs, or… whatever, so I guess the simple answer to your statement is, there's almost been a, not 180 degree turn-around, but pretty close to that in terms of usage/non-usage.

I mean, history can show, and you'd probably already know, that it [expanded computer usage, particularly CAL/CML] started off [at UCQ] with [an Education lecturer] playing around with it, but now it's everyone and his dog. It's as much part of

> music education as it is a program for the blind or all those sort of things, which, you know, …being able to use that machine to advantage people who have disabilities such as blindness… that's pretty fantastic! (Administrator, 1992, taped interview, 30 June).

CML at UCQ, 1989-91

The administrative changes affecting any developments, computer-related or otherwise, within the University of Central Queensland, are discussed more fully in the next Chapter, however it is important to place Health Science's computing activities within the wider framework of other campus developments in the use of computers in learning. In particular, the Computer Managed Learning (CML) Working Party had a major effect on Health Science CAL/CML developments. The Chair of the Working Party, a lecturer in Mathematics and Computing, also served for a time on the Health Science CAL/CML Advisory Committee.

The Chair of the Working Party, in an interview with the author, defined the role of the Working Party as advising the Vice-Chancellor on the use of technology to improve the cost-effectiveness of teaching at UCQ, and identified some of the campus developments and tensions which affected Health Science.

> **Chair**: The role of the wider group… was to initially advise the Vice-Chancellor on how teaching technologies, in particular CML, could be used to make teaching on [the Rockhampton] campus, satellite campuses and distance [education] more efficient and effective.… Initially the driving force behind setting up the Working Party… was to save time and money of Academic Staff, by seeing if teaching technologies could make teaching more efficient and more effective…
>
> I think the thought was that in the initial part it was simply to get people who had some background and some knowledge to put forward some proposals, and then perhaps to consult a bit more widely after that… I suppose it was initially kept small so that we could get some consensus… because unfortunately, when you have very large committee structures… [people] aren't satisfied at all with what comes out of it… [Alternatively,] the CAL/CML Project in Health Science is a very small committee and it seems to work very well… Once you get heaps of people involved it becomes much more difficult, much more cumbersome. Anyway, it was a small committee that was set up initially to advise the Vice-Chancellor, sort of campus-wide, on what the whole campus could do… a pretty tall order…
>
> When the [Working Party] was set up… Health Science had [already] hired a Consultant to advise on CAL/CML… Because of Health Science's interest in CAL/CML, and because of the Consultant's background in this area as well, the Consultant was included in the Working Party…

The Dean of Health Science put a proposal forward to get money from DEET… to fund a broader CAL/CML Project within the school to develop materials and the Working Party was asked if they would support that.

OK, at that stage it was very general and the Working Party in general, not everybody, but the Working Party in general, did support that concept as such. The School of Health Science was then successful in getting money for that project… In parallel with that, the Working Party was… doing a needs analysis of the whole institution. [The] School of Health Science fed to that Working Party…

So the Working Party was aware of [the] School of Health Science's interest, …they were aware that they had been granted money for this project, etc…We then move on to the Working Party feeding back to the College as a whole… the recommendations as to the campus-wide involvement…

Management, senior management… within the College decided that… the recommendations were fine but it just cost too much money to carry out the recommendations… Then decisions had to be made as to which Schools would be involved in the [CML] pilot project…

Then, there came a lengthy to-ing and fro-ing with the School of Health Science being in and out, and in and out at various stages, I'm still not sure what was happening… I think the initial feeling from senior management was that, given that funds were so short, and given that the School of Health Science already had quite a healthy whack of funding (in that first year it was $150,000, which really was quite a lot), that perhaps it was better if they weren't in the initial pilot and that other Schools with perhaps larger student numbers and who were offering their CML at a distance on campus and in satellite campuses should be involved in the project…

So the School of Health Science reacted, as they did want to be involved in the initial pilot… and they needed to be involved to meet a [financial] commitment that was written in to the funding arrangements… that this Institution had to provide some of the funds to match with the DEET funds…

This [the financial commitment] is something that the Working Party hadn't been a party to because really, to be honest, at the end of the day, whilst we gave agreement in principle that we supported the School of Health Science in seeking funding for a proposal such as this because good teaching technologies on campus are good things, and we do support them in general… we had not seen the proposal that went to DEET and we subsequently—we didn't see it until this issue came up and we did not appreciate, at that stage, that there would be a big commitment from this Institution to it…

Author: Should the CML Working Party have even been aware of it?

Chair: Yes, I believe they should have been aware of it, and the reason that I believe they should have been aware of it was that an Institution only has so much money for things like this and …if you're looking at the wider use of teaching technologies on campus …if you're advising campus-wide as to how those limited funds should be used… perhaps you need to make decisions as to what are priority areas (Working Party Chair, 1991, taped interview, 10 January).

The NPRF-funded project within Health Science was merely the largest and most visible of several CAL/CML developments occurring on campus at the same time as the CML Working Party was making its recommendations. While most of these activities had representation on the Working Party, and to a greater or lesser degree the Working Party was aware of the developments and their needs, the Working Party lacked adequate representation from administrators and others who would have been fully aware of the implications of external funding, especially on the need for the institution to match external grants with an internal commitment.

According to the Dean, even the Faculty was unaware of UCQ's matching financial commitment (personal communication) until the university received notification of the receipt of the NPRF funding. It is therefore not surprising that the CML Working Party was initially unaware of the institutional commitment. Subsequently, UCQ staff were advised that it is now Commonwealth policy to require universities to demonstrate that they have matched special grants with institutional funds.

In answer to a question about whether the Working Party should have endorsed the Health Science project, or any other project, the Chair indicated that as far as she personally was concerned, the Working Party decision was correct at the time.

> I don't know the answer to that... but speaking personally, because I believe that any work, any money that you can get to advance the cause of teaching technologies on campus I would endorse and support—and let all the bun-fighting happen later—…maybe that's really naive but from a personal point of view, no, I probably would have still endorsed it (Working Party Chair, 1991, taped interview, 10 January).

The CML Working Party recommended a CML pilot project, as a precursor to campus-wide CML development (Clayton, Dekkers, Farrands, Gregor, Pegg, and Zelmer, 1991), which was approved at various UCQ Committee levels but was ultimately left unfunded.

The CML Working Party was one response from the central administration to the changing computing environment, attempting to harness the enthusiasm of computer-experienced academic staff to develop an inexpensive, time and money-saving solution to increased enrolment and institutional under-funding. The response was probably too timid, too limited, and too slow to affect the rapid computerisation happening on the campus and was overtaken by devolved funding and other events that put more decision-making powers into the hands of Faculty-level administrators.

Aims of the Health Science CAL/CML Project

It is obvious that a multi-year project that pre-commits a significant portion of any Faculty's budget will be perceived differently by different individuals, and perhaps by the same individuals over time. This section looks at the project aims as expressed by the official project documentation and by key individuals involved with the project.

The aims of the Health Science CAL/CML Project, as stated in the application for the National Priority (Reserve) Fund, are listed in Appendix C. With a priority on independent study and support for students disadvantaged by distance, the project was designed to:

- develop and test CAL materials for pre-registration nursing education,
- develop and test CML support materials, and
- disseminate information about currently available materials to other nursing education programs in Australia.

In the less formal setting of an interview, the Dean, a member of the CAL/CML Advisory Committee and administratively responsible for the operation of the Faculty as well as the NPRF project, provides a pragmatic rationale based on the practicalities of working within an underfunded institution and establishing a completely new tertiary level course:

> I started thinking of it [the computer usage] because we have a problem. This [the Nursing program] is an underfunded project. I guess every institution program thinks that it's underfunded, but I know this one is. It's underfunded in the sense that we get exactly the same money per student as the QUT [Queensland University of Technology], which sits in the middle of Brisbane, and because it's supposed to have a large amount of students [QUT] can make some savings in terms of the administrative costs of running the program. On the other hand, we're going to have students from all over CQ [Central Queensland], we're going to have to put them out into clinical areas quite a long distance away.
>
> We've only got an intake of 100, so we're skimpily funded for what we have to do, so I'm looking around for ways to save money or to save time. One way of doing that is

> to set things up so that as much as possible the students can carry on with the learning without a staff person having to be standing up in the front of the class, or taking a tutorial, or whatever. So you save your staff time for the things that the staff absolutely have to be there for, like being with students in the clinical area.
>
> That's the kind of bureaucratic, administrative, side. I've done enough in adult education to know the things that people learn on their own—I'm sure everybody's had the experience of sitting through a lecture and either falling asleep or mentally being so far away from it that you have no idea what went on in the lecture, whereas if you were doing something that requires your attention and you've got to respond before you can go… So if you can develop learning tasks that students have to pay attention…
>
> So those were the two objectives that I had. One was to save time and money and the other was to make it better for the students; because they do an awful lot of sheer drudgery, particularly in the early part.
>
> When our students do go out into the clinical area it's important that they be safe. Now you can't teach everything via a computer but there are a lot of things you can do to get them thinking through situations, doing mental practices… so that they don't have to do all this while they're standing there in the middle of a busy nursing unit and people are wondering what the students are about, and do they really know what they are doing? …if they can get some of that awkward first fumbling practice over with in a very safe environment and in a very patient environment—for however much we push computers, they are infinitely patient, not always doing the right thing, but patient… (Dean, 1990, taped interview, 22 February).

The Associate Dean, also a member of the CAL/CML Advisory Committee and initially involved with the academic management of the NPRF project, was responsible for the day-to-day implementation of the pre-registration nursing course (the coordinator of what is now the Bachelor of Nursing program) and expressed her aims in terms of variety and self-learning:

> We can provide students with alternative ways of looking at nursing problems and nursing care, [so that]
>
> - we can put some variety into their learning, [and]
> - we can also utilise staff so that our on-site lecturing staff are involved with the more complex aspects of teaching.
>
> The student can get factual information through… CAL programs. I also think that the students need the opportunity to look at different aspects—do some problem solving with no risk—rather than if they were in a patient care situation. This gives

> them the opportunity to play out alternatives without any… neglect to the people that they are caring for.
>
> It's one way of making learning more interesting, it's also one way of getting a more efficient approach to teaching, and it also makes students responsible for some of their own learning (Associate Dean, 1990, taped interview, 23 July).

Although the regular academic staff were less sophisticated in the use of computers, they were quite articulate in expressing themselves about the use of CAL/CML, and their aims for the project were just as broad:

> [The aim is] to develop scenarios, case studies, for students to use so that they can assist them with learning differences. Learn about nursing practices using simulated experiences… and take it [CAL] across the 6 semesters [with] an increasing level of difficulty, and also would help in terms of interaction, cut down on teacher-student interaction or assist with teacher-student interaction is another way I suppose with the CML, it's to assist managers in lecturing. I'm not [as]familiar with the CML so much as the CAL (Academic, 1990, taped interview, 2 March).
>
> I guess it's a personal perception. It's a new teaching methodology that has been used overseas. However it's not been well developed in Australia and even overseas there have been some problems. To me it's an alternative to stand up lecturing, it's supposedly for students to be a bit more self-directed in what they're doing and to provide a stimulus so that they will be a bit more self-directive.
>
> The other perception I have is the general isolation of this campus from some of the more advanced technological support services within nursing, and because nurses here are going to have limited opportunities to get into the clinical area with diverse problems to solve, and the CAL can provide them with some simulated learning situations that perhaps otherwise they would normally not encounter (Academic, 1990, taped interview, 28 May).

The author, an educator and computer user, the NPRF Project Manager and thus a member of the CAL/CML Advisory Committee member, had a broader set of objectives which included supporting the needs of the mature students enrolling in the Health Science courses.

> We need to provide a good educational setting—because of current budget constraints we need to do it less expensively than in a traditional mode. Some of those constraints include the cost of travel through CQ, the sizes of the participating [clinical] institutions, [and] the number of students.
>
> We also need to recognise that a significant number of our students are mature students—are single parents or whatever—and that we've got a physical plant that

typically is only used 6-8 hours a day. We have to extend the hours of usage of our physical plant, and do it in such a way that gives a more convenient education to mature students.

We can't expect students to only come to campus from 9 till 4—

- some of them have other obligations,
- some of them would find it much more convenient to do things in different ways,
- some of them would find it much more convenient to do some kinds of subjects in 3 weeks rather than spreading it over 4 or 5 months.

So these kinds of things [require] providing a very competent, professional education in as efficient, economic and interesting way as we can.

The computing should let us get rid of some of the time constraints—

- we should be able to run the computers 24 hours a day,
- we should be able to use some of the message store and forward techniques so that even though instructors aren't available 24 hours a day, messages can get back…
- by combining with some of the other kinds of techniques, whether it's video tape, field demonstration, lab assistants, whatever, we should be able to provide better resources for the students more of the time.

We're not going to achieve 24 hours a day. I think ultimately though, we have to be looking towards, if not a continuous, more flexible intake, a continuous exit, since many of the skills that students need in nursing and other health science areas are, in fact mastery skills. Once you've mastered them, you're done, finished. Why waste another 6 weeks of subject time if you've mastered them.

If we're going to do that though… we've got a big management problem and so the management side of things—of keeping track of whose done what, when, and where, at what level of proficiency, and ensuring that they [the students] do come out of the sausage grinder …having the balance of skills and mastery things… as well as the background theory—you can't do it conventionally.

So we're trying to achieve those efficiencies in an improved learning situation. To do that, you've got to add extra inputs—and the extra inputs for us will be the computing (Project Manager, 1990, taped interview, 16 February).

Staff Involvement—How and Why!

The original Health Science staff members (both those involved with the internal pre-registration program and the external post-registration program), with the assistance of the author as a hired consultant, made a decision that computers would assist in preparing and delivering nursing education materials. They had a choice about objectives and techniques.

> Back in the Dark Ages when I was naive… I don't know how it all came up, it just happened. We were all very interested at that stage, we were all starting. I was a neophyte and so was [a colleague] in computers and [the consultant] sort of had this idea—and then we sat down, [my colleague] and I, and thought about topics that would be interesting as Case Studies.
>
> I could see great value in the idea and so we did out a whole schema, or framework, so to speak—over the three years [of the curriculum], of different subjects and topics according to the curriculum that students could pull out at any time—and do them as part of assessment, or just do them out of interest. I think assessment came a bit later, but we were more interested in developing them as part of the curriculum, part of the teaching process of it. That's how it all started (Academic, 1992, taped interview, 9 March).

Subsequent staff have joined the Health Science knowing that the UCQ nursing education program was involved with the use of computers; it was their choice to come to an institution which required them, whether they had previously used a computer or not, to become computer literate within a reasonably short period of time, and to make decisions about how they might participate in the preparation of computer-based materials.

The original pre-registration staff members were asked about their involvement in the project. The Dean, for example, noted that she had been a catalyst for getting the project started:

> I'd like to think [I was the] catalyst for getting it started, and certainly not the hands-on person. I guess I had some chances to push some ideas… to both [the] coordinator for the diploma program and… the various staff that have come on.
>
> I talked quite vaguely at first about doing something about computer assisted learning, then wrote up the proposal, so that's the concrete thing that I've done… the funding from the Reserve Fund. Prior to that, when it looked as though we had a lot of interest from [the Associate Dean and] the first two mainly diploma staff which came on—and the whole thing looked like it was getting more complicated than I could keep track of in my head or indeed than I knew—[I] made the arrangement with [the HoD] in Maths Computing to get a maths consultant:
>
> - to come and outline for us what it was that we would need,

> • to translate the rather vague, fuzzy ideas that I had into reality (Dean, 1990, taped interview, 22 February).

Although the Associate Dean had previous experience using CAL-type materials overseas, her duties as Coordinator of the pre-registration program meant that she had very little active involvement with developing CAL materials. Instead she helped design aspects of the first CML software and focussed on using the resulting project materials.

> As I recall, I was in on some of the original discussions about using CAL/CML with the new diploma course, and I've been primarily involved in looking at ways in which it [CAL/CML] could be used.
>
> I did a little bit of investigation of a project down in Melbourne at Philps Institute, and I was involved with… [a] project looking at the management of the clinical placements… I haven't had too much involvement with the case study work that's been done to date except to look at [help edit/pretest] the case studies, and talk to people about the types of problems that we would address in the case studies (Associate Dean, 1990, taped interview, 23 July).

One of the staff members originally involved in the project was relatively experienced at preparing subject materials and was soon 'writing materials which could be adapted to CAL, from that I have been asked to attend a workshop on CAL development' (Academic, 1990, taped interview, 28 May). Others found it more difficult, and some months after participating in the decision to use computers, but prior to the first effects of the NPRF funding being felt, it was already obvious that 'coal-face' teaching duties would compete with the preparation of CAL/CML materials.

> When I started employment in July… [we had to] become a little bit au fait with the computers… Then there was some talk of doing CAL and CML when it was explained to us—…we have kept somewhat of a little diary to make sure we knew where we were going, and so far we have done headings [a list of proposed topics for the case studies] and scenarios and petered out towards the end of the year—because we were planning for the diploma course at that stage (Academic, 1990, taped interview, 2 March).

One of the new individuals, with a background in gaming and creative arts as well as practical nursing but a naive computer user, got involved very quickly. 'I expressed an interest, and it just went from there, I suppose… The structure of the CAL project is loose enough that if someone expresses interest … it's okay!' (Academic, 1992, taped interview, 28 January). This individual has stayed involved and has often provided the impetus for new developments—both in the style of presentation and the development tools.

The degree of involvement, however, was subject to Faculty priorities which put teaching duties, including developing courseware to support those classes, ahead of computer software development. This is not always the priority that would be assigned by an enthusiastic and ambitious staff member. As the individual quoted above indicated:

> My teaching commitments do not include any computer development and at one stage, it was put to me that software development by [Health Science clinical] academics wasn't really on, that we were to develop materials [courseware] not new software, whereas my interest is in developing new software [authoring systems, programming environments]… (Academic, 1992, taped interview, 28 January).

A better established institution might have had the resources to enable an academic staff member to develop such interests. Health Science had a need for basic teaching materials to support the on-going teaching program and could not afford to release clinical staff for computer software development. It did, however, assist the academic to prototype an alternate courseware model with technical support from one of the computing project students.

Others move in and out of the CAL/CML activities, perhaps being quite involved in developing materials at one point and then becoming a consumer at another.

> When I came here at the beginning of 1990, the School had just got the Grant—I was probably one of the people that was in on the ground floor of it [the CAL/CML activities]. [One staff member] perhaps did the bulk of work with actual preparation of Case Studies… in the first six months I was here. In the second six months I really got more involved in that I did some Case Studies… and then last year I was one of the people that reviewed the Case Studies that had been used—to up-date them and change things—…there were some questions that didn't have really good results from the students—they were awkwardly worded and that kind of thing, so I was actually involved in that sort of re-vamping…
>
> At the moment I'm not very involved in terms of actual Case Study preparation—probably because over the period of the program I've actually moved away from… teaching to doing Continuing Ed.… however, within the umbrella of Continuing Education…we have used the facilities and the computer expertise within that program [to develop] a test bank of questions (Academic, 1992, taped interview, 26 February).

With an increase in staff from five to over thirty in less than four years it was inevitable that new staff would not always understand the purpose of the CAL development, and the tasks would be undertaken without enthusiasm. As one individual noted, 'Oh, we were essentially told that everybody had to do two [case studies or courseware modules]. And that was it, so we did 'em.' She was further frustrated when there were delays in getting materials from draft to working stage:

> Currently I haven't got any […CAL] involvement. Last semester we did a couple of CAL projects, Case Studies… I gave those to [the Academic Coordinator] and haven't seen any result of those as yet… so I figure if I haven't seen 'em… I'm not going to get too excited about doing any more till I see some output (Academic, 1992, taped interview, 8 March).

Even with the problems this individual experienced, she felt that there would be benefits from the activity.

> I think it must be a time-saver, overall, for the whole School if we're developing our own materials and putting it straight on to disk ourselves… then once we get hold of the theatre and we just take our lectures to theatre and use computers [with the Barco projector]… making your own overheads and all that sort of thing… it's a big advantage…
>
> For people who don't know how to use computers it's a big time-waster… but it's only a matter of time to pick that up (Academic, 1992, taped interview, 8 March).

The clerical staff would agree that effective computer use simply required time and practice; computers made their job sufficiently easier that there was considerable incentive to quickly picking up the new skills.

> When I first came here I hadn't had anything to do with computers and from the word ‘go’ I just loved it. It was just so much easier than the old typewriter where you had to take things out and re-type everything as it came back sort of thing. With this [the computer] it's just so much easier—it makes life wonderfully easy (Support, 1992, taped interview, 26 January).

Clerical and support staff are expected to use computing skills in most sectors of the Australian work force. Until very recently, most nurse educators were computer novices. The professional nursing journals support the use of computers for a wide range of nursing activities, including nurse education, however computers still haven't been widely adopted for use within most Australian nursing units. Health Science therefore made an early decision that it would be necessary to establish an internal technical support system—permanent staff plus senior students from the Department of Mathematics and Computing—to assist staff and students with their computer use.

Health Science staff now routinely use computers for everything from sending electronic mail messages to developing instructional materials, from collaborating with overseas colleagues to preparing their own conference papers and research reports, if not actually using them as part of their data collection and analysis process. Students likewise must use computers for preparing many of their written assignments as well as their tutorial work with the CAL materials. Basic computer training and on-going support is essential—although, as will be seen in later sections, the support provided has still not been as adequate as many staff would like.

The Lab Supervisor, an individual occupying a mid-level clerical position with additional responsibility for ordering supplies and initial staff training, provided the first level of support to both students and staff.

> I cope with the front end users, you might say, the people who the CAL products are meant for. So mainly I see the finished [courseware] product, or the almost finished product, and then my job is to help with the interpretation that the students have to get out of that end product…
>
> Initially, you could say it was the CAL Project Funds that gave me the job, created the job that I do now… now it's just an on-going ‘dogs-body’ position…
>
> Everybody is basically pretty enthusiastic, pretty receptive, and particularly becoming more aware that the computer is an extremely useful tool—provided they know how to use it. It's been two years, now and I feel that there're still a few barriers—but then, that always happens with computers, you'll always get people that don't really want them, will use them because they have to, but I think the general overall impression …[is that] they're a good thing to have…
>
> The students particularly are appreciative …the lack of facilities on campus for the other students in the other Schools do make them realise just how damn lucky they are. They've got a lab that is devoted to them, and them alone… (Support, 1992, taped interview, 31 January).

The student ‘staff’ also have their role, detailed more fully later in the Chapter. Several of the almost twenty senior computing students working in Health Science on a computing ‘Project’ were also employed by Health Science. One, now a staff programmer with the Faculty, describes how he was recruited:

> Well, I did my Degree in Mathematics and Computing at the University here. For my final year, I chose a ‘project’… with the School of Health Science and their CAL project… I did my project for two semesters with the School and on completion of my final year I was offered a position on a temporary basis and that has now been confirmed to be a permanent basis (Ex-student, now support, 1992, taped interview, 31 January).

Even from his position as a programmer, somewhat isolated from providing front-line support, he can see changes in the abilities of students and staff over time.

> I've found that the number of calls and queries about specific problems have decreased and staff members ability to use computers in different ways and use different packages… has improved.
>
> As far as the students go, I'm probably not the best person to ask—I have noticed, however, a few students who were asking questions at the beginning of the year were not asking similar questions about different things towards the end of the year. It's got to the stage where they could work out for themselves how to do it and didn't need to ask, so there's obviously some learning there (Ex-student, now support, 1992, taped interview, 31 January).

Computing Students and Health Science

The Department of Mathematics and Computing allows final year Associate Diploma and Degree computing students to undertake a computing ‘project’ that challenges students and provides them with a real-life work experience. Eighteen such students have been involved in projects in the three years from 1990 to 1992. Most successfully completed their projects, all have provided Health Science with fresh ideas and the enthusiasm to implement at least some of them.

As far as possible, the relationship between Health Science and the project students was similar to that between the Faculty and its casual staff rather than a staff-student relationship. This has meant that students have had access to facilities on the same basis as other casual staff, they have often been involved in Faculty meetings and assisted with administrative decisions, and have been provided with working space. As well, project students participated in regular ‘staff’ meetings with the CAL staff.

In this section a number of student projects are highlighted to indicate the scope of the student projects and the extent of the involvement of the computing students within the Health Science CAL/CML development.

CAL_Maker Development, 1990-1991: Early in 1990 Health Science ‘advertised’ within the Department of Mathematics and Computing for project students to assist with the CAL/CML Project. After some negotiation two final year computing students (BAppSc(Maths & Computing)) were selected to assist with HyperCard programming and developing several graphics applications.

The programmer's first simple hand-coded case study reassured the Faculty that HyperCard was feasible as a development system. Unfortunately, almost everyone else in Health Science still perceived of HyperCard as a tool for the use of programmers and their enthusiasm quickly cooled whenever they were asked to understand any code, even though HyperTalk, the programming language, is very English-like. Academic staff desired a very simple tool to take their technical information and automatically create student courseware.

The subsequent work led to the development of CAL_Maker, an in-house CAL development tool (see Appendix J), as a computing student project. There were benefits to both Health Science and the student.

> Looking back now at what we did in 1990, I can see now how little I knew about applying the computing skills I had acquired in my course to the needs of 'real' users. I consider that the year spent with Health Science to be the most significant and memorable part of the course work for my degree.
>
> - I found the atmosphere of Health Science to be relaxed and friendly. This made for an open mixing of the academic staff (subject matter experts) and myself.
> - One of the more significant challenges occurred because of the inability to ask anyone else for assistance with HyperTalk—there was no other developer at UCQ at the level that I was working—I was the person that people could, and did, call on for advice on their HyperTalk scripts.
> - One of my major deficiencies was in writing user documentation. That year I realised its importance and have been slowly improving my writing skills.
>
> Another facet of that year was my introduction to the Macintosh. The idea of working with a new platform had been exciting and subsequently proved to be much easier than I thought. My personal computing platform transition has been from Commodore 64 to IBM/MS-DOS to Macintosh; I have been left with the opinion that the Macintosh is by far the easiest platform to learn to use (Young and Zelmer, 1992).

Not all the academic staff were intimidated by HyperCard programming—two individuals started testing their own ideas using HyperCard stacks—developing new applications and pointing out new possibilities for the future. However, as Young and Zelmer (1992) report,

> A side benefit, immediate as well as long term, of these two staff developing their own applications was a growing realisation among everyone that programming both the 'tools' and developing the courseware required more work than most had anticipated.

Another student (1991, taped interview, 26 November), responsible throughout 1991 for faculty support and CAL_Maker documentation, felt that the tools she was using would also be useful within her own (computing) program. 'I think it would be really beneficial' for computing students to use the CAL tools to develop materials for their own subjects. 'It would be excellent... to actually work on something that you would see the end result from'. The hardest thing she had to do during the project was 'the personal interaction with other professionals... I feel that I won't be quite so nervous [in the future]... which will be great for me in the work force'.

This student's experience is described more fully in Zelmer (1992) where the student notes that preparing documentation for users

> Must have to be the hardest thing you could ever come at… Through trial and error I realised what sort of things they [the users] expected and what level I had to aim it at, so I think next time I'll go into that with my eyes wide open.

GHAP/CAS, 1991: One of these academic staff who was working directly with HyperCard argued that the generic stack development tool (CAL_Maker) was too limiting, requiring the courseware developer to adapt to the tool, rather than the tool being flexible enough accommodate to the developer's requirements.

> [Instead of] trying to accommodate the stack to the problem, the person who's writing the problem has to make the scenario fit the options [in the CAL_Maker stack making tool] (Academic, 1990, taped interview, 2 August).

One result was a two-person team composed of the staff member and a computing project student to prototype a new tool, originally called the *Generic Health Application Program* (GHAP), and more recently the *Clinical Assessment Simulator* (CAS). Probably the most significant result, from the student's point of view, was learning how to work as part of a team.

> It was only by bugging [the other team member] enough that we started to sit down and work together as a team—where I knew as much as he knew and he knew as much as I knew—and it was good because it gave us two perspectives, from the academic side and from the student's, [towards] how things would work…
>
> [I approached] it from an absolute novice point of view on the student's side, I have absolutely no idea of what these [nursing] terms mean, so it's got to be almost doubly clear to me what to do at each part… [not knowing anything about the content] was an advantage (Student, 1991, taped interview 26 November).

In common with all of the students working with Health Science, this student found that the project often had its surprises. His academic staff colleague was using the CAL development activity as part of his own higher degree work, and

> I didn't know [his project] was due in until about a week before [the end of the semester] so I was sort of coasting along at half pace thinking I had about another four weeks to get this done, and suddenly I found I had one week…
>
> It meant we had to work very hard, nearly twelve hours a day for 6-7 days… We did get it done… we spent a lot of time working out how does this fit with that, how does

> that end up over there, what sort of format is it in here, and what sort of format was going to [be needed here]?
>
> When we told the thing to go, it ran—everything worked—perfectly! (Student, 1991, taped interview, 26 November).

Network Management, 1991-1992: Health Science has acquired a sophisticated network system for delivering courseware, applications software and other common computer resources to staff and students. This network, seemingly in a constant state of upgrading, requires a watchful eye to maintain even minimal services, and the UCQ Computer Centre, as has been noted, has been unable to provide the level of technical support required. Fortunately, in both 1991 and 1992, Health Science was able to attract computing Project students with an interest in helping manage this resource. As one of the incumbents notes in his final project report, the responsibilities of the job are considerable:

> As student network manager, the project that I have undertaken this year is to assume responsibility of computer communication and academic local area network facilities within the School of Health Science in assistance with the Division of Computing Services. The areas of support I feel have been vital relate to both staff and students within the School and can be summarised as follows:
>
> - User satisfaction on network issues at all times.
> - Good network performance relating to configuration, response times, etc.
> - Availability of network facilities at a maximum (For both normal working hours and after hours).
> - Reliability of network facilities in general and support for problems.
> - Planning for changes and improvements of network facilities.
> - Up-to-date documentation for all aspects including staff, students and network management.
> - Provide and analyse effective security measures in Health Science' (Student, 1991, Final Project Report, 9 December).

Effect of the Student Projects: All of the students indicate in their final Project reports that they have gained from their experiences, however, as the Dean of Health Science notes in Zelmer (1992), the benefits haven't been one-sided at all. 'It has been a big plus that staff who are used to seeing only nursing students get to see and work with students who are also staff, and who know more than they do.' The students also provided the equivalent of one-third to one-half of a full time technical support staff member from 1990 to 1992. The major 'cost' for this support for the CAL/CML activities was the time required to supervise the unpaid student staff.

Achievements and Expectations

> I WANT TO SEE MORE CAL!!! used instead of face to face teaching.
>
> I WANT TO SEE MORE CAL used as supportive learning materials (Academic, 1992, electronic mail interview, 13 April).

Staff expectations about the operation of a computer service resemble a moving target—as individuals become more familiar with the operation of a component (hardware or software), or they observe someone else accomplishing something useful with the computer, their expectations rise to another plateau.

The rising expectations have led to a constant upgrading of Health Science computer facilities, both in quantity (one computer per four staff and no student machines in 1990, to better than one per staff member plus 24 for student use in 1992), and quality. As well as the purchases from NPRF and Faculty funds, individual staff members have used their discretionary funds (special incentive funds, travel or research funds) to upgrade the computers they use regularly.

Network services and applications have similarly been constantly upgraded. The Faculty provided one indication of the rising expectations, degree of use of the system, and hopefully the value of the services provided, when in early 1992 they agreed to provide an additional $14,000, from revenues received for Continuing Education offerings, towards upgrading the AppleTalk based network to a mix of AppleTalk and EtherNet.

This section provides a summary of the responses to the several interview questions relating to future expectations, impressions about the use of computers, and what the interviewees found exciting about the prospect of computing. The next section will then similarly examine the responses to questions about the problems encountered—those aspects of computer use that frustrated the achievement of the expectations.

There are hopes that the Health Science computer activities can make a significant change for nursing education:

> Well, if we pull it off, and I really do think we will, we'll have made a major change in nursing education. Nursing education as is done in most programmes in Australia, Canada, the US, the UK, really hasn't changed very much in the last 30 years, and I'm tempted to say in the last 60 years.
>
> I can date 30 years because I was a student nurse 30 years ago. We had lectures, clinical practice, first of all in a lab; and when I look at what's going on in most nursing schools, that's still what's going on. If we can manage to get a significant

> amount of this nursing education program into a more efficient kind of format for the students—a more effective kind of format—and we can demonstrate that it works, not just to our students here but presumably to other students over the next decade…
>
> It's a risk. We could end up with a big mess and everybody having to scramble and put things on in the traditional way. That's definitely a risk because we're not overly funded for this project either. We're doing it a bit on a wing and a prayer… But we can make a difference, and that to me is the exciting thing. I hope for the people who are working here it's exciting to be part of that kind of project (Dean, 1990, taped interview, 22 February).

For others, the present reality is more personal, with some hopes for extending the productivity of word processing, desktop publishing and electronic mail to colleagues and the students to increase their productivity:

> Basically, I can't imagine, now, living without it [the computer] on the desk but it's interesting—When I came here I was really surprised that we all had access to a computer on our desk… it was sort of like the icing on the cake, and it really was kind of a thrill. But having had it for two years… the fact that we've had email access... I've had email access to [an overseas cooperating institution] so if I get stuck in the re-entry program, or if I've got a question, I just send a message… and say, 'What do I do now?'…
>
> It's good because it's kept up that connection with them. It's also given me a different perspective because I see what they're doing with the program and that gives me ideas…
>
> But the other thing is, I think, just keeping my own work-load organised, I've now got somebody who's going to be taking over the re-entry program in the School and, basically, all I have to do is down-load my folder [computer files] …to a disk and give it to her and say, 'Go for your life', ...and she's got all the information starting from when we started the program, right through. So, it really makes it much easier in terms of that—instead of giving somebody a stack of files. A lot of the stuff you do still have on paper, but I would say that [the computer] is a big advantage… (Academic, 1992, taped interview, 26 February).
>
> For myself, it's been gaining experience with computers—and I'd never ever touched a computer before until I came to the School of Health Science… I think my main gain is learning how information systems interact, and even having the ability to interact with things such as the 'News', which is on Internet… to be able to have file transfer access, access to archives—I mean, to me that is a wonderful gain, as is the

> development of learning packages and you can actually see something for your work. Those are some of the main gains for myself.
>
> The main gains for the School? I don't know—educational-wise: there have been some reasonable gains using the computer materials for educational purposes. I don't really know how effective [and] I really couldn't describe them as major gains—because as much as I do like computer learning materials I really don't feel, and I think most of the literature supports this, that they are not better than other ways of learning. They are just more effective, time-wise, teacher-wise… but …until there's an integrated curriculum we really cannot see that as a major gain.
>
> I really think that the main gain is the quick communication and the dispersal of materials between staff and students because—and I think this is probably another example… (what's the word for when things become more common?)—desk-top publishing is becoming so much a reality here that you write a document, and instantaneously you can send it to someone else, they can manipulate it, print it, email it, the whole works—and notices are put on Bulletin Boards, on our public File Server… What would be really nice, again if it was eventually extended to include the students as well as the staff (Academic, 1992, taped interview, 28 January).

Staff can accept the need for using computers, and the need for nurses to be computer literate, without accepting that computer assisted learning can be effective. Older staff in particular have seen, and may even have participated in, previous attempts at reforming the teaching process through programmed instruction and similar techniques. For them the challenge is to make their teaching more creative, and CAL will seem inadequate until they experience CAL promoting creativity and lateral thinking.

> I think the use of computers in the School of Health Science for teaching methods are excellent if they are used as a problem-solving device…
>
> You'll only get from computer assisted learning what the programmers put in. I feel that there's a lot more to learning than just problem-solving and following flow-charts which you mightn't get with a computer. Now, there is no way that someone, who follows a computer-assisted learning program will ever come across the serendipitous… solution to their problem, and neither will there be ‘EUREKA’—because that's not what computer programmers are for.
>
> So that's my opinion of them—I like them. They have their uses, but I'm not too sure that they stress the imagination enough. They don't think around corners sufficiently (Academic, 1992, taped interview, 25 February).

Many of the Health Science staff had previously prepared instructional materials, generally lecture or print based, but they lacked experience developing CAL and related instructional materials. The limitations of a linear courseware presentation were widely discussed, and there was a recognition that students might learn more from preparing the courseware than they do from using courseware prepared by others:

> Case Studies, where you have serial screens that you have to access and that you don't have a hard copy of for reviewing at a later point in time, I think have limited usage—…the student cannot recall everything that is on the screen and if they don't have a hard copy really cannot use that down the track. Besides, I think students would profit more if they were gathering data from clients, patients, residents, and writing Case Studies that allow them to learn about conditions that are applicable to them at that point in time (Academic, 1992, taped interview, 2 March).

Health Science may not have achieved all of its goals for computerisation but, as one academic reports, for the staff the most important outcomes from computer usage may be:

- staff are more independent, not relying on clerical support,
- time wastage through 'double' typing is eliminated,
- staff do have some perception of how CAL COULD work,
- staff are more computer literate (Academic, 1992, electronic mail interview, 13 April).

The student benefits may have been somewhat less well-defined at that time, but staff saw the developments as exciting.

> I feel very privileged to work in a School that has such facilities, because I do use the computer every day… I can imagine that if we didn't have [the computers] the clerical staff would be really snowed under even worse, or we'd have to have typewriters or something which, having never learned to type, would be terrible for me. So, I feel privileged from my own functioning—…but also from the point of view of teaching. I think it's an exciting time of development within the School as to see this come to its full potential. For the students to have the access to CAL material… it's the beginning of an exciting time, I think (Academic, 1992, taped interview, 20 February).

Problems and Frustrations

As was briefly noted in the previous section, the use of computers is not without its frustrations. This section summarises the responses to the interview questions regarding the problems and frustrations encountered by the staff of Health Science in their computer use.

Discussion of problems relating to the use of electronic mail are discussed more fully in Chapter 7.

Intimidation is a commonly expressed reaction to getting started with computers; some individuals discover that they can control the computer, rather than adapting to its needs and demands:

> I didn't use them [computers] as a child—it was a new tool to me and it seemed to bully me for the first six months and after [that] I started to write rude words on it… I'd call it a something or other… So now it does what I tell it to do—where originally I did what it told me to do (Academic, 1992, taped interview, 25 February).

The Dean (1992, taped interview, 7 February) noted that some of the problems were the result of pushing at the edge of the technology, 'there are glitches and things that don't work… we sometimes are looking for things where the bugs haven't all been worked out and then we've got to live with them', and that others were the results of poor decision-making, as when the Faculty simultaneously moved quarters and changed the office computers from an IBM/MS-DOS platform to a Macintosh platform:

> We moved buildings, from the little temporary building… and at that point we had made the decision at the School that we were going to go to a Mac base—so it made sense for the Head of School also to be using a Mac. So we said, 'Right, that's when we'll switch, when we go to the new building'…
>
> Never move a whole School in a rain-storm and start a new computer system at the same time—it is a recipe for absolute disaster and hysterics!

For the enthusiastic academic noted earlier in this chapter, who had never touched a computer prior to joining the Faculty but for whom the excitement and creativity of computer programming had created a conflict between his role as an academic and his new programming interests, the limitations of the computer system were frustrating. He was using his entry-level computer, and its relatively slow speed network connections, beyond the limits of functionality.

Difficulties using an entry-level computer system for programming tasks are readily apparent—most programmers require advanced hardware to achieve productivity—but the degree of use made of the network by the academic staff, and the problems resulting from network failures, were not anticipated. The loss of network services, generally the result of lack of capacity or software and hardware incompatibilities, were particularly frustrating.

> I've probably had two problems, one is being, until recently, the lack of a hard drive—because hypercard development …over a network corrupts your stacks… At one stage I lost about two week's work through corrupted files. Recently, I've got a hard-drive on my desk so that solves that problem to a large degree. The other problem that I

> have had has been when [the network] goes down. I think this is universal for all the staff here, that when the file-server dies, not only do you lose access to your work area but you suddenly lose electronic mail, FTP, Topaz and Onyx [the university computers providing access to the Library database and Student Records] and all the file-server access that goes with it. And that's one thing I think we could look at in the future—
>
> Is it is possible to, if the file-server goes down… to look at the possibility of back-ups for when we do lose our file-server. I think most people could put up with decreased access but it's the lack of access that particularly hurts (Academic, 1992, taped interview, 28 January).

For almost all of the staff, the network problems—slow access, system crashes, lost electronic mail—led to the adoption of preventative tactics.

> In the actual working with computers I felt fairly comfortable because I did have a computer at home and had done a thesis on it, so I'd made all the gross mistakes on my thesis—not that I haven't made them here, but I wasn't afraid to turn it on and I wasn't afraid to work with it.
>
> It's a different system because I don't have a Macintosh [at home] but in that sense, it's been really good. I guess my difficulty has been—probably the difficulties that we all suffered in getting it up and running, a network going down and—the mail [electronic mail, only available via the network] crashed and this crashed and all we lost—you know, that kind of stuff.
>
> But I'm fairly conscious and fairly conscientious about making copies of my data—at least if I don't do it every week I try to do it every couple of weeks—…I'm not religious about it, or anything, but I do consciously try to think of it, especially if I've saved big documents that I know I don't want to have to try and type again (Academic, 1992, taped interview, 26 February).

Another heavy user (Clerical, 1992, taped interview, 26 January) would agree with the inadequacy of entry-level hardware for heavy use. A small internal memory space causes the computer to 'freeze and then you might have to turn the thing off again'. Adding additional memory and hard drives helped but there are still the network problems: 'You get the continual breakdowns, but I mean, that can be overcome.' When this interview occurred (January 1992) it was anticipated that the planned network upgrading in mid-1992, the latest in a series of almost continual upgrades, would overcome many of the problems.

What Else is Needed?

Training in more advanced techniques and applications has been a constant request from academic and support staff as well as students. Some of the skills requested, particularly for the support staff, would make current work easier, others are for staff development, the improvement of promotional prospects, and perhaps even for the challenge and enjoyment.

> I'd like someone to show me more advanced things with regard to the computer. Not just how we use it—more of the setting up of the programs—I don't think that would hurt, but it's just finding the time…

> More advanced programs and spreadsheets and databases and things like that that… the support staff could use mainly… what I'm using it for in my job now, I see as sufficient—there are some financial things that I'd like to learn… packages for financial systems—even for the Admin Officer, you know (Support, 1992, taped interview, 26 January).

> Basically learning the different programs and being able to creatively apply the different functions to the jobs you do. Even with something like Microsoft Works there is a lot of components to it that we just never had a chance to explore which could have made life easier for us. We didn't have the time, and we didn't have access to the training to help us out. It is more familiarisation with the packages, I would say (Support, 1992, taped interview, 16 March).

Others, perhaps more confident of their skills as independent learners, were quite willing to wait to acquire any additional skills until the skills were actually required.

> I don't think I need extra skills because my use of the computer is sufficient to my style of study and teaching. If I was wanting to teach with computer programs I would have to get some more instruction in that—that wouldn't take long because I've used flow-programs all my life—I'm not terribly interested in learning a program and how to write a program. I only want it [the computer] to do what I want it to do (Academic, 1992, taped interview, 25 February).

A more common view was expressed by the Dean, an individual for whom the computer is just another tool to be tolerated in its idiosyncrasies and who needs cheat sheets and other memory aids to assist in using the computer:

> What I need is for somebody to lock me up for a week with the manuals so that I get better skilled in using things like spreadsheets and the databases. I can get into using things without knowing the efficient ways and I think that's where I waste a lot of time… I think we *all* need better manuals [emphasis in original] so that it's easier to look up the things that you don't use all the time, or if you're just getting started with something, so that you can look up things.

> Now, I know we've got little cheat-sheets around for some of the things but I suppose if I had my 'druthers' I would hope that the computing support staff could put a lot more effort into that kind of document… For some reason, computer people universally loathe documenting but it's the only thing, as far as I'm concerned, that helps people like me.
>
> I get criticised by the director of my computing project for wanting a recipe book—you know, 'Give me the recipe book and I'll look up and get the answer'—and [one of the technical staff], when he was here, used to keep telling me that things were intuitive. Well, I'm sorry, I don't 'intuit' the way that those folk do, and I need it written down somewhere…
>
> So that's what, quite seriously, I think would be a major step… so that when they [our students] get out into the work world and are perhaps involved with a hospital or a health unit that is starting to computerise, they're not left standing there saying, 'Well I guess that's the way the computer world is', [instead] they can say, 'Dammit—good documentation helps! (Dean, 1992, taped interview, 7 February).

Improving and expanding the rather limited CAL_Maker documentation prepared by the Health Science programmer was the focus of one computing student project that illustrated the difficulty of preparing good user documentation. Despite workshops in developing CAL materials, and at least three revisions of the documentation, staff were still displeased. As can be seen from the following evaluation comments, staff responded both to the documentation—too much jargon—and to the necessity for them to understand and apply instructional design principles.

> Who is this directed toward? Computer programmers cos I ain't gunna read this—jeez its awful. I want to do the case studies without this stuff. I thought we were trying to get away from this jargon [instructional development terminology in a lesson 'branching' discussion] (Student project report, 1991).
>
> My understanding from the latest series of meetings was that we (academic staff) typed the case study onto the computer in the W.P. [word processor format] and the computer types *or whoever* [emphasis added] put it in the appropriate format for students to use as a CAL case study?! (Student project report, 1991).

Health Science developed CAL_Maker as an easy-to-use tool that almost every academic staff member could use with minimal training. As the criticisms above indicate, providing an individual author tool was not appropriate for some academic staff. In retrospect, the academic staff needed additional instructional design knowledge and skills appropriate to the level of CAL development task accepted by the individual lecturer.

While one academic staff member wanted the freedom to program his own CAL development tools, others wanted someone with CAL expertise to take their raw ideas, notes on the word processor, and produce functional CAL courseware without further involvement from the academic staff member. 'I don't have any time to develop CAL' was a common complaint. Equally common was the request that academics be allowed to give their rough notes to one of the typists for formatting as CAL courseware, just as they were used to doing with their paper-based teaching notes. Unfortunately, the programmers and clerical staff also lacked design skills and even those individuals with instructional design skills required more content direction from the academic staff than some seemed willing to provide.

Finally, at least one lecturer, involved with using computers for managing a nurse re-entry program with external students, would like to extend the computer facilities (CML in particular) out into the wider community:

> [I would like the CAL materials] to be able to go out to the other Learning Centres [a state-wide network of more than thirty 'Open Learning Centres']. I expect that would be an expensive proposition because they don't all use the same type of computers… and obviously that means money and time and that's an expensive proposition. But it would be really nice if we could do that. I mean, that would be a dream (Academic, 1992, taped interview, 26 February).

Summary

This Chapter has described Health Science computer activities, especially those relating to the CAL/CML developments, using the words of those involved. Whether this description is 'accurate' or not according to some external set of criteria is immaterial—this is how the participants described their expectations and frustrations.

The next Chapter provides a description of some of the events as viewed by observers outside the Faculty.

Chapter 6

CAL/CML in Health Science: The View from Outside

‘Would you tell me, please, which way I ought to go from here?’

‘That depends a good deal on where you want to get to,’ said the Cat.

‘I don't much care where—’ said Alice.

‘Then it doesn't matter which way you go,’ said the Cat.

‘—so long as I get **somewhere**,’ Alice added as an explanation.

‘Oh, you're sure to do that,’ said the Cat, ‘if only you walk long enough.’

(Carroll, Lewis, *Alice's Adventures in Wonderland* [Emphasis in original]).

This chapter primarily derives from interviews, with individuals outside of the Faculty of Health Science, conducted by the author from 1989 to 1992. The interviewees included a Pro Vice Chancellor (PVC), a Dean and an ex-Dean, a Head of Department a member of the CAL/CML Advisory Committee, two computer vendors, and two students from the first class in the Bachelor of Nursing program.

Several of the interviewees participated in the Health Science CAL/CML Project either directly or indirectly, although they were not part of the CAL/CML development activities. The Health Science students, for example, used the Health Science student computer laboratory and the courseware developed by the project. Other individuals were interviewed because they were participants in, and observers of, the changes occurring at the University of Central Queensland.

As in the previous Chapter, each interviewee makes a contribution from his or her own point of view. That the results may be contradictory and, particularly with regard to events which happened within Health Science, that individual impressions may be factually incorrect is not important. The interviews provide a view of the Health Science 'reality' as they experienced it, and add another dimension to the story of the CAL/CML activities within Health Science, helping to explain some of the difficulties encountered by Health Science.

Many of the Health Science staff interviews reported in the last Chapter were conducted using a semi-structured interview schedule designed to consistently elicit information about the conduct of the CAL/CML activities, and the interviewee's reactions to the resulting changes. The interviews reported in this Chapter were more open ended and unique to each interviewee. The main commonality between the resulting interviews was an exploration of those issues affecting the Health Science CAL/CML project with which the interviewee had direct experience.

The Student Experience

The students interviewed in the previous Chapter were computing project students—unpaid staff working for Health Science. Early in 1990 the first Health Science students arrived. As well as taking an introductory computing subject, they were increasingly required to prepare all of their assignments using a computer and, by the end of their first semester, were testing the first CAL 'case studies' developed by the project. The initial CAL materials were designed to supplement specific lessons within the nursing program, however, the students in 1990 worked through them as they were completed by the author/programmer, not as they fit within the curriculum. In a very pragmatic sense the students provided the initial testing and quality control for the materials developed.

The two students whose comments appear below were in that first class in 1990. Close friends and housemates, they are reasonably representative of the students who completed the course. They were interviewed together following the completion of their course. One of the two students had previously taken a bridging subject which provided an introduction to computing and knew the basics of operating an IBM/MS-DOS stand-alone computer. The other student had almost no prior knowledge of computers and could not understand why nurses needed to know how to use computers.

> When I came to University I thought, 'I want to become a nurse, I don't want to become a computer operator, I want to do nursing. I want to sponge people, I want to do nursing, I don't want to be behind a keyboard'. I was very negative. When [the author in his role as lecturer for the introductory computing class] entered the [class]room [in the first semester] I thought 'this is a waste of time' (Student A, 1993, taped interview, 10 February).

The need to prepare assignments using a computer and the difficulties getting access to computers at the university quickly led to their purchasing their own computer.

> When it came to our first assignment it [the assignment] was a dreadful mess. I had tried to write it out and I had a scribble here, a scribble there and [my housemate] said, ‘let's get a computer’. I said ‘No, we don't need a computer’… [but] after heaps of headaches I said to [my housemate], ‘All right, we'll get a computer’.
>
> So we got the computer, and we have never looked back since. My time on the computer was in the afternoon and [my housemate] would get on it at night time, and I got back on at 11 pm and finished at 2 am. Then [my housemate] would get on it at 4 am and finish at 8 am, and then we would go to Uni. That happened most nights of our three years (Student A, 1993, taped interview, 10 February).

Other students, she suggested, were not so lucky. Their grades suffered because they did not use a computer for their assignments.

> From other students point of view, I know that a large percentage of our class did not own a computer, and did not intend get a computer but still relied on a typewriter, and still ripped out thousands of trees and [had] heaps of headaches. I still would say that [my housemate] and I… got better marks, and wasted less time doing the incidental things. [We put] more into our actual assignment because we had our computer… We could type something in and the next morning get up and read it and say ‘What did I write that for’ and cross it out or cut and paste and do what ever you want—and you have always got it there on your computer, if you saved it properly (Student A, 1993, taped interview, 10 February).

Her housemate, initially more experienced with the use of a computer agreed on the utility of the computer to their assignments.

> I'm not a very good writer, so therefore all these tertiary assignments was indeed a headache. My first assignment [during the bridging subject]… I had thousands of pieces of paper all over my room, and I'd cut and paste bits and pieces here, and correct with white ink and everything else, and joined them together. Then I would borrow somebody's typewriter and try to type it in. Then I would make a mistake, rip out the paper, and throw it on the floor. So I had all these trees in my room…
>
> [When I used the computer] I found I could type it [a draft] straight into the computer, cut and paste at leisure, bold, enlarge, do whatever I liked with my work, rearrange as I felt fit. [I] always got ten out of ten for presentation (Student B, 1993, taped interview, 10 February).

They disagreed, however, on whether it would have been possible to accomplish the same quality of work using the computers in the UCQ laboratories. In reading their comments, it must be remembered that in 1990 it was not possible for most students to obtain 24 hour access to general purpose UCQ laboratories. Some nursing students, however, used their friendships to obtain access to the 24 hour computing laboratories provided for Faculty of Business students.

As Student B indicates, many students did manage with University supplied computers—and the help of their friends:

> A lot of them… did. They worked at night, they had access to business computers through friends of theirs… that they begged [or told] them they would give them a pizza or something or other if they got the access to business.
>
> They would go out late at night and queued up to do their assignments. I know they were quite happy about it because they had to. In most cases they liked it [assignments] word processed, because the majority of the people who had word processed material, they definitely got the higher mark. The type written material didn't seem to gather the marks (Student B, 1993, taped interview, 10 February).

Student A disagrees:

> From my point of view, I would say no, for the simple fact is I like security and… in our own little room, I knew I was locked in and I was safe… [If] I got in my car [and] went out to uni—this was before 24 hour security—I would not feel safe.
>
> So no, I would not use the 24 hour service; only because [of] my security [concerns,] not because I did not want to use the computers. That's why [my housemate] and I chose to get a computer in our own house—because we felt safe and… we could use it any time. If I was upset or I had this magnificent thing in my brain that I had to get into the computer before I forgot it, I could just run upstairs and type it in. That's only my personal thing because … I have to feel secure and I felt secure in our own house.
>
> Yes, I did know a lot of people that did go out there at one or two o'clock in the morning, only because that was the only time a computer was free; and even still some had to take pillows and lie on floors to wait. That's my personal view, I still prefer to have it at home (Student A, 1993, taped interview, 10 February).

Health Science, and most of the Departments providing service subjects for Health science, required written assignments to be prepared using a computer. The requirement was a source of some controversy when it was introduced and was not universally applied but its utility is now understood.

> Personally I think it's a wonderful requirement, as I'm in the nursing field right now—working at a private hospital here in Rockhampton. I think it is very beneficial to be

> able to know the keyboard technique, because there is ECGs (electrocardiographs) that require you to type in patients' names, sex, time, age and you must know where those keys are because you have to type it in a certain time frame and then they print it out… That little ECG reading is… like a little computer… and I think it [knowing how to use the computer] is essential…
>
> Another thing is… I think they should stick with that requirement, because there was a lot of times [my housemate] and I put a lot of time into presentation and some people would hand it in on scrap bits of paper and get higher marks… I think that you should introduce computers because they're our future. Computers are everywhere. If you don't know computing… well I'm afraid you're not developing (Student A, 1993, taped interview, 10 February).

Their initial reactions to the Health Science CAL materials was that the materials were 'boring' and the technical difficulties—software and hardware conflicts, production delays—created a negative impression. As time went on, and the quality of the materials improved, their reactions also improved.

> When we [started], there was problems you see, they [the CAL courseware] were supposed to be on a certain day, they weren't, they were a month late and there were troubles. That's more on the technical side of things. So eventually we got into the programs and we had to read through and give our answers to the questions. We did find them interesting, because sometimes we thought we had all the answers but we didn't at all. It was a good learning tool, and especially then when we got further in depth, when we got into pharmacology [and other advanced units]…
>
> There were also some who choose not to do it properly… There might have been ten components that you had to get through and you had to get them all correct… they would once again cheat. There was always a way around it and they would always find out… A lot of people didn't want to put time in to it. With computing you have to allocate time (Student B, 1993, taped interview, 10 February).

It didn't help that the materials were never error-free when introduced, or that the computer system itself 'crashed' or otherwise failed regularly.

> I found it very interesting, but the only hassle was that you got very disappointed when all of a sudden you were sitting there for two hours and you were on your last one and you were terminated and you had the right answer, but you were terminated… I think it was the initial guinea pig faults that turned us all off it. We thought we've had enough of this. We spent two hours… when we had other assignments at home that were late because we were out here [in the CAL laboratory]

> wasting time. We thought we were wasting time because we didn't see any progress, but we did (Student A, 1993, taped interview, 10 February).

Regardless of the problems, the final result was positive. Even getting 'terminated' from a CAL unit for an incorrect answer proved to be beneficial.

> One of the points that I thought on this CAL program, and mainly on Pharmacology once again, is the point that it made you read what was in front of you correctly… We would answer the questions incorrectly and be terminated and it was our own fault because you gave us milligrams, mils, or whatever, appropriately. We were… excited about working out the answer, but [we] could have killed the person because [we] didn't put in whether it was milligrams, mils or whatever and this is where the errors are very apparent out in the work place.
>
> That point has only come home [to me] recently… One girl cut a tablet in half which is sugar coated and should not be cut in half. She didn't query the dose.
>
> I queried the dose myself later on and so did the other RN… That took me straight back to the Pharmacology CAL lessons. We sat down, both the other RN and myself, and here we were both converting it [the dose] back to what the doctor had written. This other lass converted to micrograms instead of putting it back to milligrams and didn't worry about the decimal points…
>
> She would have been terminated out [in the CAL laboratory]… and that gave me a good lesson. That was only from doing all the Pharmacology out there and looking at it, because when you read books you only skim and scan, [you] don't take it all in like when you get terminated on it out there.
>
> It makes you say, 'Hey!! I put milligrams'. Then they show you your answer and you put micrograms, when they asked you for milligrams… Last week it did happen to me [for real] (Student B, 1993, taped interview, 10 February).

One of the students (Student B, 1993, taped interview, 10 February) goes so far as to state, 'I can honestly say I would not have my degree without computers'. The staff, she suggests, were 'more organised' with their computers and were able to respond more quickly to student requests.

> [The Associate Dean] would use her computer straight away… You would have that information now, not 'Come back next week', or 'Come back in two day's time' (Student B, 1993, taped interview, 10 February).

Her colleague agreed. The computer on every staff member's desk had benefits for both staff and students—and the staff did not hide behind their computers. Instead the computer enabled the staff to respond more easily to student requests. If a lecturer was working on an exam or other confidential material they simply saved their work and cleared the screen when the student arrived, returning to the place where they left off at a later time.

> Interruptions in the lecturer's office [were] never a hassle because whatever they were working on was always there [on the computer] when they returned. Whatever the lecturer was working on they always [had] time to see you. If we had a problem with an assignment they would save it [the work on the computer] or get rid of it, but they [could] always come back to it… They always had time for you… and then they would get back on the computer… I think is beneficial to both staff and students (Student A, 1993, taped interview, 10 February).

Student Assessment of the First Year Computing Experience

The first two batches of students could argue that they were guinea pigs—they tested all the materials for their course, not just the CAL courseware. They did, however, have one benefit that the current students lack, they had a two hour subject in their first semester specifically to learn about computing. This subject, withdrawn after 1991 because of time constraints in the restructured course, provided an introduction to computer terminology and hands-on experience with IBM/MS-DOS computers. The students taking this subject in 1990 and 1991 were asked to assess their first year computing experience approximately seven months following the completion of the subject. To facilitate analysis the questions were divided into two areas, their reactions to the computing subject, and their reactions to computer activities required for the Health Science subjects. Questions in both areas related to the student's self-perceived abilities and feelings plus an opportunity to make more general comments. Optical Mark Reader forms were used to collect responses to questions where a ranking response was required, and comments were recorded on the evaluation form (Appendix K).

While it is normal at UCQ to evaluate teaching subjects immediately at the end of the teaching semester, this was not simply an evaluation of the computing subject, valuable as that might be. This was an evaluation of the total computer experience during the students' first year. It can be argued that some of the students who dropped out between the initial enrolment and the time of the evaluation might have done so because of negative computer experiences. This then was a relatively informal evaluation by the survivors, after enough lapse of time that their initial emotional reactions had been eliminated, to assist in assessing the overall computing experience of these first year students.

Ninety-eight students were enrolled in the first intake, 1990, of whom seventy-six entered the second year in semester 1, 1991. Of these students, thirty-six returned their questionnaires early enough for their results to be tabulated. The 1991 class sizes were approximately the same but only seventeen students returned their questionnaires.

The computing subject, offered by the Department of Mathematics and Computing, was initially presented as a classroom lecture plus laboratory, and subsequently became more independent study oriented with videotaped tutorials (available in the computer laboratory, from the SHS Computer Lab Supervisor and the Library) and scheduled laboratory time. The textbook used contains extensive software tutorials for the applications (word processing and database management) as well as more general computing knowledge. The Department provided access to IBM/MS-DOS type computers during scheduled laboratory sessions, evenings and weekends. Both groups received demonstrations and hands-on assistance in laboratory activities provided they attended at the scheduled laboratory times.

Practical assignments were all marked against competency standards, weekly formative testing was used to ensure acquisition of terminology and other knowledge from textbook readings (in-class tests were used during the first year, optical mark reader forms collected monthly were used during the second year).

Students were also required to use computing facilities to prepare some of their normal written assignments (both nursing and non-nursing subjects) and to use the Faculty of Health Science's Macintosh computing laboratory for a minimum number of CAL (Computer Assisted Learning) assignments. These assignments were assessed as part of their nursing subjects.

As part of the curriculum reorganisation following the change from diploma to a degree program the introductory computing subject has been dropped as a requirement and the acquisition of basic computer skills has theoretically been integrated into the first year nursing subjects.

The first intake of students began their initial computer subject instruction on NEC APC III (semi-DOS compatible) computers in a small laboratory in the university Library. This laboratory had limited access times and a restricted number of computers. It had been anticipated that the students would move into a new laboratory with DOS-compatible computers within the first month of the semester. This would have been confusing enough, however the construction and installation of the new facilities was delayed, resulting in a continually shifting date for the transfer.

The first Health Science Case studies were available for student testing late in semester 1, with more available during semester 2. All students were asked to work through a specific number of case studies, reporting their completion to the SHS Computer Lab Supervisor. In addition, students were required to demonstrate use of a word processor for at least one written assignment during semester 2, and to use the electronic mail system to send and receive a message.

1990 was a construction year, highlighted by the installation of new computer facilities for Health Science and the general student body. The computer subject had previously only been offered to students studying at a distance and underwent considerable revision for the internal offering to the nursing students. Access to computers for skills development was constrained by the delays in construction and fitting of the laboratories and some nursing students actually used four different computer systems to complete their assignments (the NEC APCs, semi-DOS compatible, at the start of their computing subject in semester 1, the new 386 ‘Arrows’—IBM clones borrowed from the Computer Centre—installed on a stand-alone basis in a Health Science classroom prior to the completion of the centrally controlled DOS laboratory, the 386 Arrows in a network configuration, and the Health Science's Macintosh computers). As is common in new networked installations, the network facilities had limited functionality for the entire year; printing in particular was almost impossible from the network.

At the beginning of the second year, students in the first class were not confident about such basic computer skills as their ability to format either a Macintosh diskette or an IBM/MS-DOS diskette, however most (72.3%, n=36) felt reasonably confident (3 or greater on the 5 point scale, where 1 indicated poor and 5 indicated excellent) using a Macintosh computer, without assistance, to access a CAL case study. Equally encouraging, 80.6% (n=36) ranked their enjoyment of the CAL case studies as 3 or greater on the 5 point scale (63.9% responded 4 or greater, 25% responded 5).

The student comments revealed difficulties in both the CAL case studies and the operation of the laboratory. When asked what one thing they would change, student responses included:

> Make sure they [courseware] are operating correctly. In areas where we were supposed to type in an answer we were unable to.
>
> Have a demonstrator in the lab at all times.
>
> These questions should be confidential as to how they are done.
>
> Nothing [6 respondents]. Good.
>
> Clearer explanations of exactly what is expected—how to use would help.
>
> They were quite enjoyable.
>
> Make sure the answers were not so ambiguous.
>
> Make them more exciting and also put more information on the actual use of the Macintosh computer.
>
> Make instructions clearer.
>
> Have some relevance between Nursing lectures and [case] studies.
>
> Have had them organised earlier in the semester so there was not such a big rush at the end. Increase hours available for use.

More variety.

Have preferred more previous knowledge on topics before answering.

Make more computers available.

Make them [case studies] harder, more variation in topics, choices got too limited, some times they assume more than what we knew, other times they had ridiculous choices for answers.

Not assume that students know something that may be obvious only to an experienced nurse.

Not make them so difficult. They would be well suited for 2nd year.

Make them more relevant to what we were doing in class.

Make the lab more easily [accessible].

Their comments regarding what should not be changed with the CAL case studies were similar:

Availability

The wide variety of them that have many options to choose from

The type of studies (very interesting).

The variety of the actual case studies.

No change.

The availability of the computers as related to the case studies and the responsibility of getting it done ourselves.

Should remain multiple choice and set as they were [presumably reacting against the pharmacology materials which were teach and test, not discussion].

Variety of topics [2 respondents]

The completion of the 10 case studies; they were enjoyable.

Case Studies.

The actual use of them.

The computer set up is great. Just the actual study needs more work.

The format.

The topics.

In 1991 both the general purpose computer laboratory (IBM/MS-DOS) and the Health Science computer laboratory (Macintosh) were functional for the full year. Both laboratories did experience some difficulties in maintaining 100% availability of all computers, particularly in the DOS laboratory, plagued by power problems, but was this was alleviated as evening and weekend access to the laboratories became common during the year. In addition, instructional materials specific to the computer laboratories, and particularly in the use of the network(s), were available to students from the start. The students in the 1991 cohort therefore should not have had as much difficulty with access to computers as their predecessors. On a subjective level, the verbal complaints from students about non-functional hardware and difficulty of access was as great in 1991 as in 1990 and a number of students refused to use the DOS machines at all.

A major change from 1990 was in the presentation of the computing subject itself; in response to a number of the comments from the 1990 students, the introductory computing skills were presented in an independent study format. Students had an initial lecture plus scheduled laboratory sessions with the lecturer approximately once per month, scheduled laboratory sessions (2 hours per week) with laboratory demonstrators for hands-on assistance, videotaped demonstrations for use within the university or home viewing, tutorials on DOS and the application packages within their textbook, and weekly formative (multiple choice) questions based on their textbook readings. As before, all assessment was competency based.

Students experienced considerable difficulty adjusting to the necessity of providing their own scheduling and access to resources. Students complained about the lack of assistance with their work while the laboratory demonstrators reported that students seldom attended the scheduled laboratory sessions (three time blocks: early morning, mid-day, and late afternoon on several days). The exception was the single mid-day laboratory session, where often several times as many students as could be accommodated in the laboratory attempted to gain access. Laboratory access had initially been on a first-come, first-served, basis but even with a 'sign-up' sheet to schedule access, the mid-day session was over-crowded and the other sessions almost empty.

The small sample of students in the second intake also lacked confidence in accomplishing tasks such as formatting diskettes on either system, however, they felt more confident (82.3%, n=17, responding 3 or better on the 5 point scale) at accessing CAL case studies than the first intake. Their enjoyment of the CAL case studies had also marginally improved (81.2%, n=16, responding 3 or better on the 5 point scale).

When asked what they would change about the CAL case studies, their comments included:

> the case studies are adequate
>
> change the hours to night hours—5 pm-10 pm

have staff present, so you could ask questions about health topics

have more of them [2 respondents]

use them to learn on

Things they would not change about the CAL case studies included:

the instruction sheets [on using the lab and applications]

the evolution of their usefulness in self-teaching

the easy access to someone who knows about computers [2 respondents]

open hours of use in CAL lab

A number of the 1990 (first intake) students, and more computer-literate 1991 (second intake) students, worked as volunteers to assist the second intake students, particularly in the use of the Macintosh computers. A unanswered question is whether the use of the DOS machines would have been as problematic for the second intake students if:

- the bulk of the first intake students had not been so over-whelming impressed by the apparent ease of use of the Macintosh computers in comparison to the networked DOS system, and if
- printer access had been better on the networked DOS system.

The Advisory Committee

The CAL/CML Project operated with an Advisory Committee until mid-1992. This Committee provided guidance on the general operation of the project, on hardware and software purchases, and, most particularly, on strategic planning. One member of the Committee, a CAL/CML specialist interviewed early in 1991, suggested that Projects are successful because of two factors—adequate funding and the full time support of a Project Manager. These factors were present, she said, in the Health Science project and made the work of the Advisory Committee easy.

> When you look at projects and you see why they're successful and why are things happening—you need two things. One, you need money, and if you're fortunate to have money, and a lot of money for the project, it's great to be able to get that sort of Government support… The second thing is to have a Project Manager, not just a collection of people who are trying to do things... as… part of their normal duties, sort of one day a week… Now, I know that the Project Manager was 40% [sic] time-wise but, really, that's a joke. You know, it was much more than that…

> Projects are successful if you can have a good Manager in there, you know, a good Project Coordinator in the same way, I suppose as the other Project that I was involved in—the [Project name]—that Project worked because we had a full-time Coordinator and the Coordinator made it work. So it's really a very, very good model to work on rather than having lots of people giving one day here and there and committee-wise—you know, if you've got someone who can get in there and get their hands dirty and oversee the whole thing—and then liaise back with an Advisory Committee, you know, it all works.
>
> And really, from an Advisory Committee point of view, there's sort of not a lot to be done if you get a good Project Manager, it just sort of all happens. So I suppose that was my impression Advisory Committee-wise. The decisions that were made were very sensible. They had to be made in certain time-frames—and things just went along smoothly. There were never any, sort of, ideological differences on the Advisory Committee… the people that were on them were sensible and knew their aims and off they went (Advisory Committee, 1991, taped interview, 10 January).

From her point of view the Advisory Committee's role was to act as a 'watch dog' on the project, but not to get involved in day-to-day decisions.

> Your Coordinator has to have the power to make decisions… All [of the] people on Advisory Committees are extremely busy and [their role is somewhat] token—[a] watch dog… not really, but just to keep it all clean and be accountable and… you have to be sensible because the day-to-day operating of a large project, you know, when you're in an advisory capacity, you can't—well, I don't think you can be involved in, sort of, the nitty-gritty, that just goes on.
>
> It has to go on—and you can't be involved in every decision that's made, you have to accept that someone has to be appointed, as a Project Manager, a Coordinator, and they have these skills, and they know exactly what's going on and you know, when you look at it globally and think yes, well that's a fair enough direction and I think that's all you can do… I think you have to have faith in your Coordinator and it seemed to work quite well (Advisory Committee, 1991, taped interview, 10 January).

The CAL community in Australia judges the success of a CAL project, she suggested, by the quantity and quality of the courseware produced, not by how well it supported the students and staff or how well it was managed. This is the standard by which the Health Science project would be judged.

> The thing that I perceive that needs development now is your software side of things… The infrastructure is there, people have been told about the project, considerable resources and time have been spent sort of setting up everything—setting up the

> hardware, setting up the development software. Now is the time to do… the real work in that… software should now be developed, like case study software, CML software… Now is the time to start production on teaching materials because that really, in essence, is the whole crux of the matter…
>
> The priority areas now [the project] should be… [not] getting it out to students and actually getting students using the stuff… but actually developing the software side of things… developing the CAL, CAL simulations, case studies, scheduling system, getting all that completed and, you know, getting/starting to build up a really good bank of stuff—because I think, in the long term, that's what people judge you by— …the software, you had to produce for the project (Advisory Committee, 1991, taped interview, 10 January).

When asked if that meant ignoring the support for staff and students in their daily work, she responded:

> Yes, I think that some people see the support for the students and the support for the Academic staff, like in their electronic mail, their word processing/students word processing, stuff like that, they see that as a given and not something special—that the School should have that and that has to be there whether you have the CAL/CML Project or not. But at the end of the day people judge CAL/CML Projects by what actual CAL software has come out, how it's been used, how you evaluated the use and whether it's actually working with the students, whether there's teaching materials that work with the students. That's how I think the CAL community in Australia judge us (Advisory Committee, 1991, taped interview, 10 January).

While specifically indicating that the Health Science project had not caused any problems, she indicated that the relative success of the Health Science project had influenced the CML Working Party to adopt a central model. Strong Faculty-based projects had too much divisive potential, she believed.

> I think it [the Health Science project] reinforced our idea that a Coordinator was a key person—and that that person was very, very important.
>
> I think it also reinforced, perhaps not all the committee, but a number of members in the working party—it possibly reinforced the need for a central model and, this is being really honest, and the need for a central model because if you have a number of projects that are School-based—it can be the case that, and I'm not saying this necessarily would have happened to the School of Health Science Project or whatever, but there is a danger that if you have a very strong School-based project that expertise would grow in that project and that project, or the people then building up that expertise, could have the potential to see themselves as being sort of the technical elite

> and sell off their services to the rest of the campus which, from an egalitarian point of view I don't think that's the right sort of thing to do…
>
> You need to build up expertise that is available to everybody rather than build up expertise in one area that others then have to buy—because I think in the broader range of an organisation—that's just not the way to go. It's not fair (Advisory Committee, 1991, taped interview, 10 January).

The campus-wide CML proposal was unsuccessful, probably because of the costs involved. We can only speculate what might have happened if that proposal had been developed to support individual Faculty efforts rather than being based on a more expensive central CML unit model. In the next section another academic suggests that the university was not ready for a centralised facility.

Faculty-Based versus Centralised Development

The Health Science CAL/CML project and the university's CML Working Party began their activities at approximately the same time in 1989. Health Science received funding from outside the university—what would have happened without the NPRF funding thus became a hypothetical question. The Report of the CML Working Party was accepted at all levels within the university, but was never implemented; officially at least, it was the victim of the devolved funding process.

The Health Science project was an instructional development activity within a single Faculty. Health Science, with the strong support of its Dean, made a commitment to a computerised approach, regardless of available funding, and set out to locate the funding to achieve the Faculty's goals. Health Science, a new Faculty, did not have a history of past failures, pre-existing policies, or personalities to overcome.

The CML Working Party was established by the Vice Chancellor just before his retirement to investigate ways to provide university-wide instructional support. The Vice Chancellor, with an existing budget that might be used if the costs were modest enough, appointed the Working Party from among those campus groups which had supported CAL and/or CML in the past. Several of the members of the Working Party had served on one or more similar groups within the past several years. While the Working Party likely had the support of the Vice Chancellor himself, its membership was almost totally drawn from junior staff who collectively lacked influence among the Deans and other decision makers during a the time of considerable change and turbulence.

One interviewee, a Head of Department with considerable involvement in the use of computers for education, believed that the university was not ready for a centralised facility and would not have supported *any* university wide project.

> I imagine they [Working Party members] regret, somewhat—those who know anything about it—[that] full support was not put behind the centralised [CML] project… for good reasons… The question is really whether centralisation would have worked.
>
> Certainly de-centralisation does work in the sense that it produces results. Whether centralisation would help produce the results which were hoped for by the team which made the proposal, that seems to me a moot point. Largely because with hindsight one can see that it’s rather unlikely that they would have got institution support if they really needed it.
>
> It’s a question of the state of the University right now. Maybe a couple of years down the track when we’ve grown up a little bit more it might be a case of it but right now I think… the outcome is a good one even though it was very disappointing to a lot of people who did a lot of hard work (Academic Administrator, 1992, taped interview, 4 February).

On the same issue, the Manager of the Computer Centre expressed his pleasure with what Health Science had accomplished, and sounded a warning about centralised CAL/CML development facilities.

> I think what's happening in Health Science is really quite outstanding for a School that one would, I guess, traditionally not regard as a computing school. Health Science has done wonders.
>
> They've pushed along in areas away from the traditional computing line and pushed into the sorts of things that I would like to see happening with computers.
>
> Computers are great for crunching numbers but there must be more in life than just crunching numbers and I think Health Science are helping to find those ways… What that needs is somebody to drive it; and I guess Health Science has been fortunate in that they've had a driving force over there that says ‘This is the way we're going to go’. That same sort of thing is much more difficult in some of the other Schools where there is no driving force…
>
> It's true of most systems… unless you have someone there who is willing to pick up the ball, run with it, drive it through all the hard bits, it's not going to happen. We find the same thing happening with Admin. Systems, in fact.
>
> Unless I say to someone, ‘Look I don't care what the user says, just get on with this system. Go over there and hound them until they get it in and running’, it doesn't happen because they will always find excuses and reasons for not doing it…

> I think that's where Health Science have been able to make the tremendous gains they have. Our problem in the future… is to identify those people in the other Schools who have the potential to be that driving force but may not necessarily be getting the support that they should be getting…
>
> I'm a bit wary about central powers. I think computing has gone through the stage of being a central power that could do everything. That style of computing is no longer here. That worked when we had huge computers that had to go into special rooms and… cost millions of dollars to… install and maintain.
>
> We've moved away from that; and there is always a risk if you have a central coordinator that central coordinator will gather round them a huge bureaucracy. They will start then dictating to the academics or the workers in the fields saying, 'Hey, No, you can't do it this way because *we* have decided that this is the way it's going to be'.
>
> I guess there needs to be some coordination to say that you can't just let it all go off and develop their own. Maybe you can't, maybe you can—just let them all go off and develop their own—they might come up with something that's really brilliant that nobody else had thought of.
>
> So there's two arguments. But essentially I would like to see individuals and individual Schools try and work out what they need to do in terms of their particular disciplines, and have them meet on a regular basis. Maybe we have a half day seminar, one day seminar every six months for these people to get together. In that sense you'd need a coordinator who says, 'OK, the six months are up, fellows, let's all get together, say what we've doing, talk about our problems, go back and do it'.
>
> But really, I don't think we should spend lot of university money on developing a centre for computer development… [or] CML development.
>
> The whole scene is too dynamic, it's changing too rapidly, the technology is coming on to us so quickly that I think individuals out there fighting their own way and doing their own particular thing may be the best way to go for a while (Computing Administrator, 1992, taped interview, 27 May).

Ownership and Maintenance of Computing Facilities

Historically computing facilities at UCQ were provided centrally through the university's Computer Centre. This led to the development of a moderately large administrative computer system to support financial, personnel, student, and library records. This system, euphemistically referred to as the 'mainframe' computer, was a linked collection of mini-computers and related terminals. While rudimentary electronic mail was possible from any of the computers in 1989, national and international links were just being established and internal data could not easily be transferred from one system to another. It was not possible for a lecturer, for example, to obtain an electronic copy of a class list using university facilities at that time.

Some Faculties were beginning to install their own dedicated facilities. Education, for example, had a dedicated student laboratory using Amiga computers; Business had provided their students with a IBM/MS-DOS-based facilities; and Humanities and Social Sciences (now the Faculty of Arts) was in the process of purchasing a small Macintosh-based laboratory for the Journalism students. The Department of Mathematics and Computing, by contrast, only provided two micro-computers for undergraduate student use outside of the central computer laboratories. The centrally provided student laboratories, containing either terminals for one of the mini-computers or semi-compatible IBM/MS-DOS machines, were also used by some staff to access their electronic mail and for other academic computing. [Priorities had changed by 1992 and the Department currently provides state-of-the-art facilities to all staff and postgraduate students, and will significantly extend undergraduate facilities when taking posession of a new building late in 1993. The Department has also supported facilities for students studying at a distance to access UCQ computers.]

As one of the Deans indicated, university policies—that all computer purchases had to be approved centrally and all non-standard hardware and software had to be supported by the purchaser—were breaking down. The problems however were at least partly structural—Rockhampton was a small service centre and lacked the facilities of a capital city.

> [Education had some difficulties with the Amiga purchase because if they] bought approved equipment it would be maintained by the University. If you bought non-approved equipment, in other words stuff off the [centrally approved] list, though it might [be more applicable to your needs] you were on your own for maintenance… And in fact, initially, that was the fate of the Amigas…
>
> Looking historically at the School of Education's involvement with any of [their] computers [variously Tandy, Apple I and II, and then the Amigas]… at one time or another, [Education] had somebody who would support them locally and then not had anybody local at a critical time when we needed the help—because the non-metropolitan centre [ie. Rockhampton] has had in the past, anyway, people coming and going as their businesses waxed and waned and you would risk always being caught with stuff you couldn't service. You couldn't even trouble-shoot because there was nothing technically wrong and it was your own inability, particularly if software or whatever had been adjusted by some of our self-taught experts that we were discussing before, and that person had gone…

> Typical of the problems we had through the '80's was—I'm just trying to remember whether it was [one named manufacturer] or if it was [another named manufacturer] with the copying machines or both of them. Certainly it was copying and printing equipment and my impression is that we had a… problem at one stage… The sales and service divisions were so separate that they would blame each other… for misrepresentation on the one hand, or incompetence on the other. And regard that as the end of the problem, for them.
>
> They simply weren't accountable for the other arm of the same firm… In one case I remember the printer, having bought it, on a guarantee of what it would do and what was included in the service contract, breached by the Service arm.
>
> And the University, and certainly the School, really not in any position to go to law, which was the only way we were going to get it fixed without paying more and more money…
>
> So, that's why Schools are a bit slow sometimes in going high-tech (Academic Administrator, 1992, taped interview, 18 March).

The Department of Mathematics and Computing provided introductory service-level computing subject to both on-campus Education students and Health Science students in the post-RN degree program taught at a distance. A similar subject was anticipated for the on-campus Health Science students. Students in the Education subject used that Faculty's Amiga computer laboratory. Health Science wanted their students to have exposure to a variety of hardware types but did not yet have their own student laboratory. Health Science therefore requested access to IBM/MS-DOS hardware for their students. Since this would overload the existing facilities, pressure was put on the central administration to provide an additional 24 hour access computer laboratory, to be temporarily located in the new Health Science building.

The provision of this new laboratory (as previously noted in Chapters 4 and 5) was delayed beyond the start of the first semester, requiring Health Science students to use non-standard computers in an existing student laboratory. Since this laboratory was located within the Library, access was limited to normal Library hours. Overloading also meant that students had to share computers and only the more aggressive students, generally male, obtained access during unscheduled times. As well, the lack of IBM/MS-DOS compatibility meant that data saved on the resulting non-standard diskettes could not be accessed in other campus computer facilities, including those in the Residence halls, and could not be accessed using most off-campus computers.

Health Science encouraged the early ordering of hardware for the laboratory, the university having intended to order the hardware only after the laboratory was fully furnished and wired, and borrowed several of the new computers for use of the Health Science students prior to the opening of the laboratory. As was noted in the interviews above, some students in Health Science did obtain access to computers in other Faculties, primarily through the friendship-based exchange of goods and services, but the situation was not generally acceptable.

The new IBM/MS-DOS based student laboratory was networked, requiring a network username (ID) and password access for the operation of the computers. Printing was, and even in 1993 continues to be, difficult across the student IBM/MS-DOS laboratory networks. Computing and similar students generally do not have problems with the laboratories; non-technical students find work in the laboratory to be difficult and the IBM/MS-DOS system confusing.

Earlier, Health Science had had difficulties getting the furnishings constructed for their own student laboratory—to save costs the computer work benches and laboratory wiring had not been included in the building contract—thus student access to the new Macintosh computers was similarly limited for the first few months. Soon however, the Macintosh laboratory was functional enough that up to sixteen individual students could use the laboratory for accessing the CAL courseware or for completing their assignments. The licensed software provided included an integrated application with word processing, database, spreadsheet and graphics functions (MicroSoft Works). The borrowed IBM/MS-DOS computers provided more limited access for assignments from the computer subject, most students electing to use the Macintosh computers for their written assignments for other classes, since the software tools provided for student use on the IBM/MS-DOS computers were very limited in their functionality.

The Macintosh computers were seen as being very easy to operate, and while the laboratory was only available during working hours, the lack of scheduled classes meant that Health Science students could obtain computer access with minimal hassle. Students and staff from other Faculties also tried to access the Health Science laboratory, sometimes by walking into the laboratory and refusing to leave when requested, at other times non-Health Science lecturers announced in their classes that the Health Science laboratory was available, on-demand, for use on an unscheduled basis.

The situation was complicated by the changing structure of the university. Some Faculties were assembling resources that other Faculties wanted to use. Since the new resources had been purchased using Faculty controlled funds the Faculties were often reluctant to make the resources widely available. However, as one administrator noted, Faculty resources still belonged to the university:

> Yes, well…formally they belong to the Institution, and so if there were a serious situation where they were needed by somebody else and spare capacity was available then, so to speak, the begging group would go up the hierarchal ladder, and I don't doubt that the hierarchy would decide in favour of the begging group… [However] if

> you're anything short of completely desperate… they belong to the people who bought them (Academic Administrator, 1992, taped interview, 4 February).

Previously almost all capital installations within the institution had been funded and maintained centrally. While the institution was gradually devolving the responsibility for financial matters to individual Faculties and Divisions, the process was not yet complete. Health Science, on the other hand, had obtained a grant to provide specific facilities for one group of students, and was expected to maintain the facilities from Faculty funds. Staffing for the laboratory was also being provided from Faculty funds, not from a central computing budget.

The dialogue below between the author and one of the Deans (AA, or Academic Administrator, below) illustrates some of the difficulties involved in deciding priorities for the use of capital intensive facilities. The final responsibility for the Faculty funded facilities remains, however, with the Faculty providing the facility.

> **Author**: Do you [as Dean] have an expectation that resources in any School, an identifiable resource such as a computer lab or a School or Departmental Library, or anything like that, is freely available to the remainder of Campus?
>
> **AA**: I don't exactly hold that view. I hold the view that if there's spare time available on the resource, that it should remain freely available. I can see a situation… where if a School has to provide the resources, then I would favour some restriction on use such that the intended group were favoured over others...
>
> **Author**: How do you define spare time? …
>
> [What if] I'm the lecturer for [a computing subject] and I suggest that for every hour that my students have in scheduled lab time they should have 3 hours of [laboratory time] available at their own discretion time to be able to do their assignments, because they aren't going to get everything done in the scheduled lab time…
>
> **AA**: I'd count that as being part of the load, I think… When we go to credit points that ought to be reflected in credit points for the subject and therefore becomes… just the same. We don't allow other people into our experimental labs…
>
> I don't know about here but in many Universities… much of the time you're talking about would actually have tutors and so on associated with it [the class] in the laboratory. In our case we have demonstrators there with the students for safety reasons—and to me that scheduled time, and that group of students, has absolute priority.

Author: Even if they aren't [scheduled] in at this hour of this day, it's available to them, therefore it's a scheduled time for them?

AA: Yes, that would be a difficult one to judge, and if you walked past every day and found that the lab was [some large]% under-utilised, or something like that, you'd start to wonder about your priorities—but I'd still probably want to get to a situation such that the intended group of students wasn't having to queue while some other part of the university used the facility.

Author: Okay! You said something about priorities, and setting priorities. If it's a School resource, who should be able to set the priorities, the School and, you know, however that comes out vis a vis the Dean, but the School or the rest of the institution, or the Administration…? Who should be able to set… the priorities on that resource?

AA: [Assuming] that everyone is reasonably realistic, I think the School. I could see situations where you might have a School that was being unduly over-protective towards their resources perhaps, or unrealistic, in which case you would have trouble, but I would have thought the School… was the unit that would have the major say. I don't see how anyone else… (Academic Administrator, 1992, taped interview, 12 February).

Given that policies were not well established at the administrative level, Health Science should probably not have been surprised when individual staff and students attempted to gain access to their 'dedicated' facilities. In retrospect it is obvious from project documentation that many individuals and groups did gain access to the Macintosh laboratory, the laser printers, and the flatbed scanner. The conflicts came not from those individuals and groups who asked permission. The conflicts came from the individuals—students and staff—who used the facilities without permission. In one case the explanation given was that the computers in the Macintosh laboratory were unused at a particular point in time (Health Science student use was normally unscheduled, therefore variable), therefore this individual felt it was his right to instruct his students to use the laboratory. His later comments in the tea room, reported back by colleagues, indicated that he believed computing students should have priority over nursing students in the use of university facilities.

Hopefully, in the near future the university will have policies, particularly for the funding of infrastructure, that clearly define the responsibilities of all levels of the institution. As the manager of the central computer system explains below when asked who owns equipment purchased through Faculty funds, UCQ needs funding policies that answer some of these questions. Without such generally accepted policies, the university will continue to have difficulties with providing and maintaining its facilities.

Well, I guess the simple answer to that is that the University owns it… but that sort of begs the question… It's difficult in that now we have this devolution of funds…

I guess [there should] be a percentage of our overall University budget… 'This is what we, as the University, say we should be spending, at least, for information technology on the campus'… It's up there for grabs. Everybody put in whatever bids they like to put in… say if the Library wants to upgrade their computing facilities they put in a bid for that. If Finance want to put in a new system they put in a bid, or if a School says 'Look, we've got this you-beaut project that should be going, it will benefit the University in these ways—', they should be able to put in their bid for the money.

If that happened I guess it would be easier to say, 'Ok, this is a University facility that has been provided as part of the University'. But that doesn't happen at the moment. The Schools are given some money and the Divisions are given some money, and when they buy computing gear the Schools, or the Divisions, usually have to forgo some other benefit they could have spent their money on so… I would see that the Schools would view the computing, or anything they spent their money on, as being theirs, theirs to control.

I have no difficulty with that view… Essentially, the Schools are there to look after the academic side of the University and if they see that they want to use the computer or any other piece of information, technology, hardware or software… I don't see that it's my position to say, 'No you can't do that'… they're academic questions and they're for the academics to handle.

The only things that we feel that we should butt in is when, if they're going on some direction and it is completely at odds to what… what we perceive the rest of the University community need… If they're going outside of that we'd want to know the reasons why… Again, if they could come up with reasonable answers to that on academic grounds, I would have no difficulty with that.

I guess, getting back to your question, is that probably the Schools own, if you like, the equipment. The stuff that sits in the network that I guess can be clearly defined as only being there to serve a network function… regardless of who bought it, probably should be under the control of the central authority just in terms of keeping the whole thing up and running. We [the central Computer Centre] probably should be getting funds to maintain that general overall network infrastructure, if you like, and then whatever people hang off it is their problem.

So, in some cases, I guess, because of the way money is dished out, and there is no central pool that we can draw from, some of that network equipment may in fact have

> been bought by the Schools because they happen to have that money spare or could see that they needed that…
>
> But I really don't think they should be lumbered with that expense for the rest of the life of that piece of equipment… I say that without referring to my budget, of course, but… if all things were equal, I believe that we should be paying for the upkeep of those sorts of things (Computing Administrator, 1992, taped interview, 27 May).

Other administrators would agree that policies and priorities are necessary, not just for computing at the central university level. The university cannot afford everything that some users want, according to one administrator (Academic Administrator, 1992, taped interview, 4 February) who is ‘very sceptical of the naive “rah-rah” of research’ and the accompanying demand for additional computer facilities. Will the potential benefits justify the cost, he asks.

> A question which I think we should start asking,, at least of young hopefuls, is ‘Do you really think your research, and I’m not talking of cost-benefit analysis, I’m just talking about your personal assessment, do you really think that your research which you are doing is worth 20,000 or 50,000 dollars a year [or some such figure]?’… I think if we examine that question as we should we might be a little less gung-ho about our demands on the system.
>
> Obviously, the University should provide us all basic facilities which we need to do our work…[but] you can’t give people everything they want, or everything they say they want, because some people’s demands are a bit naive (Academic Administrator, 1992, taped interview, 4 February).

Intellectual Property

The University's current official policy on intellectual property is dated 13 March, 1978 (Appendix I). Since that time the mission of the institution has changed significantly and some of the relevant laws, such as the Copyright Act, governing intellectual property rights for academic staff have also changed. While the University has been attempting to develop a new policy, there are a number of problem areas, as one Dean explains.

> The truth is the situation is certainly very murky and especially so in the area of external… teaching. That’s an area where we have a vast amount of material prepared, and it’s a very murky area because we have so much material now that’s been worked on by several people over the period from 1974 to the present… It's very difficult to work out in some cases whose property it is (Academic Administrator, 1992, taped interview, 12 February).

The difficulties of tracing the ownership of study materials, particularly when attempting to revise older materials, were compounded by the publication process within the institution. For many years, the intellectual content of the study materials was prepared by an academic working in a teaching unit (Department or Faculty), prepared for publication by the distance education service unit (Division of Distance and Continuing Education), and duplicated or printed by a separate production unit before being returned to the distance education unit for distribution. In addition, as most academic staff members saw their role prior to 1991 as primarily oriented towards teaching, and not towards research and publication, they had little personal experience with copyright and other intellectual property issues.

The situation was further compounded when lecturers delivering a subject were not the same individuals who prepared the notes, resulting in confusion about authorship of specific materials. According to the Dean, the process resulted in some lecturers having their names removed from materials that they had produced, leading to a situation

> that’s very, very murky… We have, in fact, had one case, [an] actual case, this year where a member of staff in this School decided to write to an original author who’s now left, and apologise for the fact that the notes are now appearing without his name on them (Academic Administrator, 1992, taped interview, 12 February).

The use of written materials in publications outside the institution also potentially had problems under the current policies according to the Dean.

> [There is] the fairly clear situation of someone writing a set of material and being told they can’t then use it in a book which they want to market in their own right. It’s that latter area, where someone has prepared external materials and then wanted to take it to a publisher that I don’t have any personal experience with but I can see great possibilities for problems… (Academic Administrator, 1992, taped interview, 12 February).

The Dean went on to suggest that where external study materials had clearly been prepared as part of the academic staff member's work responsibilities and ‘provided the material is only being used for on-going teaching duties here [within UCQ's Commonwealth funded courses]’, the university's responsibilities were probably limited to ensuring that the individual's input was recognised. However, he stated, the university might have an on-going financial responsibility where the materials were to be used for the university's financial gain.

> If we were going out to sell this material in a grand style to non-Commonwealth funded students, people who are not part of our normal life, I’d have to think about that… but I would have thought that if the person prepared the material as part of their normal job while they were paid with Commonwealth money, and we are still using the material essentially for that purpose, I wouldn’t have much sympathy with

> on-going royalties for external study material… On the other hand, if it's material being put into a book which is going to earn outside funding, will teach maybe on campus in Dubai or India or somewhere like that, I'd be tempted to think that yes, the person would deserve royalties because it's not the original intended purpose of the material (Academic Administrator, 1992, taped interview, 12 February).

This Dean (1992, taped interview, 12 February) argued that the university should be able to collect some return on its investment in physical plant and staff training, even if a staff member developed materials primarily outside of the regular university work hours, but understandably refused to consider UCQ or the Faculty being responsible for any losses from a commercial venture that might result from an attempt to market such materials.

The situation in Health Science was little different with regard to external study notes and related materials except that, the Faculty being newer, the authors of the study materials were still generally employed by the Faculty. The concerns with ownership, and the need to revise materials in the future, lead Health Science to include revision provisions in contractual agreements for the development of some study materials.

Health Science academic and support staff were more concerned with the Bursar's (1990, personal communication, 7 June) interpretation that, under UCQ Council policy (the 1978 document), all computer-based materials, courseware as well as software, were considered to be computer 'software' with potential commercial value, and the copyright for all such materials was to be vested solely in the University. The issue was complicated by an implied agreement to participate in the Faculty's computer activities that new staff made during their recruitment process. If that agreement was considered to be a binding contract, then even under the new Copyright Act the University might have a right to insist upon retaining the copyright for courseware. On the other hand, most of the staff affected were hired under the normal terms of an academic staff industrial Award, and courseware development is not a normal job responsibility under that Award.

A local hardware and software vendor (1992, taped interview, 22 February) suggested that the staff should not be concerned about who 'owns' the copyright, as copyright is only valuable if commercial exploitation of the intellectual property results in a profit.

> There's not a commercial value in reality. So the issue of copyright is really academic; it's only an issue given the person is successful in a commercial field, and we know how difficult that is.
>
> So, in the sheltered grounds of a University where it's not subject to commercial scrutiny… you can be very successful. To take the same idea outside the University and try and make it a general success requires a different skill. I think if a person was successful enough to do that, then good luck to them.

The author, however, was particularly concerned that since Health Science staff were not being otherwise compensated for the extra time being spent developing CAL materials, they should have their intellectual property rights recognised and retain control over the use and revision of courseware materials.

This is a descriptive study, not an evaluation…

The Health Science project was implemented at a time when the University and the Faculty were both undergoing massive changes. The changes involved physical facilities, institutional structures, formal policies and procedures, and general attitudes. UCQ policies on intellectual property rights have not changed quickly enough to benefit the project, however, it may have been that the concerns and operational constraints arising from the CAL/CML project raised issues that might otherwise still not have been initiated.

This is a descriptive study, not an evaluation. However, if it was an evaluation of the Faculty's computer activities, it would be important that even with the negative effects of delayed computer laboratory availability and both network and courseware problems, the students remained reasonably positive about the results.

Other individuals and groups within the University were more varied in their responses and at least one other Queensland nursing Faculty (the institution which purchased a copy of the Health Science developed CML software for clinical scheduling) might have been quite negative if they had been questioned. The Faculty's major computer hardware and software vendors, who were in regular contact with a variety of courseware development activities Australia-wide and overseas, were very supportive in their comments. The comments of one of local vendors appeared in an earlier chapter. A Regional Manager (1992, taped interview, 28 February) for the major hardware and software vendor visited the project on a number of occasions and was impressed by the practicality of the Health Science developments.

> The nice part about dealing with [the Dean] is that she had some very practical ideas as to how computers could be used in a teaching type of environment. She didn't think it was pie in the sky at all, she was trying to think about what was actually happening in the lecture theatres and trying to make a laboratory type of application. So that was the nice part about it…
>
> It appears to work, and when I say it appears to work, it's used… If something isn't used, then obviously there hasn't been much point in developing it. If the students are not passing, then obviously, what you have developed they may be using but it's not assisting them. I think you've been successful in both of those categories.
>
> There are a lot of people that would probably look at what you have done and say, 'Oh, you've used Hypercard, you've used monochrome machines, you're not using

> large screens, good grief… there's no interactive video… it's very, very basic.' But… what I have found by looking around is that a lot of people who think [that are] not thinking about the practical application, they're thinking about the technology.
>
> So, I'm not saying at all that these things shouldn't be used, what I'm saying is that they shouldn't be used for the sake of technology. They should be used because of the fact that they have a practical application in what you're teaching. And the other thing to keep in mind, of course, is that they're not cheap.
>
> So, I think if you can develop something that works, that's used… that is helping the students… and you've achieved that. I'm not saying that looking back now and being experts in retrospect, there aren't other methods like QuickTime [a technology recently introduced at the time of this interview for image compression for practical interactive video applications] that could have been used that would have enhanced what you've done, but that's not to say it can't be enhanced now. But I think what you've done, considering that it really started…three years ago and it was only probably about ten months after that that something was actually started. Now, looking back on that and what was happening at that point in time, I think it's pretty amazing.
>
> I'm not just saying that, I really believe that. That you've actually created something because people at that point in time tended to generally fall into two categories—either the people who thought that 'that was for the boffins, nothing was really going to happen with that', or the people that were just thinking technology and didn't actually produce anything…

Health Science, however, still has a significant task yet to accomplish if the concepts and courseware developed within the Faculty are to become fully integrated within the teaching curriculum at UCQ or elsewhere. As the Regional Manager (1992, taped interview, 28 February) noted, getting the materials produced by individual projects into wider circulation is still a major challenge.

> There was one other major problem that I could see and that was the fact that if I actually went around and spoke to people in institutions I would suddenly find, crawling out of the woodwork… quite a bit of stuff that had been developed. But nobody knew about it.
>
> There was no method whereby somebody was sitting down, developing a database or publishing a catalogue that talked about the products that had been developed… shrink wrapping them, you know, neatening up the manuals, etc. so that they could be sold.

Chapter 7

Why did it happen?

A Discussion of Selected Issues

> When you say that you agree with a thing in principle, you mean that you have not the slightest intention of carrying it out in practice (Prince Otto von Bismarck, 1815-1898).

Each participant in this study has a unique point of view, one that is situated in a particular time and place. It is quite possible that some of the participants would not agree with many of the comments from their colleagues, and might even repudiate the comments that they themselves made at an earlier time. At various times during this project the participants disputed many aspects of the project: its goals, its progress towards those goals, and its management. That is normal within academic life and within a dynamic interdisciplinary project.

Each participant in this study has been represented in the ‘stories’ in the preceding Chapters. Some of the participants have ‘spoken’ more directly than others, and some, either because they were more eloquent, or because they were more involved than the rest, have been quoted more frequently. The process of committing the stories to paper also provides a filtering that results in selected issues being highlighted, generally because the author believed that they best illustrated issues that needed to be addressed by the study.

Since the participants' stories do not provide a complete picture, someone has to stand back and fill in some of the blanks. That is the purpose of this chapter. While the examination draws on evidence from a variety of sources, the author's recollections and diary notes provide the basis for the discussion. In this way the author potentially receives the last word, the right of reply to criticisms, and the opportunity to rationalise solutions to problems that occurred.

There is a recognised danger (Morse 1991b, Hinds et al 1992) in a study of this type that the author's voice overshadows all others. The voices of most of the participants have been heard in this study, and many both saw and had the right to change their input, but the author, one participant among many, was the one who chose which voices have been heard. There is also a danger, since the author's actions and motivations are the ones best known and documented, that the author can assume too much of the credit for the success of the project. It is not without reason that Gillespie (1992b) included the non-participants getting the fame and honour in her ecology of a change exercise (reported in Chapter 2). Equally, and for the same reasons, there is a danger that the author can take too much of the blame for the failures of the project.

That, however, is not the purpose of this Chapter. The author's role in this Chapter is that of a reflective observer, albeit a situated observer with inside knowledge. The analysis focuses on several specific issues that shed light on this change project and its management.

Novices and the Fear of Computers

One of the initial concerns of project designers and staff was the possibility, perhaps even probability, that the nursing staff and students would react negatively towards computers because they either feared or did not understand computer technology.

In one sense this concern was unfounded. Many of the staff became very enthusiastic users of computers and the related technology. Their enthusiasm, and their insistence that student assignments must be presented as computer output (primarily word processing), helped overcome many of the students' fears as well.

In another sense, the concerns were well founded. As has been documented elsewhere in this study, the installation of staff and student facilities did not occur smoothly. Hardware often failed to arrive as scheduled, or if it arrived, had to wait upon over-extended Computer Centre technicians for installation. Software ‘fixes’ sometimes added more problems than did the bugs they were supposed to fix.

Because the computer was viewed as an essential tool, and was expected to function *exactly* as promised, students and staff alike were frustrated when the tool did not work properly or responded too slowly.

Some users failed to understand that many of the computer problems were not only universal, they were beyond the control of the computer staff to resolve. These students and staff responded as if they felt that the computers, or more often, the computer staff, were deliberately sabotaging their work.

Problems installing the computer network(s), for example, resulted in a significant loss of time and energy for many users. Those users who were not enthusiastic in their support for computerisation sometimes used the loss of services as an opportunity to cease using the system, particularly the electronic mail. Others, while not engaging in active sabotage, may have deliberately ignored basic preventative procedures. One or two individuals, for example, always seemed to have forgotten to save critical materials, or to have ‘wiped’ a disk, immediately prior to a critical assignment being due (Lab Supervisor 1990, personal communication).

Unfortunately, the repeated problems experienced by some of the staff as they struggled with understanding the computer system may have been misunderstood by their more computer literate colleagues. To the extent that some of the problems represented a genuine plea for a better explanation, and to the extent that the computer staff were overwhelmed by their responsibility for maintaining services, the plight of these novice users may have been ignored.

As the staff grew larger it became progressively more difficult to hold staff training sessions and to ensure that every staff member with a problem received prompt and appropriate assistance. In March 1990 it was possible for the author to meet with the three Health Science staff members most involved in the CAL/CML project and arrange a weekly schedule which alternated between information and training sessions. When the new staff arrived early in 1991 it was almost impossible to find times that were convenient for most staff and the priorities of teaching sometimes led to cancelled training sessions. When the new staff arrived in 1992, the responsibility for staff training had been devolved to the CAL/CML Academic Coordinator and, partly at the request of new staff who wanted to get their classes in order before embarking on CAL/CML activities, orientation sessions were postponed. The result was that organised staff training did not occur in 1992.

The problem of training new users has been recognised in other parts of the university as well. The UCQ Division of Information Technology (Computer Centre) began upgrading their User Services support in 1992 to include both an on-line (electronic mail) and telephone 'Help Desk' service.

> It's our responsibility in Computing Services to do the training for all those things associated with computing or information technology—and in information technology I'm including such things as the fancy phones that people have got who, you know, they just pick them up to make a simple call because that's all they've been taught how to do… there's lots of other things that can be done but the training hasn't been done.
>
> One of the problems we have, and going back to this question of policy and funding—I guess is when we were funded in the old CAE terms … because it was essentially a teaching organisation… the teaching side of computing was fairly easy. We would say, 'Okay we need this many labs, and we need a… central computer to handle all that.'
>
> End of support for academic computing. We'll have a couple of programmers who are there to say, 'Look, if you want to come over we'll teach you how to use this particular bit of software on this big computer, you bring all your stuff over to us and we'll teach you how to do it'.

> The rest of the money was essentially spent on Admin Computing and that happened I guess because [Admin] Computing is a nice commercial installation where you [can] always predict what's going to happen. You know that you have so many people on the staff, therefore you have to have a payroll of… size. You know when that payroll's going to be run so it's very easy to predict how much computing power you'll need; and that goes the same for Student Records. You know how many students. You know when you've got to make the major runs. You can schedule everything; so you can build up a nice simple commercial installation.
>
> Once you've done all that, you then start putting money in to programming [staff] to support this commercial installation… and that's sort of where we were a few years ago. We've tried to get away from that, and I guess we've gone to the other side of things now where we only have four people in Admin Computing. The bulk of our staff—there's about seven in Networks and supporting the academic side of Computing.
>
> I've also created a User Services Section… There's about three people in it… but it's their job to do this training… They've only been going for six to eight months and what they've been doing is trying to develop some training courses, if you like, for the students and for academics… [and] the staff in general. There are a few things that are being to taught to the students as part of their [academic subjects]… that really… should be taught by a central resource, and not be part of an academic course at all.
>
> I don't see that it makes any sense to spend good academic time teaching somebody how to run a word processor with the number of computers that are in the High Schools. Most of the students pick up a lot of those things but you'll always have those High Schools that are under-funded or don't delve into computing where you'll have students coming here who don't know how to use a word-processor…
>
> I know in a few of the American Universities—lots of the American Universities and certainly in some of the Canadian ones… the computing centre or computing services run non-accredited courses to teach students how to use a word processor, how to use a spreadsheet and how to run a simple database. And they're the sorts of things we would like to do here. If the School wants to go ahead and teach them more advanced work, then that's fine but the essentials—of just getting on there and being able to type up an assignment—is a skill that we should teaching, we should be making available to the students… (Computing Administrator, 1992, taped interview, 27 May).

The Department of Mathematics and Computing, unable to wait for these services to be provided centrally, has also expanded its support services to novice users through the provision of weekly hands-on tutorial assistance in one of the IBM/MS-DOS labs, videotaped tutorials and demonstrations of basic procedures, and a telephone 'Hot Line' service for first year students from all Faculties. The result is, that as with Health Science, the Department is funding services that the Computer Centre Manager agrees should be provided centrally.

> In terms of who pays for this? Who pays for training of staff? Philosophically we believe that we should be doing that as part of the service that we offer. And we should only charge for material… somebody's got to pay for that and I guess the easiest and best way to do that is to have the user pay. But in terms of the actual teaching and the time—We believe we should be offering that as a service, unlike some of the Schools and Divisions who believe it is a nice way to make money… (Computer Administrator, 1992, taped interview, 27 May).

The Network and Electronic Mail

The computers within Health Science have been linked together in a network for sharing files and other resources since the acquisition of the first Macintosh computer. The original network implementation relied solely on the built-in LocalTalk facilities of the Macintosh.

The staff portion of the network was quickly upgraded to use a central file server and related software for communicating beyond the Faculty, accessing licensed software, and sharing resources (primarily printers). It has since been upgraded several times and currently uses both AppleTalk and Ethernet connections to a Faculty-owned central file server.

The nursing student lab has used both a broadcast-type file server (designed to quickly broadcast copies of the same software to every connected computer) and AppleTalk-based connections to a Faculty-owned file server. Future expansion, and software maintenance, is possible through the laboratory network connection to the main Health Science file server.

Electronic mail (email), the computer application which allows staff to exchange messages electronically, was one of the first applications implemented on the staff portion of the Health Science network. Staff use the system to the extent that they identified electronic mail as one of their computer primary applications—in the 1992 interviews most staff mentioned word processing and electronic mail as their first two computer applications. Students also noted that Health Science staff used the electronic mail system, sometimes in preference to other forms of communication.

> We could easily notify all the lecturers of on coming events, whether it was a BBQ on the Friday, whether it was the Ball, or whether it was something else that we wanted all the lecturers to attend.—it was so simple to put it up on email (Health Science student, 1993, taped interview, 10 February).

> It seemed to me that they would read email first, before they would read big signs right in front of them that would nearly trip them over… We did have better

> attendance when we put things on email. Everybody read them on email, but not everybody read them on noticeboards (Health Science student 1993, taped interview, 10 February).

The Dean, an early and constant user of electronic mail, provided much of the incentive for establishing a workable system within the Faculty, however, even she was amazed at the degree of acceptance of electronic mail by the staff:

> I'm just utterly amazed that people have taken to things like the Email system as well as they have, because I thought there might be a lot more resistance… but I haven't really heard [much] opposition (Dean, 1992, taped interview, 7 February).

The electronic mail implementation at UCQ uses an internationally agreed protocol for addressing, automatic routing to send mail to its destination without operator intervention, and a 'store and forward' concept to overcome time constraints. The sender's message is forwarded automatically and stored in the recipient's host system until retrieved. The message system within Health Science is linked to the main UCQ computer. That system is linked to the Australian Academic and Research Network (AARNet), with the result that messages can be easily exchanged worldwide.

The use of electronic mail was not without its complications. Successful electronic mail operation requires the network to function reliably and to respond in a specified period of time. As one academic staff member notes, the network quickly becomes a required part of the office and work suffers when the network goes down.

> [I cope] by screaming and shouting a lot… like everybody else, [I] go outside for a coffee… it's amazing when it is down, and you're here, it's like you can't figure out what you should do because you're so used to it being on and you think, 'Oh well, I'll do this', and then you think, 'No, I can't because it's on the computer'… so, yes, it's become an extension of what you do (Academic, 1992, taped interview, 26 February).

The successive upgrading of the network system is another testimony to the inadequacies of the network at various periods of time. At one point, the academic staff even allocated $14,000 of money that could have been used for staff travel and other benefits to the network upgrade.

While it has always been a goal of the Faculty to provide nursing students with electronic mail access, hardware, software and staffing limitations have delayed this implementation. Students in Faculties with business, computing, or engineering subjects have electronic mail access through their use of the general purpose computer laboratories, although many would never check their mail.

The first Vice-Chancellor (previously the Director) used electronic mail for administrative communications and promoted its use across the campus. However, electronic mail does not have universal acceptance across the campus. Some senior administrators use the system, others request their secretaries to read the mail on a regular basis and prepare paper copies. Most academic service units respond to electronic mail but prefer other forms of communication. Many support units (Works and Services, Educational Media, et cetera) do not have electronic mail connections.

While all UCQ academics have access to electronic mail through the general purpose computer labs and dedicated Faculty or Departmental laboratories, some academics do not have access to electronic mail within their work area. Academic staff in Health Science, Applied Science, and Engineering generally have desktop access to electronic mail. Even within the Department of Mathematics and Computing, however, less than half of the staff check their mail more than once per week, even though their students are encouraged to communicate using the system.

The Health Science local area network is also used to control access to licensed software. Most staff and students use an integrated software package, currently Microsoft Works, for their word processing, spreadsheet and database work. Network licenses for this and other software are significantly less expensive, and easier to maintain, than individual packages for every user. Similarly, a relatively small number of printers, connected to the network, can provide for the needs of a large number of users.

Staff and student generally operate on different segments of the network, but even then the network delivery of computing resources means that the both are dependent upon the network for almost all of their computer activities.

Maintaining computer services to staff, while always a priority with the support staff, has not always been successful. By the end of May, 1990, for example, Health Science had moved into its new building and been connected to an internal Local Area Network (LAN) with connections to the university's central computers. While attempts had been made to lessen the disruption to staff during the move, delays in installing the LAN cabling had resulted in staff reverting to single drive computer operation for several weeks. New LAN cable had to be ordered and installed as it was discovered that the cabling pre-installed during construction had been damaged beyond use or destroyed, some of it buried in one of the few poured concrete walls.

> The Project's highest priority was the moving of the computer equipment and all computing equipment was moved by the project team itself. Academic staff who were to have computers on their desktops were able to pack up their materials and move directly onto their new computers as we installed these machines from our lab stock, packing up their old machines for installation into the lab at a later date. Three other machines were also made available to staff in the upstairs 'part-timer's office' so that

> no staff would be disadvantaged. Unfortunately, as the network connection was delayed, these machines had only a single floppy drive… lots of disk changes for their use [ellipses in original] (1990, CAL/CML Project Progress Report to VC's Advisory Committee, 25 May).

The Timing of Change

Managing change requires managing the timing of the changes. When this did not happen, either because of lack of attention to detail within the project, or as a result of external forces, the project suffered. Several examples serve to illustrate the scope of the problem.

The Dean has always been a very strong supporter of the use of computers within Health Science and serves as a positive role model for their use. The timing was deliberate, but it was particularly unfortunate that the change in the Dean's office from an IBM/MS-DOS to a Macintosh platform coincided with the mid-1990 move from temporary quarters to the new Health Science building. As the author's progress report for May 1990 reported:

> In retrospect the timing was probably wrong, particularly as it became necessary for the two individuals [Dean and Administrative Assistant] to deal with both the change and the non-existent or limited network system for the first several weeks after the move. I would estimate that the CAL team has provided roughly 40 hours of support in this area alone since the move [approximately one month] (Zelmer, 1990, CAL/CML Progress Report, 9 May).

Health Science had moved into the building before construction was fully completed. In the May progress report the author noted that university maintenance staff, while inspecting the new building, had repeatedly, and without advance warning, cycled power on and off, with the result that computing services were lost.

> We are still not sure whether there has been some equipment damage, however it appears that network integrity is lost in such a situation. (Zelmer, 1990, CAL/CML Progress Report, 9 May)

The university loses electrical power service severely enough to result in the loss of network services a minimum of three to four times per year. As a result of these experiences Health Science eventually purchased the university's first uninterruptible power supply for its local area network server. After this purchase Health Science has consistently been the first building to have its network services restored following such an outage. Power failures still disrupt the Health Science network, typically resulting in the loss of unsaved work on individual machines, but the integrity of the network is normally maintained.

The slow delivery, or non-delivery, of ordered hardware and software was another perennial problem. In the early months of the project orders were frequently delayed within the university itself. The 'proper' procedure for ordering computer equipment included gaining the approval of a standing Computer Advisory Committee at its monthly meeting. This procedure was modified to allow the Director of the Computer Centre to approve purchases, but delays to explain the purpose of even routine purchases led the Faculty to gain approval to bypass the system for its Macintosh purchases. With the more recent devolution of spending authority within the whole university few purchases are now required to be approved by the Director.

Most computer vendors in Australia seem to be small and under-financed in comparison to their North American counterparts with which the author was most familiar prior to the project. This often resulted in the need to send payment in advance of delivery for both hardware and software items. Needless to say, the local Apple vendor had a number of difficulties with third party vendors who failed to make delivery after receiving the advance payment. It would have been easy to criticise the local vendor for the problems, and undoubtedly sometimes it was his fault, or at least the fault of his record keeping system or cash flow difficulties, but more often the problems were beyond his control and ate into his expected profits.

Deciding when to lead the edge of technological development is another problem. When Apple increased the capacity of its 3.5" floppy disk drives in 1990 it became easier for a user to operate a stand-alone, single disk drive, computer. Stand-alone single low-capacity disk drive computers were the norm in Health Science. Since the need for economy, the ability to easily recover from power failures, or even the desire to take the machine home, required single disk operation, upgrading from machines to high capacity floppy drives was easy to justify.

On another occasion, Health Science ordered a batch of external floppy disk drives with the new 'superdrive' configuration from a third party (non-Apple) source. Fortunately the drives were ordered through the local Apple vendor as the drives took almost a year to arrive, and were then unsatisfactory—the drives did not work properly—and had to be returned. In retrospect, the decision to purchase these drives was made before the market could deliver a reliable product, and while this was probably the worst order in terms of delays and cancellation, it was not uncommon for orders to be delivered with substitutions and/or some items cancelled outright as technology changed or 'vapourware' (products announced and advertised but not delivered by the manufacturers) failed to materialise.

The cash flow management system within the university also caused similar problems. When the new Health Science building was built, cost increases and an attempt to maximise the capital investment resulted in a number of items being removed from the construction contract for completion by the university's own Works and Services staff. The subsequent bankruptcy of the builder added a number of other items to the Works and Services list, a list over which Health Science had no control. Delays, and the consequent frustrations were inevitable. At least one easily predicted computer theft was another result:

> The university has not been able to build the furniture for the CAL labs [neither the dedicated Health Science lab nor the centrally controlled IBM/MS-DOS lab in the 24 hour access room in the Health Science building] or the CAL production offices… It is therefore impossible to lock down any of the computers and we are only able to allow students access to computers under close supervision.
>
> This situation is compounded by the temporary keying situation and the poor fit of many of the doors. The lab does now have a deadbolt, however the doors to each area have individual keys and some of the hall doors are particularly hard to lock (Zelmer, 1990, CAL/CML Progress Report, 9 May).

A number of power cords and other miscellaneous items, and one of the Macintosh computers, disappeared shortly after the official opening of the new building.

Instructional Development

Hypercard, a user-friendly hypertext-oriented product distributed free with all Macintosh computers, was used to develop most of the Health Science courseware. The initial Consultant's Report (Zelmer, 1989) had reviewed sixteen different CAL/CML authoring or programming tools, but recommended that Health Science delay a decision on the choice of authoring software.

In 1989 both the commercial authoring tools and the development platforms were in a state of flux. Authorware, for example, promised a very powerful programming interface, but was expensive and had significant distribution costs. These costs were later reduced with the introduction of an educational site license policy. TenCore, another strong contender, had two programmer's modules (separate CML and CAL modules) but was just introducing a module aimed at non-programmers.

The most promising CML system ran on a VAX computer. As the CML Working Party report indicated, that was not an option for UCQ.

> Even with the current VAX upgrade program it is the perception of the Working Party that there would not be enough mainframe computer capability available for CML use. This usage aspect was not considered in the projected needs analysis for the VAX upgrade. Consequently any *immediate* CML use would need to be microcomputer based [Emphasis in original] (CML Working Party, 1989, 15).

The capabilities of the microcomputer based systems were also in a state of flux. The Macintosh platform promised a graphical interface and a commitment to the easy inclusion of audio, video, animation and other graphical images, particularly through Apple's support for multimedia and the required hardware. The IBM/MS-DOS platform, pre-Windows still in 1989, did not appear to be as advanced graphically.

With the advantage of hindsight, the decision to use the Macintosh platform, but to delay committing to any specific authoring platform, seems correct. It did however, have another implication. The use of HyperCard to develop both an authoring tool and courseware allowed neo-literate academic staff to develop their own tools with limited support from technical staff and computing students. The author emphasised this in a letter to Apple Computer Australia, the local vendor, and other supporters late in 1991.

> As a 'die-hard' CP/M user and reluctant convert to DOS computers I discounted by at least 50% of anything that you […] said about the capabilities of Apple Macintosh computers. I had used Macintosh computers and knew their basic capabilities, but I wasn't a convert. I needed to see proof, in the form of existing educational materials, that would demonstrate the realistic capabilities of the Macintosh and provide a guidepost to the future.
>
> You provided that proof and demonstrated how we could expect to make our materials work on Macintosh computers. 'Rufus' using Oyster, the 'Optical Work Bench', and other programs did their bit, however I want to particularly acknowledge the importance of the demonstration of UQ's Dental Education software. As much as anything, it was [the Dentistry lecturer]'s home brewed HyperCard software that convinced us.
>
> We have had our difficulties with the Macintosh system, however we would have had difficulties with any system. In assessing the past 30 months, I am amazed at what we have accomplished. It isn't so much the 'product', the software and courseware that we've developed, it's the way that academics and general staff who never used computers before now use electronic mail for communications, a word processor for preparing course notes and papers, and a spreadsheet for storing their class grades. The system works, and it works for them! (Zelmer, 1991, correspondence, undated, c. November).

Several academic staff have suggested that the project would have been more productive using a classical instructional design methodology and a team of professional designers and computer programmers. This was the approach recommended by the CML Working Party for a coordinated campus approach to Computer Managed Learning.

> It is proposed that there be the establishment of a CAMEL (Computer Aided, Managed and Enhanced Learning) unit to act as a focus for, and a coordinator of, CML, CAL and CEL development and usage. This coordinating role is vital to guard against activities becoming fragmented…
>
> It is preferable that the unit be an autonomous office and not be attached to a single School or department… (CML Working Party 1989, 24-25)

Individuals within Health Science indicated that the they felt that the small and relatively informal CAL/CML project staff was isolated from the regular functioning of the Faculty. This perceived isolation, and the resultant lack of 'control' over the project staff would likely have been even worse with a 'real' instructional development team. The most difficult problems experienced by the project, in the author's opinion, related to differences in role expectations and difficulties in communication between academic and academic, and between academic and support staff/project students.

Similar problems, confirming the author's perception, exist between the Faculties and the Division of Distance and Continuing Education (DDCE) in the preparation of conventional distance education materials. DDCE operates as an independent academic unit with minimal policy input from the Faculties, although there are project development officers with joint appointments in specific Faculties and Departments.

In 1990 DDCE attempted to introduce a single CAL/CML instructional design approach for the campus to support their DEC (Distance Education Centre) status as a provider of contract development services. Noting that

> There is at present a window of opportunity for UCCQ to become a leader and to be at the forefront of CAL/CML courseware development for distance education and industry,

the Director stated:

> CAL/CML development needs to be systematic in order to ensure standardisation, consistency, quality control and acceptability. It is important for CAL/CML to be a co-operative venture, not only within UCCQ, but with other significant developments directly involving UCCQ staff. UCCQ must be able to present itself as a united team to prospective clients. Integral to this approach is instructional design (DDCE, 1990, memorandum to the Vice-Chancellor, 12 March).

This design approach, and the training that was provided in support of the approach, was based on a single, very expensive, development environment—Authorware Professional on high-end Macintosh computers. This approach, essential for fast, professional courseware development for external contracts, ignored the low-cost, academic led, development model in Health Science.

The approach was also too expensive for Mathematics and Computing, one of the strongest supporters of a centralised approach. More importantly, the Macintosh platform was inappropriate for their IBM/MS-DOS delivery requirements. Students studying both at a distance, and in on-campus laboratories, generally used IBM/MS-DOS type computers.

The tools are now available to make cross-platform courseware development more feasible, and the Windows environment has now brought improved development capabilities to the IBM/MS-DOS platform.

The alternative, an iterative development by academic staff themselves, had been demonstrated at the School of Dentistry, University of Queensland, in November 1989. The Dentistry courseware, developed primarily by a single academic staff member, had many of the attributes desired by Health Science, including low-cost development, was designed specifically for the curriculum, and utilised a combination of text, graphics, and animation. The success of this Macintosh based development system contributed directly to the Health Science decision to opt for a low-key development process and an iterative instructional design philosophy.

A low budget approach did have limitations. All of the staff involved had competing priorities and Health Science never developed the type of procedures that were common in dedicated CAL production units for ensuring quality assurance and standards. The project did develop a style guide (Appendix J) to be used when producing courseware, but the guide did not lead to the quality assurance standards requested by at least one staff member as early as April, 1990 (Academic, 1990, memorandum following a workshop sponsored by DDCE, 10 April).

By 1990 it was recognised that many Health Science staff would prefer concentrated periods of time exclusively for courseware development. Without the pressure of classes and other duties they would find it much easier to develop quality courseware. The first staff member given such an opportunity had no previous experience with CAL development but still produced two units and gained an understanding of the limitations of the CAL format and the need to understand the curriculum when developing courseware.

> I'm very aware of the fact that the questions that we can ask in such a package does nothing to even scratch the surface of subjects… although principles might prevail across. I feel that by giving a scenario related to a particular illness or whatever… that you're only just touching a small part of it, although it may be a most important part…
>
> All patients are different, they are all individuals. The problem is you can only take one instance and that instance might never be repeated. I'm sure that in the course development we might get around some of these problems (Academic, 1990, taped interview, 25 August).

The integrated use of the CAL materials is an issue that has still not been resolved by the Faculty. The initial project developments proposed the use of CAL materials to supplement classroom lectures and other conventional teaching materials. There were two reasons for this direction. First, tutorial sessions, typically small groups of students with a lecturer reviewing lecture materials, are very expensive. Converting even half of the tutorial sessions into self-directed CAL tutorials would relieve staff time for research and other responsibilities. Second, it was recognised that developing instructional CAL materials could easily require several hundred hours of a lecturer's time for a simple unit. Simulations, animated and multimedia materials, however desirable, would require even more time. The time requirements on lecturing staff to develop tutorial review materials would be significantly less.

This approach required that the computerised materials be integrated fully into the curriculum, just as textbooks, laboratory exercises, and clinical practice were integrated. It also required the academic staff to be willing to accept that students, at least some of the time, could learn without the presence of an academic.

CAL_Maker was developed as a tool to enable staff to quickly produce such tutorial materials. The tool does work and students have generally accepted the materials, albeit with some complaints about the lack of variety and the need to schedule themselves into the lab on their own time.

Unfortunately, the 'glitter' and 'hype' connected with more sophisticated authoring systems and full instruction materials led some staff, as was recorded in Chapter 5, to feel that they were being unreasonably restricted by the Faculty's cautious approach. In addition, a number of staff did not structure their tutorial time to permit self-directed student learning activities. This was particularly evident following the restructuring of the nursing course from diploma to degree as whole subjects, including the first year introduction to computing, were dropped, and tutorial time was used for direct instruction by the lecturers.

The academic, quoted in Chapter 5, who wanted to develop new software, rather than spending time preparing courseware, did manage to produce some more sophisticated materials. With the assistance of the equivalent of a full-time assistant (a computing Project student and significant support from the full-time staff) basic instructional materials were developed for a pharmacology unit and a sophisticated clinical practice simulation for developing nursing care plans was developed in prototype form. These materials were creative and more exciting for the students than the post-lecture tutorials developed with CAL_Maker, but they reinforced the original development time assumptions. Developing materials to 'teach' via the computer takes exponentially more time than developing tutorial materials for review of a topic taught by more conventional means.

Utilising Existing Resource Materials

Health Science evaluated a variety of existing CAL/CML materials on an ongoing basis. North American publishers provide the largest number of CAL/CML titles. Unfortunately, most North American materials are based on U.S. usage, including temperatures, weights and other measures in the Imperial system. European and British materials tended in earlier years to require incompatible computer systems, and Australian produced materials were almost non-existent, or were more applicable to medical rather than nursing education. Software distribution is generally subordinate to a textbook publisher's main business, resulting in poor service and limited understanding of site licensing needs.

The Dean and the CAL/CML Project Manager made several unsuccessful attempts from 1988 to 1990 to contract with North American publishers to obtain Australianised materials and site licenses. In a typical letter to a publisher (1989, correspondence, 12 April), the Dean expressed frustration with the lack of site licensing provisions, 'Frankly, I find it difficult to believe that there is no provision for such a purchase agreement'. Even when the Australian distributor referred the matter to the U.S. company the issue remained unresolved. A similar problem occurred with regard to contracting for a metric version, 'I am not talking about altering the program in any way, simply substituting metric values for imperial', and obtaining supplementary materials, other than a textbook, for use with the software.

Project Management

If success of the CAL/CML activities within Health Science is defined by the continuation of funding and staffing through Health Science, then the CAL/CML activities would have to be judged a success.

- The NPRF funding provided $150,000 per year for two years. Assuming that the institution (Health Science and UCQ) matched those funds on a 2 for 3 basis, a not unreasonable assumption I believe, then the annual funding in 1990 and 1991 was approximately $250,000 on CAL and computer-related activities.
- In 1992, the staff of the School of Health Science funded 2.67 positions directly related to CAL and computer-related activities as well as providing support services, and assisting individual staff and student project activities. One academic staff member, for example, spent approximately 1 day per week for most of the year preparing user documentation for the clinical placement software.
- In addition, the School allocated an operating budget of almost $200,000 in 1992 (Appendix F), and the academic staff voted to spend an additional $14,000 for computer network upgrading from Continuing Education funds that could have been spent on travel, professional development, research resources, etc.

The costs for establishing a traditional CAL/CML development unit would have been significantly greater. The Faculty itself had anticipated hiring a larger CAL/CML support team, an objective that was impossible under the reduced NPRF funding received, as the Dean explains in a letter cutting back the project management from half of a mid-level academic manager to one-third of a junior academic position.

> We did not receive the total amount requested for this project and have cut back the proposed full-time joint appointment of a senior lecturer between M&C [Mathematics and Computing] and SHS to this 1/3 appointment of a Lecturer (Dean, Health Science, 1990. letter to Dean, School of Science, 5 February).

Funding is not the only resource that determines the success or failure of a project. The support services within UCQ were over-committed and were not accustomed to working to deadlines. The following extracts from the author's diary of November 15, 1990, provide examples of seemingly minor, but irritating, service failures that can escalate into major management issues if left unresolved.

> **An update and two or three cautionary tales.**
>
> Thursday, not a really good day as Jasper [the central computer being used as a file server by Health Science] has continuing problems. We experienced two power problems in the last several weeks. The first wiped out Jasper for several days, the second finished the job by crashing one of the disk drives ([The network manager] says that it looks as if one whole cylinder has gone).
>
> The last backup was on Saturday, thus anything done this week may be lost. Unfortunately it looks as if [the Associate Dean] had some important work that will be lost.…
>
> There aren't any network facilities in most of the Science offices yet. One or two people have Ethernet connections, however the remainder of the building is still without any of the LAN or even serial connections. They were to have been available as we moved into the building, and the techs actually had the wiring mostly done, however the bridge/terminators/etc. had to be relocated. The story is that one of the Science staff had agreed to the junction box being installed in his office, then changed his mind when he saw the actual size of the box. In any event, the box is now being hooked up out in the hall and we should have connections to the VAX, etc., within the next week or two, or three, or...
>
> **One cautionary tale... The Stamp Pads**
>
> Some months back the CAL/CML Project staff decided that we needed several rubber stamps for marking books before loan, etc. One of the needs was for an updated AARNet address for the brochure, the address having changed since the brochure was duplicated. Several weeks back I got the stamps made and gave to [the Health Science Lab Supervisor] for follow-up.
>
> We haven't yet marked journals, books, draft articles, brochures, etc., with any of the relevant stamps as 'Stores don't have any inkpads', and the School inkpad doesn't

make a dark enough impression (not recently re-inked). It appears that we are now waiting for Stores to get a bottle of ink for re-inking pads. ‘For the lack of a nail the kingdom was lost!’

A second cautionary tale... Security Cables

There has apparently been thefts of computer gear to the value of about $22,000 from the Southern Annex over the last couple of weeks. None of their equipment was fastened down and access to the building is fairly easy.

Access to SHS isn’t necessarily very easy, although the building is often open out-of-hours. We’ve ordered the materials to fasten down the equipment months back... [ellipses in original] through the Computer Centre. We are still being advised that [the local supplier—a boat repair shop] is unable to supply the steel cable.

When [one of the secretarial staff] moved upstairs I supplied cables to lock down her equipment from my personal stock. The Computer Centre at least supplied a lock if I remember right.

I don’t know if security gear is simply not part of the normal mode of operation, in the same way as everyone ignores power filtering, etc., or whether the companies are so busy filling orders that they can’t/won’t/don’t stock the materials. We also had problems getting security plates to affix to the machines themselves. After going through several suppliers for a unit that was designed for Macs we ultimately ordered a self-adhesive plate from [a named supplier]. We would likely have had the necessity of ordering some self-adhesive units [in any event], however we hadn’t intended to have a big blob on the side of all the machines (the special Mac plates fit in a special slot in the machine’s case).

A third cautionary tale... The Mobile Cart

The wood and steel cart for the standup work station in the hallway outside the lab still hasn’t arrived. Next week maybe, otherwise...

The cart is being paid for through the CAL/CML Project, thus under normal circumstances we shouldn’t necessarily have to wait for Works and Services to fit it into their schedule. They are extremely busy with the fitting of new buildings... [ellipses in original] they hadn’t finished with work on Health Science when the new Science building became ready for occupancy. I understand that there are whiteboards, door tack boards, etc., all built in the shops and awaiting time for installation in SHS, for example.

> The system required that we send the work out for tender, then submit the tender documents to Works to see if they could do it cheaper, etc. As part of the tendering process I consulted with both the carpenters and [the Manager] to ensure that our tender document was ok, etc. My drawing of the mobile, with typed tender request, was then hand-delivered to 4 local cabinet making shops, three of which tendered.
>
> The lowest tender was from a firm that [the Manager] said was reliable, etc., and had submitted a rough drawing of the steel frame as part of their quote. Since the top surface overhung the edges, etc., the frame dimensions were different from the overall cabinet dimensions. In any event, [the Manager] approved the tender after seeing the drawings, etc.
>
> The order, with all the attached tenders, tender request, etc., was sent to Finance. Some time later Finance called to say that there wasn't a colour indicated on the order. There was, it was just one of the several specs on the 'see attached'. In the process of this request [the Associate Dean] changed the colours, however we believed that Finance was satisfied.
>
> Roughly two weeks later we discovered that Finance had sent the documents back to [the Works and Services Manager] for clarification. They were confused by the 'drawings of the two different cabinets'. I'm not sure whether they looked at the specs, couldn't understand the difference between outside and inside dimensions, or what, but the document had been sitting on [the Manager]'s desk for some time.
>
> It took several days for me to be able to catch [the Manager]... he was never in when [the Health Science Lab Supervisor] called and didn't seem to return her phone calls... When I caught up to him late one afternoon and explained the drawings to his satisfaction he had to personally phone the vendor and request an extension on the tender acceptance dates... the 30 day tender had run out.
>
> Maybe next week… (Project Manager, 1990, CAL/CML Log, 15 November).

Staffing Issues

Technical support (programming, maintenance, network services, instructional design, graphics, etc.) for CAL activities in Health Science has always been minimal. First, the university's centrally funded facilities have never been able to provide sufficient technical support for novice users. Neither Computing Services, Distance Education (instructional design), nor Educational Media Services have the staff capability or mandate to provide an adequate level of support. Second, while Health Science has attempted to provide these services itself, it has not had sufficient funding to hire all the technical support required, the staff hired have been unable to devote all of their time to any single aspect of the development, and student staff have inherent limitations—their classes must come first, regardless of their capabilities or interests.

Support from commercial liaisons, particularly with Apple Computer Australia, was envisaged as early as 1989 with the application for the Teaching Companies Scheme funding. When this was not successful, Health Science applied unsuccessfully to a variety of sources for additional staff funding. Both the local Apple vendor and the regional office in Brisbane provided significant technical support at various times but their main priority was commercial sales and materials to support commercial sales. When courseware development was slower than anticipated, they were unable to maintain a significant technical involvement, although a partner in the regional office (Brisbane) maintained an extended involvement through membership on the Advisory Committee.

The involvement of the vendors was unashamedly commercial; their value systems were obvious and while their values occasionally caused minor conflicts with and within the Project, relationships with the vendors were easily managed. Staff value systems were not so easily managed.

The CAL/CML Project began as an activity involving a very small number of individuals. The vision came from the Dean, moderately computer literate and an outsider to Queensland and Australia, but respected as an administrator and nursing educator. The initial design and methodology came from the author in his role as Project Manager, and the initial nursing education input came from the small group of academic and support staff then employed by Health Science. As the Project expanded the credibility of this initial team was sometimes questioned, particularly by some of the newly employed technical staff.

The first Health Science programmer was seconded on a part time basis from the Computer Centre, with the result that he had divided loyalties and an unclear chain of command. Academic staff and management alike were quite critical of this situation, and Health Science attempted to solve the problem by hiring a full time programmer whose loyalties would be to the Project.

Unfortunately, while the new programmer accepted the values and directions of the Project, other criticisms of the programming function continued—programmers require periods of uninterrupted time to be productive, periods of time when the programmer is unavailable to handle routine requests from both staff and students. It is immaterial that many of the tasks could easily be handled by others, that the persons requesting the service could often do the task themselves, or that the tasks are seldom as urgent as they seem. The programmer (or the Lab Supervisor or the Project Manager) 'catches the flack' when not immediately available for assistance.

In retrospect, value conflicts may always have been somewhat of a problem in relations between academic and support staff, and between management and support staff. Some of the nursing educators, for example, appeared to feel ignored and insulted when support staff failed to respond to their needs ahead of student needs, or when support staff failed to be sufficiently respectful. The intervention of both the Project Manager and the Academic Coordinator was required on several occasions to resolve conflicts.

Support was also expressed by staff for an purportedly common Australian tradition of ignoring unpleasant work, or a supervisor's instructions, when they conflict with the individual's perception of proper 'Australian practice'. On one occasion, for example, the comment was expressed that 'the bosses only think that they manage an enterprise, but the workers really decide what, if anything, gets done' (Zelmer, 1992, personal diary, 26 September). Similar comments were expressed to the author by support staff in another university division regarding their response to requests from both academics and administrators.

Some problems may have resulted from unrealistic expectations or simply a combination of workload, inadequate skills and poor communications. A CML package for scheduling clinical placements, for example, was only partially functional mid-1993 after more than two years of development and a rewrite of the design specifications. The rewrite had been requested by a progress meeting early in 1993 in an attempt to bring the project to completion, and not incidentally, to salvage the programmer's fading reputation.

Health Science was the first UCQ academic unit to hire a support staff member with a primary responsibility for student computer use. Unfortunately budget considerations, and the small student load during the first few months, resulted in this Lab Supervisor also having responsibility for academic staff support and training. As the first Lab Supervisor had little or no previous experience with Macintosh computers, and had very limited prior staff training experience, the staff training role was often shared with the CAL/CML Project Manager—with the Lab Supervisor learning the required skills as problems developed. Other support staff also shared the training role as required, or as their expertise allowed, but the total training program was still perceived by the support staff themselves, the students and the academic staff, as being insufficient.

From 1989 to 1991 skills training was provided in this manner and included specific computer skills—including use of the computer, word processing, spreadsheet, database, electronic mail, statistics, instructional design and courseware development using the tools available in-house. In 1992 staff training became primarily the responsibility of the CAL Academic Coordinator, a relatively new Health Science academic with some limited release time from teaching duties.

The Academic Coordinator was an enthusiastic computer user and CAL advocate, but required some time to become familiar with the program, facilities and work responsibilities. The Academic Coordinator cited inadequate time release, conflicting responsibilities, and personal (family crisis) problems for the paucity of staff training in 1992 (CAL/CML Academic

Coordinator, 1992, personal communication and electronic mail). Courseware production, another responsibility of the Academic Coordinator, also ground to a halt for similar reasons.

A deliberate decision had been made to utilise Macintosh technology for both staff computers and the CAL/CML development and delivery. The success of this initiative is reflected in the extent to which both staff and students in Health Science have adapted to computer technology on a personal level. The staff has also had a fully functioning local area network with electronic mail and shared printing facilities from the earliest days. This is in contrast to the level of services in some other Faculties and Departments with similar computer expenditures. Mathematics and Computing, for example, had still not achieved the same level of network service to staff in early 1993 using an IBM/MS-DOS platform that Health Science had in 1991 with the Macintosh platform.

The downside to this decision was, and still is to a certain extent, a reluctance from the rest of the campus computer community to accept the Macintosh platform. Fortunately the computing students did not have the same reluctance and their participation often resulted from a desire to obtain experience with this platform.

Although staffing problems and productivity have not occupied as much total time as this discussion might suggest, they may have contributed more significantly to the development, or more properly, non-development of CAL/CML and computing in Health Science than was realised. Because the CAL/CML use potentially affected the teaching style and educational philosophy of every academic, and difficulties using the computer (individual computers or the network) have an immediate impact on the productivity of every staff member, the computing staff certainly had a greater importance than the author had anticipated in budgeting for staffing levels.

Health Science was one of the first academic units in the university to dedicate full time computing staff to support staff and students in their use of computers; other units typically provided professional programming support. In retrospect, more resources should probably have been devoted to staff training and 'help desk' style support; and more attention should have been paid by the author, and those selecting the support staff, to the benefits that could result from properly trained and motivated 'end-user' support specialists.

Regardless of the difficulties, Health Science has accepted the computer as a work tool, and the academics are strongly supportive of the continuing use of computers in teaching, albeit with some changes from the initial program design. A note in the author's diary suggests that the project may merely be going through another stage in its development:

> Initially I felt a bit like "the delivery has been a success but the baby died", now I'm feeling more like we [have] created a rebellious teenager (Project Manager, 1992, personal diary, 26 September).

The Vision—Hospital in a Box

In the Dean's initial vision statement (Appendix A) it was suggested that a *Hospital in a Box* would be the ideal end product of Health Science's CAL development. It was accepted that the tools did not exist at that time to develop such a training package within the available resources, but the vision would serve as a goal for the future.

The author, and likely others connected with the UCQ Faculty of Health Science project, will therefore define success in some measure as the degree to which the CAL/CML activities came to realising that vision.

The answer, on an absolute scale would have to be, not very far. The Faculty does not even have a large number of tutorial style CAL units developed, the full featured CAL materials for basic instruction are limited to only two or three areas such as pharmacology, and the nursing care plan simulator has only been developed to the prototype stage.

On a relative scale, however, the answer would be quite different. All of the staff are using computers for some aspect of their work and are networked together in a system that permits individuals to work together on collective projects. The student infrastructure is in place and the use of the computer lab has been accepted by the students. More sophisticated materials suitable for Australian students are becoming available on the commercial market and staff are willing to use them in their instruction. Finally, the CAL_Maker development software and the nursing care plan simulator that was developed in prototype form have shown that at least some aspects of the Hospital in a Box vision are feasible today, not sometime in the future, if sufficient resources can be made available for software development.

The resources required are enormous. While Health Science has been building the foundations for their CAL/CML work other educators have developed products that also demonstrate the feasibility of the vision. Dr Joseph Hendersen (1992) of Dartmouth Medical School demonstrated a fully functional simulation that provided a similar training environment for US military medical personnel. Based on a *MASH* format, it used taped segments with live actors integrated with the CAL framework to provide a very realistic simulation that bordered on virtual reality.

It is quite possible that Health Science could have developed a similar teaching tool for nurses if all the CAL/CML resources had gone into developing the one activity. In practical terms, that was simply not possible, thus the vision will have to remain for a future project once development costs have fallen to a level where multimedia projects are feasible on the desktop.

Mid-1992, the author and colleagues within Health Science, Mathematics and Computing, Distance and Continuing Education, and Educational Media Services jointly presented an unsuccessful proposal for CAUT (Committee for the Advancement of University Teaching) funding to explore the potential of multimedia further. A very much scaled-down version of the proposal is being implemented with funding sufficient only to purchase a minimal hardware platform and prepare a limited demonstration CD-ROM. It is anticipated that one outcome of this research endeavour will be a 'how-to' manual to assist tertiary staff and students in developing economical multimedia presentations.

The Department of Mathematics and Computing, recognising the importance of providing adequate development facilities to post-graduate students and staff, has (May, 1993) submitted a funding request ($160,000) supported by Health Science, Business, and Distance and Continuing Education to the Australian Research Council, Mechanism B program, to equip a multi-platform lab with six state-of-the-art full-function work stations (two each Pentium/DOS, Alpha/Unix, Power PC/Macintosh) capable of supporting multimedia and graphics research projects. This lab would be located in the new Information Technology Building, expected to be occupied late 1993 or early 1994.

National Exposure

The government indicated from the beginning of the funding that the project was expected to have a national flow-on effect. The Department of Employment Education and Training letter announcing the grant indicated that

> In supporting this project, the Government anticipates that the resulting products would be made available to other nursing programs nationwide (DEET, 1990, correspondence from the First Assistant Secretary, Higher Education Division, to Vice-Chancellor, Attachment 2, 26 January).

The Dean, the Associate Dean, the CAL/CML Project Manager, the CAL/CML Academic Coordinator, and one academic staff member, in particular, made a number of presentations promoting and explaining the project to professional, educational and industry groups. Some of these presentations have been noted in the Timeline, others are noted in References and the Appendices. The Faculty also actively promoted two software products, CAL_Maker and the Clinical Scheduling system. CAL_Maker, and/or samples of the courseware produced by the CAL_Maker software, were distributed on an informal basis to developers and academics. The Clinical Scheduling software, albeit never fully functional, was sold to three other tertiary institutions in Queensland.

Recapitulation

This study was not intended to judge the success of the CAL/CML activities within the faculty of Health Science. Inevitably, however, everyone involved with the Faculty's CAL/CML activities and this study, as well as observers from outside the Faculty and the University, ask whether the activities were a success. The response has been mixed, and may depend upon the respondent's degree of involvement in the CAL/CML activities.

Most evaluators would agree that it takes a number of years to assess the impact of projects involving technological change, and that the lasting results will only be apparent after a change of personnel, particularly project leadership (See Appendix L for the Dean's discussion of leadership transitions). On that basis it will be several years before we can be sure of success, however it is apparent as this study is being written that the Health Science staff have taken ownership of the CAL/CML activities.

In the short term, the project has been successful in that:

- all of the staff and students use computers regularly,
- many of the staff *are* involved in developing computer-based instructional materials, and
- some staff are using the available tools to develop courseware that is very different from standard Health Science materials.

As well, from its own budget the Faculty funds computer support positions, infrastructure (hardware, software and network) upgrading. It is budgeting for an additional student lab, and has begun investigating multimedia applications.

Health Science was an innovator within the university and took a number of hard decisions to support those innovations. Beginning with the hiring of the Consultant in 1989, the Faculty provided funds for planning, management, support staff, and computing infrastructure (hardware, software, network and training). All Health Science staff and students participated in the computerisation of the Faculty, the former through the provision of desktop computer facilities, and the latter through the use of CAL/CML materials and the need to use computers for the presentation of assignments. As well, the Faculty has consistently used well qualified and motivated students to assist in the installation and operation of their system.

Other academic units depended much more on services supplied by the university's Computer Centre, with the result that in at least one Department in early 1993, staff still used 'sneakernet' facilities (hand carrying of diskettes containing printable files to a computer connected to a printer) for printing—and they will continue to carry their disks to a centrally located printer until their recently appointed (1993) network manager gets more than half of the Department's staff computers installed on their network (personal communication).

Health Science staff and students will vary greatly in how successful they feel the CAL/CML activities have been, but one of the indicators of success comes from the local computer community:

> Three years ago I was sceptical—yes, sceptical… I didn't believe you could do it. I thought you were doing it on the cheap…
>
> We were pushing a far more sophisticated solution… and fortunately, common sense prevailed because [that solution] was far too expensive in terms of resources and in terms of initial outlay—…it would have limited the project severely had that been adopted.
>
> HyperCard, on the other hand, has proved an admirable vehicle for the development. It's allowed [the computing project] students to come in… and it has enhanced the feeling amongst the team by radiating out from that core group of students so that the whole University has benefited. That's how I really see it (Local vendor, 1992, taped interview, 22 February).

Health Science's CAL/CML Academic Coordinator reflected on the value of the CAL Project during a 1993 meeting. The CAL development, she said, might look as if it had run 'out of steam', but the reality was that staff had accepted the use of computers and CAL as part of the teaching process with the students as the real winners. The real question was what would the teaching program be like if the Faculty hadn't undertaken the CAL development project.

> If we hadn't started it, where would we be now?
>
> - No computer use
> - Limited instructional development
> - Probably no self-instruction
>
> In hindsight, we've done at least two-thirds of what we started out to do—and the base is there—staff are committed to CAL. Some of them will never do any CAL development themselves, but they are all committed.
>
> We now have a development team that is taking CAL into other areas—and that came out of the Project—and we're now working in both the Mac and DOS platforms.
>
> The real benefit is to the students. They are getting the benefit of the materials developed and in the pipeline… and the materials and ideas are being taken elsewhere, through consultancies, etc. (CAL/CML Academic Coordinator, 1993, personal communication, 23 February).

Chapter 8

Plan to Fail...

Warum einfach, wennes Kompliziert geht?

Why bother to make it elegant if it already works? (Anon., from Mackay, 1991)

As soon as a woman crosses the border into male territory, the nature of professional combat changes (Giround, 1974).

To discover that something has been wrong is not necessarily to make it right (Kempton, 1970).

This study is a description of a major instructional development project and the changes that occurred as it was being implemented. It has examined the project and its management from the perspective of the project participants to determine the motivation for some of the decisions and their consequences. The study highlights some of the deficiencies of the project and its management, how they were resolved, and their consequences.

In the previous chapter the author discussed a number of the themes arising from the study. That discussion primarily highlighted quotations from diary and other notes made during or immediately following particular events plus the author's reflection following the completion of the study.

This final chapter summarises some lessons to be [re]learned from the study. It refers back to the literature study in Chapter 2 for a theoretical foundation, and postulates a number of questions (displayed in italics) that a project designer should ask before embarking on a similar technology project. These are summarised in a checklist for guiding future projects. The chapter concludes with a discussion of the role of the CAL/CML project in the Faculty's strategic plans and suggestions for the future.

The Need for Common Definitions

The summary of instructional design principles and requirements which eventually formed Chapter 2 was written at least twelve months after the commencement of the project described in this study. One of the author's clearest recollections of the project relates to the completion of that summary and can be stated quite simply as 'Why didn't we do this earlier'. This recollection provided the basis for the statement in the introduction to that section of the literature study indicating that the project could have used such a document in its initial stages.

The answer to the question is not as simple as it might seem. Goals and objectives were hazy at the beginning of the project and the timelines were short. The UCQ (then CIAE) library was lacking in many of the basic resource materials required to support a major instructional development project, and even today some publications (books and journals) are only available within specific Departments or Divisions.

While it was possible, approximately two years ago, to suggest that a summary briefing paper on CAL/CML and instructional design would have been useful a year or more earlier, in retrospect, the project did have copies of an excellent basic book, *Understanding Computer-Based Education* (Siegel and Davis, 1986), as well as the discipline-oriented book, *Computers in Nursing: Hospitals and Clinical Applications* (Mikuleky and Ledford, 1987). Unfortunately, Siegel and Davis (1986) was probably oriented too far towards education, and books such as Mikuleky and Ledford (1987) and various chapters in computer-oriented texts such as Coats and Parks (1977) were not designed to address the problems of nursing education.

For the project to have produced an additional briefing document in its early months time would have necessitated abandoning some other aspect of the project and, if it defined the instructional development process too rigidly, could have constrained future creativity. The reality was that the staff, and the Project Manager in particular, were fully involved with ordering materials and other duties at that time. As well, with less than half a dozen staff involved during the initial stages of the project, it was difficult to forecast the information needs of staff who had yet to be hired.

The first draft of the section was used for orienting some of the later staff, but for others, particularly for the earliest staff, the project relied on Siegel and Davis (1986), an ever-changing collection of photocopied journal articles, and the instructional design knowledge of the participants, a knowledge that was unfortunately never explicitly shared between participants. While it would likely have been useful for participants to explicitly share their instructional design knowledge, it would have been even more useful to identify what knowledge was lacking, and where conflicts existed between participants' design philosophies.

The lack of an explicit commonly agreed design philosophy had even greater repercussions when new staff joined the project. New staff generally received an orientation to the project from the Project Manager, but they tended to adopt the design philosophy of the staff member(s) with whom they were working most closely. A similar problem existed with regard to an understanding of the goals of the project itself and, in retrospect, may also have existed with regard to the mission and educational philosophy both of the Faculty and the University.

There was such a volume of orientation material for new staff members that they received only a brief introduction to the CAL/CML project when they first joined Health Science. Some staff may not have read the materials available, others may not have understood the project's rationale or the jargon in the materials supplied.

Misunderstandings, or the lack of information, might or might not have been correctable at a later date. A limited number of copies of project documents, for example, were placed in the Health Science staff common room, but these might not be generally available for months at a time as they were borrowed by other staff for reading.

The project might also have benefited from commonly agreed definitions of success, different definitions possibly being required for the individual participants and the CAL/CML project. Chapter 2 included a number of ‘recipes’ (Gayeski, 1989, Carr, 1988, Dede, 1989) from the literature for achieving success in instructional design projects. Branson (1989) provides a more generic definition of success, adaptable to the needs of both individuals and the project:

> By succeed, I mean a project that meets a defined need, adheres to design specifications, is implemented, and becomes a routine part of organisational operations after the project director leaves the scene.

It is inevitable that this study will be seen as an evaluation since the NPRF funded Health Science CAL/CML activities have not been evaluated in any other forum. Even an evaluation of the first year teaching materials, projected to occur late 1992, at the end of their first multi-year cycle of use, had not occurred by mid-1993. It is useful, therefore, to recall the quote in Chapter 2 from Dede (1989, 10) where he indicates that innovators should be able to take risks and have the ‘freedom to fail’.

Institutionalised Change

The success or failure of a project is often determined by the extent to which the project's activities, and the results of the project's activities, have been institutionalised (Crock and Carss, 1992, Gillespie, 1992a). Since this project resulted in changes both to work practices and learning technologies, success must be defined by the degree that the changes were institutionalised among staff and students.

Rogers' (1962 and 1983) theories on the diffusion of innovations may now be discredited by Buttel (1990, 61) and others, however it was these theories which guided the approach to change within the Health Science project, and these theories can still provide one framework for guiding and analysing a technology project. For example, Rogers' (1962) quote about technology change being more than just the technology product itself, as noted in the

Introduction to this study, '*it is the idea* about the new… *that is diffused* as well as the product itself' (emphasis added), was a guiding principle for the staff managing the project.

It also seemed useful to categorise participants into early and late adopters, innovators and non-adopters for staff training purposes, although the author acknowledges that the categorisations may have adversely affected relationships between individual staff members or between project and non-project staff. The categorisations, for example, became labels that stuck, and may continue to stick, to individuals beyond the time when their skill level or enthusiasm level changed.

- ❑ *Does the success of the project depend too heavily upon 'super-human' commitments from participants?*

UCQ general staff have defined hours and duties and are, in general, compensated for work outside of these designated times and duties. Academic staff, however, do not have similar explicitly stated safeguards and it is therefore possible, as with this Project, for dedicated staff to far exceed a normal workload. This was particularly obvious with staff who were simultaneously teaching new subjects, developing both conventional and CAL/CML materials for those subjects, engaged in upgrading their own academic or professional qualifications, and involved in the development of new systems and procedures for an institution undergoing major changes.

Two somewhat contradictory factors become evident when examining the extent that computer use was institutionalised within Health Science. First, the practical reality within Health Science is that computers are a fundamental part of the daily activities of Health Science staff and students. Second, the widespread use of computer assisted and computer managed learning—the integrated use of computers within the delivery of instruction, the goal of the NPRF project—has not been achieved.

The Faculty of Health Science at the University of Central Queensland may well have the most significant staff computer use of any of Queensland's nursing programs. Certainly most staff use computers for word processing, maintaining student records, accessing the central student record and Library systems, and electronic mail. Staff involved in post-graduate studies, often use their computers for their research work and for communicating with colleagues and supervisors.

Students also make significant use of computers for their assignments, and as shown by their comments in the study, have an appreciation of the use of computers that extends into their work as nurses.

Staff use, and students see the use of, computers in instruction on a regular basis. Some lecturers use the computer, in conjunction with a video projection unit, as a sophisticated presentation device. Others demonstrate study and research skills for their classes, perhaps doing a live demonstration of a library catalogue search for the class. All staff use the computer to prepare their lecture notes, exams, reports, and journal articles.

Neither staff nor students, however, make extensive use of computer-based learning. The students are required to complete a number of computer-based exercises and case studies in the dedicated student learning lab. Never-the-less, these assignments are generally completed on their own time and are seldom integrated within the curriculum to the extent that a student's progress would suffer if they were not completed at a particular time. Computer-based learning simply hasn't become an integral part of the learning strategies for most staff and students.

This result is not surprising when we examine more closely the development path of the computerisation within Health Science. Novice computer users were introduced to computers within an environment where it was both necessary to learn to use the new technology and to deliver instructional materials within a very short time span. The staff involved accepted that the use of computers would (eventually) facilitate their own work and learned the minimal skills necessary for their use, but did not see sufficient benefits to the integration of computer-based materials within their teaching strategies to devote the time to materials preparation. This was further compounded by the almost exponential growth of staff from 1988 to 1992, by the curriculum revisions required by the mandated change from Diploma to Degree course, and by the role shifts necessitated by the change from an Institute of Advanced Education to a University.

Except for the planned staff growth, these changes were unforseen when the CAL/CML project was initiated.

The Dean of Health Science indicated that changing computer platforms at the same time that the Faculty moved into a new building was not, in hindsight, a wise move. While it is often impossible to predict what might happen to change the working environment, this suggests a general question for program developers:

- ❑ *Can the project be structured to avoid making more than one major environmental change—mission, curriculum revision, physical facilities, computer platform, senior staff, etcetera—at any one time?*

Without the NPRF funding the institutional and program changes that occurred over the term of this study would have likely resulted in the abandonment of the Health Science project. Even with the funding, the successes have required considerable personal sacrifice from staff and administrators to overcome these environmental constraints.

Time Management

The observer of a project, even when the observer is also a participant in the project being studied, has a responsibility to identify issues that have failed to be highlighted by direct evidence during the study. Time management is one such area.

The development of a project funded by external monies is often constrained by the limitations imposed either by the funding agency or the initial budget request. In retrospect, this Project, while always constrained for funds, was fortunate in that it achieved reasonable funding for non-staffing resources. Project participants never had to wait very long to obtain the computer hardware or software they *required* to perform their computer-based activities yet the Project seldom had excess or under-utilised facilities.

This can be attributed to the initial Project design, the guidance provided by the Advisory Committee, the extensive use of Computing Project students as technical support staff, and the supplementary funding provided through the Faculty and UCQ. The Project also benefited from the dedicated performance of staff who, as was noted earlier in this Chapter, assumed workloads that exceeded normal expectations.

- ❑ *What is the balance of resources necessary to achieve the project objectives? More specifically, will the staffing levels be adequate for success?*

The initial and continuing staffing decisions resulted in the time management skills of participants becoming a major constraint on this project. Almost all of the project staff, for example, were full time university staff or students holding part time appointments with the project, necessitating their 'juggling' other work assignments with project activities and deadlines. For example:

- The author, seconded from the Department of Mathematics and Computing, initially had a one-third time appointment to manage both the technical and academic aspects of the project. When the amount of work became unrealistic, the academic aspects were assigned to a Health Science staff member on a similar part-time basis. Both had other teaching and administrative duties to perform.

- Almost all of the technical support—programming, instructional design, etcetera—was provided by staff with part time Health Science appointments. One of staff member was seconded from the Computer Centre, several were computing 'project' students working without salaried payment as they studied, and others were staff from service units who undertook specific tasks, such as developing the training videotapes, as required.

- All of the content expertise was provided by academic staff with other duties. While some were specifically provided with 'released time' for CAL/CML development, most developed materials as part of their regular duties.

This situation was a direct result of decisions about staffing that had been taken early in the project's development. The project required the support of staff and students who would have a variety of potentially conflicting priorities. Academic staff supporting the project could do so because they were developing new curricula and teaching resources for the new program and computing students could provide technical support as part of their academic studies. Just as important, funding levels were inadequate for a full time technical support staff for programming, network management, and courseware development in addition to the single full time individual providing a basic 'help desk' style of support to staff and nursing students.

- ❑ *What are the implications of basic planning decisions, particularly the restrictions imposed by implied decisions, upon staff who join the project at later dates?*

The decision to emphasise infrastructure building (to purchase computers and network facilities, to share scarce resources such as printers, and to locally develop CAL tools) was made on the basis of the enthusiasm of the existing staff, admittedly very small and inexperienced when the decision was made, and the availability of existing resources. The relative lack of suitable courseware, for example, necessitated local courseware development. The need to plan for the eventual distribution of CAL/CML materials to students studying at a distance meant that state-of-the-art CAL/CML development tools could not be purchased because of their cost and restrictive license agreements.

Perhaps it was naive to assume that staff joining the project at a later date would, or could, have the same enthusiasm for the project as the initial staff. As well, some of the decisions explicitly made had additional implicit commitments that may not have been fully understood at the time. The decision, for example, to install a local area network for the use of electronic mail, and the sharing of scarce resources such as printers and software, had implicit commitments to manage (staffing expense) the network and to continually upgrade the facility (hardware and software expense).

While some of these commitments were anticipated, others were not. For example, the University did not have the experience to anticipate the capacity (number of users, data transfer speed, and network server hard drive storage) or the service levels that would be required, particularly given that advances within the industry—cost reductions, new technologies, increased capacity, new network applications—drove the demand for increased services.

Once initiated, the project required a commitment from staff that was often hard to sustain. The project managers should likely have given more emphasis to providing assistance with skills in time management and related areas, however for most staff, even with the best of intentions, it would have been difficult to juggle the conflicting demands of the project and teaching, while at the same time being initiated into the use of a computer and being socialised into a new Faculty in a new University. Time management is a set of skills like any other and must first be learned, then practiced until proficiency is achieved.

- ❑ *What staff training is required for the success of the project? Technical—basic computing, computer applications, instructional development? Professional—staff supervision, budgeting? Other—time management, evaluation?*

Many of the Health Science staff lacked even the basic level of skill as defined by Lillie et al (1989) when they first became involved with the instructional development project. Their need to use electronic mail and word processing for general communications and the preparation of subject notes drove the basic literacy process. Within a few weeks most staff had also experimented with using individual items of student courseware, particularly if materials had already been developed for use by students in their own subject area.

Staff acquired additional skills as the need arose; hands-on training sessions were conducted on an irregular basis according to demand and the availability of support staff. As well, the services of the computer laboratory supervisor were always available to both staff and students when problems arose, although as has been seen in Chapters 5 and 6, problems arose in areas where the lab supervisor and other support staff themselves lacked technical competence.

Some Health Science staff had the ability to design effective instructional materials and may have jumped over Lillie's (1989) second level of competency in the push to develop materials for their classes. Some of the problems related to the difficulties arising from their incomplete skill development, including the difficulties encountered by students working with staff who themselves lacked the courtesy to work to an agreed timetable (Student, Chapter 5), have been discussed in this study.

- ❑ *To what extent have you provided for problems of a personal nature disrupting the project?*

Management of personal (non-work) time and priorities is also a problem with any activity that demands an 'extra' commitment. Family illness, difficulties with trades people and suppliers building the new family house, and the trauma experienced by family members who are unable to find work or the 'right' school after moving to Rockhampton with a new Health Science staff member, are disruptive at any time. When the staff member is already 'stretched' by a new job and related commitments, the personal problems must sometimes over-ride the work commitments.

Cultural Expectations

- ❑ *Has the project provided adequate safeguards against personal differences, including differences in cultural expectations, causing delays, changes to priorities, and management difficulties?*

Cultural expectations, and cultural differences between various staff, are difficult issues to address. Depending upon the maturity of the individuals involved, and their involvement in the issue being discussed, the discussion has the potential to either degrade into 'tea room' whinging or escalate into a personal attack on particular individuals.

Some issues that arose during the course of this project, however, can likely only be addressed with an understanding of the cultural differences between the actors in the study. Unfortunately, neither the author, nor any of the individuals involved with the management of the project, realised the extent to which this was important.

In the Study Procedures the author noted the difficulty of maintaining diary and similar notes on a regular basis. These difficulties resulted partly from a work load that did not permit extensive reflective time each day, however they were also the result of the intense emotional stress resulting from some of the project activities.

The personal stress resulting from a two day Health Science 'team building' exercise early in 1991, for example, resulted in the author abandoning reflective diary entries for several weeks. In hindsight, but without either the benefit of diary notes detailing the author's view of events or a report of the exercise (the facilitator did not provide a promised report), it is likely that the issues of isolation, favouritism, and ethnicity directed against the project and its management, recollected as major issues during the exercise, were important indicators of the change process.

Unfortunately, identifying the underlying reasons for the still-remembered emotional outbursts during this two day exercise would only have been possible if an assessment had been conducted immediately following the activity. There is also a question of the degree to which concerns about the management and the incompletely internalised goals of the Faculty might have been transferred by staff to what was regarded as a safer target—the CAL/CML project.

The Faculty was in the midst of revising the Diploma curriculum to meet the needs of an imposed degree structure and had just hired several new staff. Individual goals and aspirations must still have been unclear, particularly as they related to the changing Faculty and University goals. Computerisation and CAL/CML was totally new to many of the new staff and posed additional challenges if not fears.

The nursing educators in Health Science came from a variety of backgrounds and countries. None had received their basic nursing training in a tertiary institution, few had taught clinical nursing before, and fewer still had taught at a tertiary level—either on campus or at a distance. While many of the staff had received tertiary training subsequent to their basic training, some were still enrolled in bachelor level studies. Many were hired directly from clinical work experience.

Most of the Health Science staff were, and still are, female. While the question was never asked, it is likely that many of the study participants would suggest that the majority of the project's computing personnel had been male, even though the supervisor of the Student Computing Lab for two years, the Academic Coordinator, and several of the computing project students were female. The practical reality was that most of the dominant personalities—

including the Project Manager, the programmers, and the novice academic staff member who became so involved with computers and CAL—were all male.

Work experiences were varied. Several staff had worked overseas (developed and developing countries), others had come from interstate or overseas, some had only worked in Queensland.

The Dean and the Associate Dean, the two individuals with the greatest experience with tertiary nursing education, had both come from overseas, had previously only worked outside Australia, and had received their training overseas. In addition, they were almost the only Health Science staff members with doctorates in a fledgling university which now valued PhDs and research experience very highly. The third staff member with a doctorate in the early years was also from outside Australia. This individual had a very brief tenure with the Faculty, departing because of health problems exacerbated, it was alleged, by racist harassment (personal communication).

The only other staff member with a doctorate left the Faculty following a dispute over alleged improper working conditions and Faculty management.

Expectations also seemed to vary with regard to the 'work ethic', the extent to which duties could be 'assigned' to individual staff members, and the type of recognition required for individual contributions to group activities. Common room gossip and discussion at one of the Health Science staff training retreats (January 1991), for example, included derogatory comments about particular staff members and their lack of 'laid back Aussie' work habits, and negative comments were made to the author at other times regarding the recognition being received by members of the CAL development 'team'.

To a large extent such cultural issues have been ignored in this study. This is partly because they seemed peripheral to the main focus of the study while they were occurring, partly because the issues were so emotive, and partly because some of the specific situations were effectively *sub jure*, being the focus of disciplinary action.

Giround (1974), in one of the quotes at the beginning of this Chapter, indicates that women have to overcome major hurdles when they attempt to compete in a predominantly male arena. It was not the purpose of this study to debate the literature on the role of women, or their exploitation in the workplace. Lay (1991, 353) acknowledges that a major issue in feminist theory is whether the differences among men and women 'should be located in cultural or biological traits?' As was noted earlier, the Faculty had a predominantly female staff with a diversity of backgrounds, the CAL/CML project, had a predominantly male staff. Although the project was a sub-set of the larger Faculty, it may have seemed more threatening because the males were perceived as less diverse. Unfortunately the data to answer such implied questions was not collected.

Similarly, it was not the purpose of this study to investigate the difficulties encountered by men working in a predominantly female workplace, but the parallels are obvious.

Information on these issues might potentially have been collected through the study interviews, however, the author did not have sufficient distance from the problems to raise the questions. This was a participant study and the author participated directly in project activities as well as observing. As Spradley (1980, 55) indicated, 'we all adapt to the potential threat of overload by paying less attention to information we do not need or want', and the questions were not asked.

The author undertook to manage a project, then to document that project from the point-of-view of the participants. This provided a focus that ensured the potential completion of both and left responsibility for the management of the Faculty to others. The result was a compartmentalisation of effort and an avoidance of questions about the 'health' of the Faculty, the answers to which might have been useful to better Faculty management.

Although the questions were never asked, the intensity of the author's still remaining feelings about activities such as the 1991 team building exercise suggest that, in hindsight, some of these events may have had much more effect upon the functioning of the computer related activities than was previously acknowledged. What was initially perceived by the author as disruptive, but 'petty', may actually have been fundamental and might confirm Dunn's (1991) observation reported in Chapter 2:

> Retrospectively, I noted that the physical and emotional responses I experienced were parallel to those expressed by the subjects in my study.

This also reinforces the necessity to look beyond the current problem to determine the limitations on and opportunities available for the more global objectives. Zuboff (1988, xiv-xv) noted the same challenge:

> I learned that while resistance to new technology is a valuable source of knowledge, it is not the only one. It became equally challenging to understand the indifference or enthusiasm or resignation that can greet the new technological conditions of work… My continuing efforts as a consultant to organizations teach me never to underestimate the magnetism of the past and the forces of inertia upon which it thrives.

Upgrade Control

- ❑ *What quality control procedures need to be implemented to ensure the success of the project?*

This is a study of a technology project. It might be appropriate, therefore, to emphasise the problems resulting from the technology itself, and to postulate a variety of technological 'fixes' for future such projects. The experience of the participants in this study, however, reinforce the cautions in the literature that the 'people' problems (Mackenzie, 1991, Bernard, 1990, and others) are more important. Even when examining a technological problem such as upgrade or version control, the people problems predominate.

One of the major aims of the project was to deliver instructional materials to the Health Science students using a computer-based format. This should have implied that the curriculum needs and priorities would determine the instructional materials specifications, that materials would be purchased or developed to be available when required, that they would have been tested on the delivery system prior to use, and that 'bugs' and other problems in the delivery would have been fixed prior to use by the students.

Unfortunately, student materials were often not ready for use when required. Students naturally became frustrated with software that did not function according to the user manuals (when a manual or instruction sheet existed), or which contained obvious errors. As one small example, answers to questions in a pharmacology courseware module were hard coded by the programmer rather than being computed by the program. When these answers were incorrect it became impossible for the students to complete the unit.

Other problems included the installation of old versions of software, the loss of the most up-to-date versions of software and courseware due to the lack of backup copies, and communications failures between staff, as when a staff member failed to complete an agreed system change or changed the system without notice.

The responsibility lies in several directions.

- The courseware was often considered an 'add-on', rather than being an integral part of regular subject activities. Deadlines and quality were therefore not seen as being critical.
- The project staff, individually and collectively, failed to establish, or were unable to meet, deadlines and quality control procedures.
- Programmers and materials developers, including academic staff working on the materials development, overlooked the need for quality.
- The courseware, the local area network, and the student computers were sometimes inadequate, particularly for the demands of multiple users.
  - ❑ *What are the critical technologies for your project—the ones which will severely affect your success if they fail to eventuate?*

The problems of controlling courseware versions and failing to fix known bugs before the courseware was required were all potentially within the power of the project to control, although the large number of seconded staff and project students somewhat inhibited the implementation of control procedures. Other upgrade problems were beyond the ability of Health Science to control.

- Manufactures and distributors sometimes supplied hardware without the required software drivers, or provided software, including network or system upgrades, which failed to function properly.
- Promised hardware upgrades, including items for which payment had been made in advance, sometimes failed to eventuate.
- Electronic mail software never worked exactly as advertised, and new upgrades always had some incompatibilities.
- The priorities and management procedures for purchasing and finance, computer maintenance, and university construction services did not necessarily allow for academic or project priorities.

Health Science and the project did attempt to resolve these problems as they arose, but some were never possible to anticipate and most could not be resolved as simply as installing an uninterruptible power supply on the network server to overcome the effects of the frequent power failures.

At least since 1992, the Department of Mathematics and Computing has been investigating the application of quality control procedures to the development of its instructional materials development, both for internal students and those studying at a distance. Significantly, the control of every stage of the development process—identifying who is responsible for implementing each decision, who is responsible for collating the materials developed, deadlines for preparing the materials, controlling and identifying various versions, etcetera—is an important part of the proposed quality control system.

Learning From Mistakes

❑ *Is the project structured so that it is possible to learn from mistakes—mistakes that are evident both from the literature and from the project as it develops?*

The reality of the university, and perhaps any institutional setting, is that a particular project team will usually only get one opportunity to perform. Since each project requires a unique mix of expertise and skills, a project team seldom lasts beyond a single project. Staff may also leave the institution, change jobs within the institution, or otherwise leave the project environment.

This constantly changing mix of staff and experience has positive aspects in that skills learned are transferred to other projects, but it can also have negative aspects if the staff have been unable to learn from their mistakes.

❑ *Are the students adequately protected in the event of failure to meet project deadlines, objectives, etcetera?*

The ability to learn from mistakes is particularly important within an educational institution as the consequences of failure may be apparent for several semesters. The 'clients' of the university are the students who are will enrol in the future as well as those currently enrolled. Thus, if a project fails to meet its deadlines, budget, or other milestones, the impact often extends beyond the project to both current and future students and their learning.

- ❑ *Does the project staff have adequate resources to succeed, including leadership, quality control, and scheduling flexibility?*

Since this is a descriptive study of the management of a project rather than an evaluation, the successes or failures of the project are not crucial to this study. What is important is the extent to which observations of practices from the project are able to guide future projects, especially projects involving massive social and technological change as well as curriculum materials development.

The study demonstrates the need that was expressed by various writers (Bernhard, 1990, Gillespie, 1992b, London, 1988, Mackenzie, 1991) for the project management to maintain appropriate controls and to be particularly observant regarding people issues—defining responsibilities, providing adequate staff and resources, controlling technical staff, ensuring continuing education activities, and maintaining quality, enthusiasm, and commitment to the project goals.

- ❑ *Has the institution provided adequate support for the project—budget, staff, administrative approval, academic approval?*

The study also confirms the need, indicated by Gillespie (1992a) and Crock and Carss (1992), for the institution to provide adequate support—financial, administrative and psychological—to enable the project and the project team to perform.

- ❑ *Are the project goals defined well enough to provide an indicator of success or failure?*

Throughout the period of this study and the subsequent writing process, the author has struggled with the necessity to avoid evaluating the success or failure of the computer developments within Health Science. It is axiomatic for many qualitative researchers that a descriptive study should avoid taking a stand on such an issue—the rationale being that the objectivity of the study can be lost through the author's attempts to rationalise failure or to justify success. A descriptive study should serve to present a story that leads, through further study and analysis, often by others, to the development or refinement of theory.

In reading the preceding pages, it is evident that the author ultimately failed to maintain an absolute separation between description and evaluation. The author was, after all, one of the participants most involved in the development and operation of the policies and practices which were being studied. The author's role as participant was to manage the project, a role which required a constant assessment of the success or failure of not only the project, but also individual activities undertaken to further the project. The author has also been, through authoring project publications and training materials, through preparing and presenting conference papers and demonstrations, and through promoting and defending the project in numerous venues, one of the most prolific and visible advocates of the computerisation of the Faculty of Health Science.

The CAL/CML Project, funded by the National Priority (Reserve) Fund and the University of Central Queensland, was designed and supervised by the Foundation Dean of Health Science. The author assisted in the design of the project and managed both the technical and the academic aspects of the project until Health Science appointed an Academic Coordinator from its own ranks. The academic staff, both supporters and detractors, in addition to developing the courseware, developed the curriculum upon which the CAL/CML activities rested, and moulded the policies that guided the project. The technical staff, both full and part time employees and Project students, contributed to the operation of the project in their own manner. The students were the ultimate users of the courseware developed. They were the 'guinea pigs' for our ideas and, ultimately, are major recipients of the benefits of the project.

The project did not operate in a vacuum. It was the product of a rapidly changing technical environment, where new tools (hardware and software) sometimes appeared weekly, and operated within an institution that was experiencing massive structural and organisational changes.

Some staff members (Chapter 5) may have disagreed with the project priorities and the quality of the materials produced under any circumstances where they had not been involved in setting the goals and where they were not personally setting the priorities, but the 'bottom line' is that their endeavours did not always contribute to immediate project and Faculty goals.

Unfortunately, the institution did not contribute as fully as was required to provide the motivational rewards desired by these individuals. The unsuccessful efforts of both the Dean and the Project Manager to obtain recognition of the intellectual property rights of individuals preparing CAL/CML materials began shortly after the initiation of the project (Appendix I). Their failure contributed to the difficulties experienced with these otherwise enthusiastic and creative staff.

As was noted in Chapter 2 by Gillespie (1992a) and others, integration into the regular program is seen as a major indicator of success. While the use of computers has been well integrated into Health Science, the use of CAL/CML has not. In retrospect, CAL/CML development skills have been well integrated into the personal skill bases of selected individuals even while the use of CAL/CML courseware has not. One of the novice health science academics noted above, for example, has subsequently transferred to a service unit as a CAL development officer on the basis of the skills initially acquired while working with the Health Science project.

The person(s) using the courseware in the classroom, normally either a laboratory technician or a lecturer at UCQ, will typically be neither the instructional designer nor the courseware author. Computer use skills are still important for this individual, although in practice there may also be support from a computer support staff person, but the most important skills for success will likely be motivational—good teaching skills that encourage the students to use the courseware effectively.

Ultimately, the project, with all its success and failures, is not important. What is important for the institution is the use which the graduates make of the skills and attitudes that they have learned while at the institution.

Checklist for Managing Failure

When seeking advice from colleagues in the computing industry one is often cautioned, ‘if it ain't broke, don't fix it’, a reference to the belief that a ‘fix’ may cause more problems than it cures. While this practice may be valid when dealing with electronic hardware which, theoretically at least, cannot be periodically adjusted in the same way as the engine on an automobile, it can lead to novice or non-technical computer users being abandoned to a system or an application package with a poor interface or obvious bugs. The ‘expert’ may know enough to ‘work around’ the problem, but the normal user suffers.

People systems, software applications, and perhaps even electronic hardware, require regular maintenance and periodic revision for proper functioning. Elegance in a system requires, in addition, that the system be designed to meet the needs of the real user (of either the system or the information generated by the system), and that the computer applications used in the system are also easy to operate in normal use.

The guidelines which follow, distilled from the literature on technology change as well as the experience of this study, should assist the technology project planner to develop an implementation which meets the needs of the eventual users.

❑ **Anticipate failure.**

Ensure that the students are adequately protected in the event of failure to meet project deadlines, objectives, etcetera.

Structure the project so that it is possible to learn from the mistakes that are evident both from the literature and from the project as it develops.

❑ **Goals must be explicit.**

Identify assumptions and implicit decisions.

Include indicators of success or failure.

- ❑ **Projects will always take more resources than anticipated.**

Successful projects require adequate support—budget, staff, administrative approval, academic approval.

Critical resources include adequate leadership, quality control, and scheduling flexibility.

Commitment from participants requires adequate resources and a positive working environment.

Training is critical. Allow adequate time and resources to provide basic and advanced training opportunities for all participants.

Project participants will accept responsibility if they also have the authority to make the decisions required to perform their functions.

Few people appreciate a ‘super-human’ contribution—and a project cannot be designed to depend upon superhuman contributions.

Anticipate people problems. Training and communications will help ensure that such problems do not disrupt the project.

There has been a demonstrated need in modern society for sexual harassment and equity committees. Support services and procedures must be available within the operating environment of the project to assist staff to ensure that individual differences and rights are respected.

- ❑ **Plan for change.**

Develop programs to orient staff who join the project at a later date.

Technology means change. Design projects to withstand major technological or structural changes.

Identify critical technologies (or people) for your project and provide substitutes or backups.

Avoid making more than one major environmental change—mission, curriculum revision, physical facilities, computer platform, senior staff, etcetera—at a time.

- ❑ **Quality control may be everything.**

Timely, appropriate and effective. This is as appropriate for project management as for upgrade control.

Finally, the author, while working as an adult educator for many years, acquired a reputation for always having a contingency plan—a viable program alternative in case something went wrong.

Often the disaster never occurred and the backup plan was not required. Sometimes the extra planning resulted in the contingency plan being switched for the original plan, however, the extra planning was never wasted as a better planned program and a more confident implementation resulted.

Confidence comes from knowing that you can carry on, and probably succeed, even when the best laid plans fail.

What Happens Next?

Writing a descriptive case study is very similar to story telling in an oral tradition. Both writer and narrator, for example, must know when to begin and end the story in order to provide a coherent tale with optimal impact. Unfortunately, while the narrative can be modified every time that it is presented to take into account changes in attitudes and events, the writer does not have the same flexibility. The written tale has a fixed beginning and end.

This 'story' began with a decision to utilise computers in an under-funded nursing education program and ended as the Faculty of Health Science took over full responsibility for funding and managing its computer activities.

The Faculty of Health Science, however, is a dynamic institution and the effects of computerisation have continued. This section briefly looks at what has happened in the eighteen months following the author's arbitrary end point for the thesis story and the implications for the Health Science's future development.

CAL/CML Development as Strategic Plan

The CAL/CML project and its implementation provided an informal strategic plan for the development of the Faculty of Health Science as well as the development of resource materials until approximately the beginning of 1991. At that time the change from Institute to University was under way and the Health Science staff had grown sufficiently that it was necessary to develop a more formal mission statement and objectives.

In retrospect, it is obvious that the technical staff of the CAL/CML Project had established a working relationship with the initial Health Science staff. The relationship was not always positive and staff were unhappy with the delays in implementing computer support services and the relatively frequent system 'crashes' and related down time. In general, however, they knew the Project staff, met with them during 'smoko' and lunch breaks, and could complain 'in person' when problems occurred.

The influx of new staff late in 1990 and early 1991 coincided with the concerns over copyright, university-wide discussions regarding the future of CML on campus, expanding electronic mail usage, difficulties in installing required network facilities, and the need to revise the curriculum because of the mandated change from diploma to degree program. In addition, as the CAL/CML Project had received outside funding plus a commitment for partial matching funds from UCQ, and the both Project Manager and the support staff did not have 'nursing' backgrounds, it may have appeared to some staff that a significant portion of the Faculty budget was outside their control.

It is not obvious what should have been done differently. The Advisory Committee, which met regularly to provide guidance, contained knowledgable individuals both from inside and outside the Faculty; a Health Science academic staff member had been appointed to coordinate the academically-related management of the Project; and workshop and other training activities were being conducted for both old and new staff to assist in developing the requisite computer skills, and the support staff itself was increased.

Factors Affecting the CAL/CML Development

For the author, there were five very important factors affecting the CAL/CML development during this time, leading to the replacement of CAL/CML development by increased staff computer support as the main priority within Health Science.

First, and perhaps most importantly, the reaction of Health Science staff to the use of computers may paradoxically have been both over-rated and under-rated. Staff were displeased, frustrated, and confused by the many changes that occurred to 'their' computer system. Many of these changes were a result of the staff's own demands for increased computer capability, the rapid expansion of computer services, including several upgrades of the network and associated software, and software manufacturers' upgrades.

Regardless of the reason, few of the changes were transparent. As the Dean noted in an earlier chapter, it is extremely difficult to change word processors while in the midst of a physical move. It is equally difficult to adapt to a new version of a software tool, such as a word processor, when the curriculum is being revised and new staff are being added daily.

The Project reacted to this situation by increasing the amount of staff training, resulting in even more demands upon staff time. Newer versions of software and hardware, implemented in order to solve the problem, exacerbated the problem. Thinking that a solution to the problems verbalised by staff was to provide every staff member with their own personal tools, available

24 hours per day, the Faculty may ultimately have over-reacted. Funding that might have been used in other ways was used to purchase additional staff computers and related materials.

Paradoxically, some of the problems were undoubtedly real concerns about the computerisation of the workplace and the educational process. In the author's opinion, the academic staff were ultimately able to accept the benefits of electronic mail, word processing, and similar applications because they could see an increase in their own productivity using the computer tools. This productivity increase was probably heightened by the knowledge that support staff for typing and similar chores could not be increased for budgetary reasons and an observed democratisation and speeding up of communications through the electronic network. The staff were willing to endure a significant learning curve and were able to overcome their personal concerns and phobias because of the perceived benefits.

The CAL/CML development, however, required an additional time investment and, while not investigated at the time because the author did not perceive the problem in these terms, it appears likely that most of the academic staff were unable to 'give up' their personal contact with students sufficiently to accept CAL/CML as an educational alternative. Some staff, for example, consistently used the computer-based teaching materials as extra or 'add-on' assignments, rather than using them as designed to replace face-to-face tutorial sessions.

The author's experience with academic staff in the Department of Mathematics and Computing over the same time tends to confirm aspects of this hypothesis. At least one computing lecturer has had similar difficulties using scheduled non-lecture (tutorial or laboratory) sessions for tutorial rather than lecturing activities. Similarly, several staff have been reluctant to provide on-line or telephone tutorial and 'help desk' support because, they insist, the students 'need' face-to-face contact with the lecturer for all their learning activities.

A second factor affecting the CAL/CML development, in the author's opinion, was the insistence of some Health Science staff, that all Health Science staff should be Australian-born and have nursing qualifications. Since several academic and general staff were not Australian born this led to a generalised management problem, seemingly solved when one of the most vocal academic staff members eventually left the staff. The lack of basic nursing qualifications, although not the lack of health education experience, was common to all of the support staff except the nursing laboratory supervisor. This led to some generalised management problems, but was more specific to the CAL/CML development. It was difficult to discuss a teaching strategy or even an improvement in grammatical style with a colleague, for example, when that colleague refused to accept that experience in any other field or country was applicable to teaching Australian nurses.

The result was a decrease in involvement with some staff and a failure to become involved with the CAL/CML development on the part of others.

The third factor affecting the CAL/CML development resulted from unforseen personal difficulties of staff involved in the Project and the Faculty. The spouse of the academic staff member appointed to coordinate the academic portion of the Health Science computer activities, for example, became quite ill soon after moving to Rockhampton. This resulted in the staff member losing significant amounts of time to assist with the spouse's treatment. It is probably not surprising, therefore, that the Academic Coordinator was unable to accomplish the integration of computer-based learning materials into the curriculum.

The situation of another staff member was equally unfortunate. The industrial dispute involving this staff member affected all staff within the Faculty, resulting in some staff spending more time documenting their activities than in performing their assigned duties. Computer support staff were involved as it was alleged, among other complaints, that this individual's computer files had been deliberately erased.

The fourth factor relates to the first, and was a result of the unforseen but constant changes that affected the Faculty from beginning to the end of the CAL/CML Project.

The CAL/CML management team—the Dean, the Project Manager, and the CAL/CML Advisory Committee—recognised that Health Science and the University would change during the time of the CAL/CML Project. What was not recognised was the degree of change that would be involved. For example,

- The nursing curriculum, with many subjects not yet completed, would have to be totally and immediately revised in 1990.
- Time constraints within the curriculum would lead to the elimination of the introductory computing subjects for first year students.
- Health Science would become the most heavily computerised UCQ Faculty, with probably the highest per capita Faculty-funded investment in computing infrastructure.
- The staff demands upon the network and the in-house computing support staff would lead to almost constant software and hardware upgrades, with resulting confusion and increased training needs, and an unintended down-grading of the importance of completing CAL courseware.
- The senior management of the institution would change, and the focus of the institution would change from teaching to research, all within a few months. With this would come the need for changes in almost every policy and procedure within the institution.
- Individual staff without higher degrees would be encouraged, indeed required, to upgrade their qualifications immediately.

Finally, the fifth factor was the degree and speed of change that occurred within the computer-based learning industry itself.

In 1988, the IBM/MS-DOS based computer was clearly inferior to the Apple Macintosh in terms of its potential for preparing and delivering non-text-based learning courseware. The Macintosh had a consistent graphical interface across most applications and good quality courseware authoring tools. Development tools, such as flatbed scanners, were readily available and easy-to-use. Multimedia, hypermedia, and other sophisticated presentation technologies were limited to courageous individuals and researchers.

As well, it appeared that although authoring systems such as Course of Action and Tencore were expensive and required well-trained professional developers, tools such as Hypercard would make individual author development of courseware as feasible as small scale publishing had become using desktop publishing tools. The Health Science decision to adopt the Macintosh platform and develop learning materials locally seemed quite feasible.

By 1993 the IBM/MS-DOS platform has caught up to the Macintosh platform in terms of the presentation of CAL/CML and multimedia materials. Certainly there are many millions of older machines being used that cannot support newer technologies, but the newer machines on both platforms are capable of presenting live video, animation, sound and colour as well as text. Current commercial educational and training courseware uses all of these features.

The Macintosh is still the development platform of choice for innovative developers but both platforms support development products, such as Authorware and Macromedia Director, that are equally capable of preparing innovative instruction and entertainment products, for the individual or group that has been trained in their use.

Instructional designers may still question whether sound, motion, and colour are important for learning but the 'infotainment' industry has dictated that courseware without these attributes will be seen by the consumer, student and staff member alike, as inferior. Ultimately, this commercialisation and raising of user expectations probably also condemns both the desktop-based individual author approach and local development of anything other than very basic materials to oblivion.

A New Strategic Plan

The strategic direction that had been provided through the CAL/CML Project faltered as staff size increased and institutional priorities changed. The challenge for Health Science is to develop a new strategic plan that takes into account the current institutional priorities, student needs, and technological realities.

Staff use of computers for personal productivity is well enough established that this change would likely be impossible to reverse. Given past trends, it can be expected that staff will continue to demand more powerful facilities (additional memory, faster computers, CD-ROM drives), infrastructure improvements (faster network, more and faster laser printers, subscriptions to external database services), and enhanced software (desktop publishing, multimedia products). Given the probable lack of additional resources from the University administration, Health Science will have to provide such support from Faculty funds.

Staff preparation of CAL/CML courseware has been very uneven. Some staff members prepared courseware using the Faculty-supported tools, primarily CAL_Maker. Others used Hypercard and other tools to prepare unique and innovative materials for student use. Perhaps the greatest irony of the CAL/CML Project is that it was the development of these more innovative materials, usually with financial support from the CAL/CML Project funds, which led to the dissatisfaction with CAL_Maker.

The availability of Australian-based nursing courseware has not increased significantly since 1988, thus the argument for locally-developed courseware remains. The Faculty must first decide whether to continue to support computer-based learning, then whether to continue to support local courseware development.

If the Faculty continues to support computer-based learning, then outstanding issues such as the ownership of the intellectual property in courseware and what credit an individual developing courseware should receive towards promotion must be resolved at the institutional level. In basic terms, the question is whether courseware development is equivalent to academic publishing.

The current computer-based tools, primarily CAL_Maker for courseware authoring, the multiple choice question bank, and the Clinical Placement system, were appropriate when conceived and, like the thousands of Cobol programs still being used by business, appear to be functional for their designed purposes. The Faculty will have to decide whether to continue their use or to replace them. Either course has financial, staffing, and training implications.

Avoiding the Time Warp

Any technology project such as has been described in this thesis forces its participants to make decisions that create a 'time warp' in their thinking, if not in reality.

Budget realities force priorities and decisions that constrain future decisions. Choosing the Macintosh platform, for example, provided a certain set of courseware development opportunities. A smaller student laboratory and a one-two person expert-staffed development facility with high powered computers would have cost approximately the same as the twenty station student laboratory, desktop computers for staff, and in-Faculty computer use support, however the results should have been far different.

The Faculty made a decision to purchase a reasonably large number of lower cost monochrome computers, spreading the impact of computerisation but decreasing the ability to respond to technological innovations such as colour, CD-ROMs, and multimedia.

Unfortunately, these same decisions were seen by some staff as constraining the educational process. Perhaps there would have been less dissension if these individuals had been involved in the decision-making process from day one of the Project, however, it is doubtful. A dedicated educator, entranced by a technology that can seemingly make a significant impact on learning, will always have difficulty accepting the reality of priorities and budgets.

Developing a new strategic plan will be the greatest challenge for Health Science. The strategic plan must provide a blueprint for the future that is sufficiently flexible to adapt to changing circumstances, people, budgets, and technologies. For if we have only learned one thing from this Project, it is that change is constant.

Finally, the Faculty must look at the form of its management as one of the strategies for achieving its goals. The conventional management structures of a hospital or teaching institute may not be appropriate for managing change in a technology-based organisation where change is constant. As Zuboff (1988, 7) indicates,

> Computer-based technologies are not neutral; they embody essential characteristics that are bound to alter the nature of work within our factories and offices [and universities], and among workers, professionals and managers.

This study has provided a small selection of stories from one small portion of the University of Central Queensland as it reacted to organisational and technological change. There are many more stories that could, and perhaps should, have been told. The future of the University may rest in how well we have learned the lessons available from these stories.

Appendices

Appendix A

Initial Documentation—Project Design

This appendix contains documents and excerpts from documents relating to the period from October, 1988, to February, 1990 when the Project was conceived. The documents trace the development of the initial concepts, the consultant's work with Health Science, and the development of computing student projects.

Initial Responses to Nursing Computing Needs

To: **Head, Nursing Department**

From: [Author's Consulting Firm], 29 Oct 88

Re: Computing Facilities for Nursing Department

The following notes are an initial response to your recent memo describing your current computing facilities and projected needs. The physical situation and needs are not abnormal, however your notes indicate a possible lack of awareness of the current uses of microcomputers in academic situations and suggest that you and your colleagues need to ask some serious questions about the extent of the facilities that you want to provide. These notes assume some knowledge of computing terminology, and in the interests of brevity over international communications systems, I would suggest that you seek local assistance in understanding new terminology.

Current Facilities: A first quick examination of your situation indicates that the ThinkJet and Laser printers are your only computing items that are compatible with currently marketed equipment. We are then looking at a reasonably clean slate and can ignore your current equipment in looking at your new needs.

The range of microcomputer equipment that you indicate for other units within the college suggests that we also do not have to conform to institutional "standards" as there do not appear to be any for the acquisition of microcomputers.

The need to maintain links with the existing mini or mainframe computers (VAX, IBM) on the campus can either be met with dedicated computer terminals or by almost any microcomputer running the appropriate software (communications software for microcomputers often includes terminal emulation capability). Since you currently use the existing VAX system for accessing external communications systems any access to the VAX machines will automatically provide the access to the external services. Alternatively, the microcomputers, using the same software, can access the external communications services as long as they are provided with a modem.

Limitations of Described Needs: Your memo indicates several staff needs: word processing for all staff with the departmental secretary providing formatting and final polishing of copy, and access to communications systems. There is no indication of the quantitative demands upon the facilities. For example, will all 25 of the expected staff be preparing their own materials for several hours each day? How many staff members will be sharing each office? How many additional support staff will you be adding along with the additional teaching staff? Will all of the staff be located in the same building, or will some of them be located on one or more satellite campuses?

The answers to these questions have obvious implications for the quantity and type of facility required. There are at least two common models for computer use in North American academic institutions. The first model places a computer on the desk of every full-time faculty member who has a need for the equipment, part-time faculty usually have to share equipment. In this model each computer may have its own inexpensive printer (your current ThinkJet, for example) with laser and other expensive facilities centralized. In this model the institution may supply the equipment directly, or the staff member may receive a subsidy to purchase his/her own equipment. The second model categorizes staff needs and assigns equipment on a pooled basis. Where staff share offices the equipment might be placed in individual offices for the use of the individuals in the office. Alternatively, staff may have to move to a special computer room for their work. In both cases arrangements need to be in place to resolve disputes over priorities and timetable conflicts. It should be obvious that the first model provides for individual needs. The second model may be more economical but does not encourage the effective use of the resources.

You indicate that the student use is limited to the use of study packages produced elsewhere. This suggests a study hall approach where you have a small facility that can be pre-booked as needed by individual students. This also seems to suggest that the students will be expected to view the computers as a tool for delivering parts of their academic programme but not as a tool for their professional use. The staff are requesting access to computers to assist in the preparation of their written materials. Are the students not expected to have similar needs? Do you not expect computers to have any role in their professional work: admissions, patient monitoring, records, etc.? How do you expect the students to work? Individually? In small groups? Large groups? In their residence rooms? Remotely from their homes or satellite campuses?

On another tack, it has been proven that one of the most effective teaching techniques is to allow students to design and produce study materials. As they work on the study materials they are required to learn the subject matter, preparing the study materials brings the same benefits to learning as that provided by student tutoring. Will all of the study materials be obtained from outside the college? What type of study materials? What level of simulation or graphics will be required? What form of student interaction? Your current computers, for example, were designed with a touch screen to facilitate user (student) interaction. While this type of computer is no longer available, there are other techniques for achieving user interaction. Some of these techniques are implemented in hardware, some in software, the level of need will have implications for your specific requirements.

The Next Step: I have posed a number of questions, some of which will have implications for the management of your department far beyond the simple acquisition of computer facilities. Certainly your answers will have a significant impact on the physical design of your buildings (academic and residential), the way in which your students and staff interact, the design of your instructional programme and the student's perception of his/her role as a health professional -- the basic philosophy that you are teaching.

I am willing to forward additional comments, suggestions, recommendations, however I await your response to these thoughts before doing so.

Electronic Mail Message to Students Describing the Project

To:	second_year_mm	Date:	October 28, 1988 1:01 pm
From:	[Author]	Subject:	308 Business System Assign

....

Your course outline indicates a "Business System Assignment" due the end of week 12 and worth 5% of the final mark. Herewith follows the first information on that assignment:

You have been asked to advise the head of a new Nursing Dept. at a college on the purchase of computer hardware and software for a new building which the Dept. will be occupying in about a year's time. You should be prepared to discuss hardware, software, physical facilities and the "general care and feeding" of the acquisition.

The Nursing Dept. currently has two HP150 micros with dual disk drives (3.5" incompatible disks) and use Microsoft word processing software. The micros are primarily used by the Head of the Dept. and the Dept. Secretary, both for word processing. The Director has a Thinkjet printer and the secretary has a laser printer.

The college has a VAX system which is used for an internal mail system, for connections to external mail systems, and for maintenance of the library catalogue and records. A separate IBM system is used for the college's financial, personnel and student records. Other departments at the college use a variety of different (incompatible) systems for word processing, database management, scientific calculation, etc.

The existing staff of the Dept. (4 nurses plus Head and secretary) have some interest in the use of computers. The Head is a reasonably knowledgable IBM micro user and one other staff member uses an Apple II at home for word processing. The staff is expected to increase to about 25 over the next 3 years, with about 400 students in nursing at the end of that time.

The nursing Dept. has expressed an interest in the greater availability of micros to allow:
- all staff to produce their own notes, exams, papers, etc.
- the secretary to receive disks, etc., containing draft materials for final polishing and printing.
- all staff to gain access to at least on-campus electronic mail and perhaps other systems.
- students to use study packages produced elsewhere, currently mostly either Apple or IBM compatible format.

The budget for purchases is not yet fixed.

What would you recommend to the Dept. Head in this situation?
- Hardware, software, physical facilities, consumables & maintenance?
- What questions should she ask (of the vendors, her staff, the students) before making any decisions?

I suggest that you should be prepared to submit a rough draft for comments in week 10 (prior to COMDEX), and then the finished recommendations for week 12. We will discuss further aspects of the assignment in class over the next several weeks.

Third Response to Initial Query

To: **Head, Nursing Department**

From: [Author's Consulting Firm], 20 Nov 88

Re: Computing Facilities for Nursing Department

This is the third in a series of responses to your computer facility query. The first posed a number of questions for your department. The second was a copy of the rough draft of one student's response a `case study' representing your problem. This note will discuss the basic physical considerations for an installation regardless of your final selections.

Almost any small computer installation has the same physical requirements of adequate power, potential connectivity, and physical comfort (of equipment and user).

Assume from the beginning that you will need to provide a minimum computer system to each faculty member and student work station (or residence room). You may not initially require (or be able to afford) this level. However it is cheaper to provide the power and other connections at the design stage than it is to retrofit even a few at a later date.

Assume also from the beginning that you will want to link every piece of equipment together into a local area network. Such a connection is extendable to external services (the VAX, IBM and commercial computer systems) as well.

POWER: Microcomputer users have at least twice the electrical power needs of non-computer users. The requirement for each individual work area should be based upon at least the peak power demands of the following equipment:

> Desktop Computer with heavy-duty power supply, Colour Monitor; Laser Printer, Stand-alone Modem, Stand-alone FAX machine or Scanner, Telephone system, Desk Lamp, Portable Air Conditioner (humidity, ionizer), PLUS whatever nursing, teaching or other equipment would be used (slide projector, tape recorder, simulator, patient monitor, fridge, etc.).

CONNECTIVITY: All current network systems can be accommodated within an electrical conduit or channel with a 2" or so minimum diameter. Some systems use ordinary telephone cable, others special network cabling, and even other newer optical technology. All will fit within standard electrical conduit. If your building provides conduit and wall or column mounted junction boxes for all work stations specific decisions can be left to the future.

[Note, for maximum flexibility this conduit MUST be separate from the electrical system, have turns of no less than roughly 24" radius (No "T" joints for example), extend from floor to floor as well as room to room, and feed to a common service room on each floor.]

PHYSICAL COMFORT: Lighting, natural or artificial, must be designed for the all potential video screen locations; reflections and glare are impossible to remove "after the fact".

The ventilation system must account for the extra heat generated by the electronic gear; smoke and dust control are equally important. Consider also providing secure space for confidential records (secure being defined as environmentally secure as well as the more conventional "lock-up" security) in a central location.

The physical security of equipment could be ensured through the provision of built-in tie-down rings of case-hardened steel to which cables fastened to the equipment can be locked.

Could these tie-down rings be located in a recessed wall or column box so that users don't trip over them on the floor? And could all power-connectivity points be similarly located? This would give the added advantage of providing maximum flexibility for future room changes.

Ergonometric seating and similar considerations are a problem of furniture and hardware selection, not building design. However the space in which to put the chair or desk is part of the design. Particularly in small offices and residence rooms, increased space allowances must be made for computers, printers, etc., in addition to normal work space needs. In realistic terms, the work minimum space and furniture requirement probably doubles with the use of computers.

SUMMARY: Keep your computer options open. Provide adequate power, a conduit for future connection possibilities, and a safe, healthy working or living environment and you will retain your flexibility for the future.

Initial Vision: Hospital in a Box

c. February 1989, Written by [Author] from discussions with [Dean]

Hospital in a Box

This computerized learning exercise is proposed as an alternative to a manually operated simulation exercise. Manually we might envisage a collection of files folders, one for each of the 30 patients, plus a number of folders representing the central records for the unit. Each individual folder item (test result, nursing report, x-ray plate, etc.) should be contained in an enclosure (envelope?) which is coded for easy retrieval but designed to keep information private until required in the exercise.

In addition, the exercise would require student and instructor guidebooks and similar materials to structure the exercise and provide feedback for common responses.

The computerized exercise would contain the same basic materials, and a presentation system that allows students to participate in the exercise with minimal instructor supervision. The 'folder' items would typically be retrieved from the data base and bedisplayed on the CRT rather than as artifacts. The computer would allow the student to choose appropriate (or inappropriate) actions, present information from the database upon request or as structured into the exercise, provide feedback on theimplications of the actions, and maintain a record of the student's progress for evaluation and supervision.

A student using the exercise could proceed in a structured routine as directed by the instructor (and/or the computer presentation), or alternatively, in an unstructured manner similar to some of the more complex computer 'adventure games' or business simulations which it resembles. (One of the obvious differences from the 'game' would be the volume of information available to the student in the database.)

Preparing the exercise would require compiling fictitious data or modifying real patient data to develop all of the appropriate records that might be available to a nurse on the standard hospital unit. The data base would have to be designed to accommodate textual information, numerical data, scanned representations of photographs, x-rays, etc. The data base manager(s) should be designed as generically as possible to allow the same basic presentation engine to be used with a number of discrete data bases.

The computer exercise has several obvious advantages and at least one major disadvantage. The computer data base can make available much more information than can be managed with a manual exercise. The computer exercise can hopefully be used with minimal instructor supervision, it can be used repeatedly with the same or different data, and can immediately present implications of actions taken. As well, the computer exercise can allow the student to experiment with appropriate nursing decisions in a manner which is safe and relatively economical. One major disadvantage of the computer exercise is the cost, both to develop the materials, and to provide suitable computer equipment for use by a large group of students.

Clinical Scheduling Software

Memorandum from the Associate Dean, 13 March 1989, with the genesis of the clinical scheduling software.

From: [Associate Dean]

Date: Monday, March 13, 1989

Topic: COMPUTER PROJECTS

A couple of ideas for computer projects for [a nursing project student].

1. A programme that enables us to track each student as To:

    simulation and other exercise practise

    clinical competence attainment

    field visits

    individual projects

    clinical placements

        place

        time

        competencies practiced

It would need to be a system that could be accessed by the student for input and output (a form of student diary) and by the instructor for input (feedback to the student) and output.

2. Grade Record

A programme that enables us to enter the grade for each assignment for a subject and have the weighted grade calculated. On completion of the subject a final grade could be produced with the minimum of calculation by the instructor. Scaling of grades could also be built into the programme if that is required.

Staff Involvement in Planning Computer Use

Memorandum from the Associate Dean to the Dean

From: [Associate Dean]

Date: March 14, 1989

Topic: TEACHING STRATEGIES WORKSHOP

I would like to schedule a two day workshop for staff the week of May 15.

I feel that it is essential that we get together and discuss the philosophy and objectives as outlined in the submission document.

Putting the "Green Book" into operation demands committment on our part as to the types of teaching strategies used and the evaluation processes used for students and curriculum.

Could we discuss this proposal?

I have identified several teaching approaches that we could use for the course. *We also need to present our ideas on the use of computer managed learning to the total staff. I have the feeling that some are more than sceptical.* [emphasis added] The use of field and clinical resources is another area for discussion.

The outcome of such a workshop would, I hope, be commitment to an overall plan for implementation and the formation of working groups to begin identifying competence and cognitive levels for each nursing subject. We should also be identifying areas for course and program research.

I will contact [Assistant Master of the Residential College] and see if Common Room A is free for a couple of days that week. A light sandwich and salad lunch would be nice (not the strictly correct use of nice but I can't think of another word).

Consultancy Objectives

Written by the Author for the Dean, Health Science

DRAFT - CONSULTANCY FOR DEPT. OF MATHS & COMPUTING SCIENCE AND DEPT. OF NURSING [c. 2/5/89]

Objective:

Provide these Departments and potential co-operating agencies with a draft plan of action for the development and production of computer-assisted instructional materials for the Dip.Hlth.Sc.(N) program.

Specific Tasks:

1. Brief review of existing CAI materials now available at CIAE or elsewhere which might be of use in this program.

2. Review of curriculum of Dip.Hlth.Sc.(N) with course co-ordinator and other relevant staff to develop a priority list of instructional units which would be most amenable to a CAI approach.

3. Preparation of a draft plan of action outlining:

- priority units to be developed in each of the next 3 years
- time-lines for preparation of these units (including an estimate of the amount of staff time, both nursing and cae, required)
- equipment list required for development phase

4. Consultation with Computing Services with regard to computing equipment and software which will be required in the Nursing Building as a result of this project.

5. Consultation with Dept. of Nursing and Dept. of Maths & Computing with regard to staff capabilities required.

Time Constraints:

It is expected that this consultancy, including all interviews and preparation of final report will be concluded by 31 August, 1989. Interim monthly progress reports to be made to the Heads of the two Departments. It is anticipated that 200-=250 hours of consultant time will be required for this project, including all activities.

Support:

If the consultant is based in Rockhampton office space and secretarial support will be available through the Dept. of Nursing. If the consultant is based elsewhere the provision of support services will be his/her own responsibility.

In either case the Dept of Nursing will make available appropriate nursing staff for subject-matter consultations and will facilitate the consultant's access to other relevannt individuals on campus.

Copies of the relevant curriculum outlines will be supplied by the Dept. of Nursing.

Consultant Characteristics:

1. Ideally some familiarity with instruction in the health care area.

2. Experience with cai at the tertiary level and/or in technical/professional settings.

3. Able to interact effectively with health professionals and educators who have little or no experience of cai.

Joint Activities with Mathematics and Computing

CAPRICORNIA INSTITUTE OF ADVANCED EDUCATION
DEPARTMENT OF NURSING

MEMO TO : [Name], HEAD, MATHS & COMPUTING
FROM : [Name], HEAD, DEPT. OF NURSING
DATE : 24TH MAY, 1989
SUBJECT : <u>RESEARCH AND DEVELOPMENT - COMPUTING AND HEALTH SCIENCES</u>

I trust you have received my previous message re meeting with interested staff in Dept. of Nursing on Tuesday June 13 from 9 - 10 am. to discuss whatever you wanted to raise re Maths and Computing interest in computing and health sciences. Here are a few thoughts to get the discussion started.

1. The "easy" applications in health science have already been done and are available commercially, although at a high price and sometimes needing a lot of adaptation to fit Australian practices. These are primarily in financial, personnel and inventory systems but there is still scope for developing useful and very user-friendly small-scale systems which would be a genuine help rather than an extra problem in very small hospitals, nursing homes, clinics, etc.

2. The Qld. Dept. of Health has a quite large scale hospital computer project going. I'm not sure what it really includes, but information would be available from the Brisbane office. (Probably too far away and too big to fit in very well with possibilities here.)

3. The Dept. of Nursing (Capricornia) will be trying to develop a number of CAI applications which could certainly involve some maths/computing expertise in development and testing. This experience would probably help to familiarise grad. students etc. with the health care field and perhaps make them more credible to the service side - no promises though. And one caveat - any "help" coming from grad students must be helpful and not another drain on our resources.

4. The possibilities for developing "bedside" or "field" applications (patient records, on-call information, etc.) are almost totally unexplored. Given the proliferation of [pocket paper] reference guides for nurses and developments like the Sharp IQ7000 there would seem to me to be a lot of possibilities here - some of them may even be commercial in time.

5. The "Hospital in a Box" idea is educational in intent, but may also have uses for planning and forecasting.

6. We have a desperate need for a system for recording student clinical experiences and evaluations. A simpler version of such a system could also be very useful in staff evaluation.

Your turn!

[signed],

Application for Consultancy

To: [Head of Department, Mathematics and Computing]

From: [Author], 30 May 89

Re: **Consultancy for Diploma in Nursing Program**

Further to our recent conversation, I am enclosing a short timeline and notes about some of my concerns for this project. I have not detailed a 'proposal'; I assume that an operational workplan would evolve from meetings with the staff.

I understand that you are now looking at the end of September for the recommendations for the new building, etc., and I have taken this into consideration in my timeline.

My investigations suggest the Institute currently lacks viable authoring software to prepare courseware and/or instructional simulations. Having read the proposal for the upgrade of the academic computer I do not believe that there will be very much initial support for CAL/CML from that system. One of my major concerns then is that the timeline is somewhat out of our hands in that we will be dependent upon receiving information from distributors in Sydney and Brisbane and/or overseas (even when there is an Australian distributor for a product that interests us). Local vendors appear quite interested in providing as much assistance as they can, however they readily admit that their local resources are very limited.

The local vendors are very hardware oriented. This is to be expected given the market situation, however it will constrain our attempts to define needs and locate appropriate software prior to the selection of a hardware platform.

The nursing staff that I have talked to are quite interested and enthusiastic about the possibilities involved in CAL/CML; however their experience is limited. I would suggest that one of the activities of the consultancy should be the development of trial lessons, sample test banks, etc., using some of the software packages that can be obtained for evaluation. In this way the staff and consultant can both get a better idea of the time demands, computer skills, subject knowledge, and pedagogical expertise necessary to develop courseware. In other words, the consultancy should be used to develop the nucleus of a CAL/CML 'team' within the nursing staff.

The time required for this last task in particular needs to be very flexible. I assume that the preparation of the Plan of Action and related curriculum topic priorities, equipment lists, staffing lists, training requirements, etc., has the highest priority. I would suggest that a minimum time allocation of 250 hours, plus related materials and other costs, be budgeted. It would then be the consultant's responsibility to manage the time to achieve the maximum results possible. To assist in this, I would suggest a meeting of the consultancy advisors approximately 15 June to review a draft work plan, and monthly following the interim reports to monitor progress.

As I am in Rockhampton I would assume that the Institute would provide work space and support services, most particularly communication facilities and suitable computer services for the preparation of reports, Plan of Action, etc. In this latter regard, I am most willing to supply my own applications software (word processing, spreadsheet, data base management, project planning, etc.) for a standard IBM style computer with a minimum 10M hard drive if I can have exclusive use of the machine for the duration of the project. Alternatively the Institute could supply software or arrange a rental of my own computer.

TimeLine (assumes a 1 Jun 89 start)

15 Jun - Draft: Workplan for Review

30 Jun - Monthly Interim Report

Review of Curriculum and Draft Priority List for CAL

Review of existing CAL materials at CIAE

31 Jul - Monthly Interim Report

First Draft: Plan of Action (as per your draft tasks)

Final Draft: Priority List for CAL

First Draft: Equipment List

31 Aug - Monthly Interim Report

2nd Draft: Plan of Action

2nd Draft: Equipment List(s)

Demonstration Package of Sample Projects

First Draft of Courseware Evaluation Paper

30 Sep - Monthly Interim Report

Final Draft: Plan of Action, Equipment List(s), etc.

Input to the CML Working Party

CAPRICORNIA INSTITUTE OF ADVANCED EDUCATION

DEPARTMENT OF NURSING

MEMO TO : [Name], CHAIR, CAL ADVISORY GROUP [sic, actually the Chair, CML Working Party]

FROM : [Name], HEAD, DEPT. OF NURSING

DATE : 6TH JUNE, 1989

SUBJECT : SCHOOL OF HEALTH SCIENCE INTERESTS

I'm not quite sure when and how we can or should make some input into the advisory group, but I am anxious that our interests and needs are included in the total picture (especially since a number of people on campus have been quite surprised to find that we have any interest in CAI-CML at all).

For starters:

1. We have set up a database of all software (and non-computer based simulations) which seem to be pertinent to nursing education. The database is far from complete, but is probably the best picture of the state of the art of the Australian situation at the moment. I am anxious to get this onto the Vax so that it can be a publicly searchable database and so that Capricornia 'stakes out its interest' in this area. So far all of this work has been done with Dept. of Nursing funds since Computing Services was unable to provide help within the three-month time limit which we had for preparing this material. What infrastructure is CIAE prepared to develop to support not only particular CAI projects, but also the field in general?

2. In the course of obtaining information for the data base I discovered that two items of software which were ostensibly available at Capricornia weren't. One was on 'permanent loan' to another school and could not be found; one which Nursing had recently purchased and had placed in the Library had apparently been improperly copied. (When I queried this I was told that the software could not be run on the micros available in the library, but would require machines with a hard disk. This is not so; apparently the material to run the simulation can all be copied onto one diskette but it requires some knowledge of systems generally to know that if you have to leave off something, the .exe file is not the one to omit.) I cite this story not to bad-mouth the Library, which is making a noble effort to provide services, but simply as another example of the need for a better infrastructure if we are to go in this direction. If I refer students to this material in the Library what will they be told about its availability? How will they be helped to use it?

3. In the Diploma in Nursing program we are making a valiant effort to put as much material as possible onto a CAI or CML format, but there has been almost no support (other than moral support) from the college as a whole to date. Computing Services is apparently kept busy keeping their existing systems going. Maths and Computing has some expertise but again fully occupied. We have eventually take the rather desperate measure of hiring our own computer consultant (at the cost of a staff position, which we can

ill afford). If we need to create our own CAI-CML 'service unit' within the School of Health Science we will probably do so, but I believe that the college (university?) would be better served as a whole if that expertie were available in a central location. We have taken the temporary expedient of hiring our first short-term consultant through the Dept. of Maths & Computing, but I am not ure that that Department wants to see itself as providing this kind of service to another academic department. If that is seen as a useful role for the Dept. of Maths and Computing then it would seem to me that it should be given appropriate resources rather than having to 'bill back' the units receiving the service.

4. A similar problem exists with hardware. The proposal for a new academic computer which was recently approved by the Computing Advisory Committee makes no mention of microcomputers or other hardware which will be at the periphery of the network. When I inquired I was told that micros have to come from the Departmental budgets. I know that that is the present system but, again, it seems to me that the overall interests of CIAE would be better served if the resources for 'computing' were looked at as a whole rather than depending on individual departmental priorities for anything other than mainframe computing. This is not exclusive to the CAI-CML issue, but isnce a good many packages are prepared for use on micros I think that it is a point which should be considered.

5. We are hoping to develop some kind of joint project with Apple with regards to the development of several CAI packages in nursing. What encouragement is there for this kind of endeavour?

[signed]

Head, Dept. of Nursing

Consultant Explains Objectives to Health Science Staff

Memorandum from the Author, Consultant, School of Health Science

For discussion with Dept. of Nursing: 9:00 a.m., Tuesday 20 Jun 89

Diploma in Nursing Program

Computer Consultancy

Objective: Provide the Departments of Nursing and Mathematics & Computing with a draft plan of action for the development and production of computer-assisted instructional materials for the Dip.Hlth.Sc.(N) program.

Tasks: In brief, the consultant will provide:

- a review of existing CAL materials that might be useful;
- a review of curriculum of Dip.Hlth.Sc.(N) to develop priority list of instructional units;
- a draft plan of action for next 3 years including priorities, time-lines and equipment lists;
- assistance regarding computing hardware and software requirements for the new building;
- assistance regarding staffing capabilities required.

The consultant, [Author], has worked with a variety of individuals and institutions over the last several years; helping them define their computer needs, assisting in the installation of their computer facilities, and providing training in the use of these new facilities. He will have space in [Health Science office] until the end of September and will be available for consultation, meetings, etc.

Rationale: The Department of Nursing is looking at the feasibility of using computers to enrich the learning environment, provide a wider range of clinical experiences, and relieve staff of mechanical chores associated with teaching- learning activities.

Computer Assisted Learning (CAL): The use of computers within the learning environment to deliver instructional materials. The computer is used as tutor, peer advisor, simulator, etc.

Computer Managed Learning (CML): The use of computers to assist with the management of the learning environment. This includes maintaining class lists and grades, maintaining lists of clinical assignments, testing and remediation, and directing students to appropriate learning materials.

Advantages of using the computer include the potential availability of learning materials 24 hours per day, managed pacing or self-pacing, alternate learning techniques and/or patterns easily accommodated, and convenient monitoring of student progress.

The development of a program based upon the intensive use of computers therefore implies the development of a student-based, self-paced learning environment. It also implies a high degree of staff and student commitment to initial development and then to maintaining the program.

Student Projects Initiated

To: [Coordinator, Student Projects], Maths & Computing

From: [Author], Maths & Computing, 27 Jun 89

Re: Field Placements for M&C Students with Nursing CML

Further to our recent meeting, I have descriptions of two potential field placements for your Grad.Dip. students. Once we have met and discussed their possibilities I can probably provide further details.

1. HYPER: Modifications to a PASCAL program to meet the needs of the Department of Nursing for a hypertext-type processor.

Matthew Kennedy has programmed a very simple hypertext-type processor for displaying text (no illustrations) and is suitable for use as an on-line help manual. This program has potential for wider application but needs a number of modifications to make it more useful. Modifications required include the ability to display screen diagrams, ability to nominate levels of importance and appropriate changes to the 'table of contents' to list only major topics with a corresponding full TofC, retention of major topic as top of screen heading, concordance generator step with hand editing as input to an automatic linkage generator, etc.

2. RECORD KEEPING FOR STUDENT PLACEMENTS: Development of the specifications for a student record management system for use by the Department of Nursing for clinical assignments.

As the first step towards a fully automated CML system for managing the learning process, assignments, clinical placements, special placements, etc., the Department of Nursing needs a pilot system capable of keeping track of roughly 300 students in field placements at 20 different institutions. This system should be able to schedule placements and clinical supervisory time to ensure against duplications, provide balanced assignments, etc. The system must be flexible enough to handle holidays, sick leave, etc. as well as being modular to form one part of a broader student management system. It is anticipated that this system would probably be installed on a PC style computer.

Setting Priorities within Health Science

To: Colleagues, Nursing

From: [Consultant], 30 Jun 89

Re: Informal Meetings, Computer Wish List, etc.

1. As discussed at our recent meeting, I want to be available for informal discussion on a regular basis. My suggestion is Monday, 10:00 a.m. to 1:00 p.m. I will endeavour, as far as is possible, to be available in the common area at morning tea time and then from noon onwards. I will also be available in the back room the rest of the morning, please feel free to interrupt me.

2. Having set the general time for our informal discussions, I will be involved with the Byte Computer people this coming Monday at 10:00 a.m. The developments with Apple/Byte are very interesting and you might want to get an update later Monday morning.

3. I am trying to develop some priorities for the development of the computerized instructional materials… Do you have any suggestions for a 'wish list', either for specific instructional materials, or hardware, or support tools???

4. I am trying to start a file of materials that would be usable for a series of case studies or similar tools looking at the some of the following topics. If you have any references to resource materials (or copies of the materials themselves) I would appreciate your passing them on to me. - Community Health activities - Ward Management - Cross-Cultural, ethnic, aboriginal health issues.

The Institutional Environment

Draft Report for Discussion, from Consultant [Author] to Health Science

DRAFT: 30 Jun 89

CAL at CIAE

Facilities

Computing facilities at CIAE are available at two levels. The central computing facilities include academic and administrative support and communications with external users. This is accom plished with medium-sized VAX (academic) and HP (administrative) systems and centrally scheduled microcomputer laboratories. As well, Schools and Departments have their own microcomputer laboratories and/or microcomputers for individual faculty. Clerical staff use a variety of word processing facilities, both dedicated and micro-based. In total there are at least five reasonably incompatible microcomputer types (Amiga, Apple, HP, IBM/MS-DOS, Macintosh, etc.).

Microcomputer software support is just as varied. Site licenses have been obtained for some teaching and support tools, word processing, spreadsheets, and database managers being the best examples. The library orders commercially-available software for teaching use; this is then placed on permanent load to the teaching unit or made available for short-term loan from the library. Computing support personnel (students, staff and hired programmers) develop specific applications from scratch or through application program templates. Finally, some academic staff purchase or code their own tools.

Several academic units use application programs on the various computer systems as tools to assist in the preparation of assignments, etc. Thus both business and education students are exposed to 'useful tools' such as word processing and spread sheets, and mathematics students use computer graphing programs. There is even limited use of the computer for the delivery of instructional materials, generally using programs developed by individual instructors, as with Biology.

[The staff programmer], Maths and Computing, is the acknowledged expert in the use and development of authoring tools at the Institute. He has programmed two of the tools being used (see below) and has used most of the others.

It is not surprising therefore that the tools for easily preparing (authoring) materials for use in specific subjects (courseware) are not generally available at CIAE. The Director's CML Working Party will hopefully provide some direction for CML activities, however CAL is still an open field.

Authoring and other CAL/CML Tools

Ed-Cal: A public domain authoring system, now apparently also available commercially. Runs on IBM/MS-DOS, supports some graphics. Suitable for drill and practice and tutorial applications. Site license information unknown. (Education, Maths & Computing)

Hyper: A pseudo hypertext system developed by Matthew Kennedy, allows for display of chained text in multi-screen units. Runs on IBM/MS-DOS. (Maths & Computing)

HyperCard: A true and powerful hypertext tool, available free or at nominal charge, displays chained text and graphics on Macintosh machines. (H&SS has the largest collection of Macintosh machines, however HyperCard is not being used at present. Their new machines should be delivered with HyperCard)

Pilot: One of the oldest authoring systems available, developed in the mid-1970s, and has low-cost versions for many computer types. Limited graphics, although some versions do have facilities to control various A-V devices. Suitable for drill and practice and tutorial applications. Site license information unknown. (Maths & Computing: [names of individuals] personal)

Quiz: A multiple choice question generator for IBM/MS-DOS, written by Matthew Kennedy. (Maths & Computing)

Publisher’s Test Bank Managers: Several of the publishers of required text books provide computerized test banks and the associated software managers on request. From experience the software is likely marginal in utility and does not seem to be currently in use at CIAE.

Staf2: A powerful authoring system (Science Teacher’s Authoring System) using complex programming language; developed by the Open University in the UK. Suitable for all CAL applica tions except simulations. Lacks graphics, runs on IBM/MS- DOS and other systems. (Maths & Computing)

Student Scheduling and Records: A number of applications exist that meet the needs of specific Schools or Department and routines exist to extract student information from central records into Lotus 123, etc. Unfortunately, most such work is done manually.

In addition to these specific (and limited) tools, there are a variety of programming languages available on the campus including Basic (all systems), Fortran (at least IBM/MS-DOS and VAX), Logo (at least Amiga and IBM/MS-DOS), Pascal (IBM/MS-DOS, Macintosh and VAX), Prolog (at least Amiga) and Snobol (IBM/MS- DOS). Applications system such as dBase III+ and Lotus 123 are available on all the computer types on campus, and could be used for specific CAL/CML applications (student records, test banks, etc.). These could be (and in some cases are being) used by competent programmers (including some academic staff in almost every School or Department) to develop either new authoring systems or the courseware itself.

Tools for Developing Simulations

There do not appear to be any specific tools available at CIAE for developing instructional simulations, although the Byte Centre people have recently been demonstrating a program called ’Course of Action’ which could be used to develop simulations as well as other forms of courseware. Course of Action requires a Macintosh computer to develop its programs, however delivery is apparently possible using either Macintoshes or IBM/MS-DOS machines. Course of Action is complex and powerful, and has the ability to integrate text and graphics as well as linking to independent application programs.

Consultant's Interim Report, 30 June 1989

Excerpts from the Consultant's Interim Report of June 30, 1989

To: Consultancy Advisors: [Dean and Associate Dean, Health Science and Head of Department of Mathematics and Computing]

From: [Author], Computer Consultant

4. The current use of CAL/CML at CIAE is limited. A memo was distributed on 16 Jun to all Deans and Department Heads asking for information on their use of computers in instruction. Two (2) responses have been received and are being followed up. I also met with [staff programmer], Maths and Computing, as the acknowledged expert on authoring systems at CIAE and received copies of most of the available systems for review purposes.

The attached report lists the available CAL/CML tools on the campus and some possibilities, however **any coordinated work by Nursing would be breaking new ground at the Institute**. [emphasis added]

6. A letter has been drafted for distribution to the Matrons at all of the cooperating hospitals requesting information about their current and future computer plans to enable Nursing to coordinate their program with their graduate’s marketplace.

7. As a member of the CML Working Party I have been able to short-circuit several steps in obtaining information and support. We might anticipate the results of this group, however Nursing will likely have to move ahead regardless.

Request for Vendor Assistance

To: Vendors of Computer Hardware and Software, Rockhampton

From: [Author], Consultant, 5 Jul 89

Re: Computer Assisted Learning for Health Science (Nursing)

THE PROJECT

The Department of Nursing is interested in using computers (CAL: Computer Assisted Learning and CML: Computer Managed Learning) to enrich the learning environment, provide a wider range of clinical experiences, and relieve staff of mechanical chores associated with teaching-learning activities.

The advantages of using the computer include the potential availability of learning materials 24 hours per day, managed pacing or self-pacing, alternate learning techniques and/or patterns easily accommodated, and convenient monitoring of student progress.

The development of a program based upon the intensive use of computers therefore implies the development of a student-based, self-paced learning environment. It also implies a high degree of staff and student commitment to initial development and then to maintaining the program.

The range of computer materials currently available seems limited, and the specific instructional materials are often oriented towards North American situations. It seems appropriate therefore to look at a 3-6 year development cycle, picking up a new year's subjects every year.

The current planning stage emphasises the first three years of the process since a major progress review should be conducted that time. Assuming a reasonably smooth development program, the initial labs will have been equipped and extensive first year materials will have been prepared, tested and revised during that time. Some may be marketable (commercially or otherwise) by that time. Second year materials will be well along in the cycle and third year materials will be well-planned and programming begun.

It is assumed that the Department will start with existing data management and authoring tools, using their academic and support staff, as well as students, to develop instructional materials as quickly as possible. This development system must therefore be usable with a minimum of training and computer expertise. If necessary, materials can be refined by computer personnel once they have demonstrated their utility in use by students.

At the same time it is essential that work be begun on more sophisticated materials for use in senior years. Many tools, including those for scheduling and management, must be modular ized so that they can be used to support nursing management topics in the later years. As well, experience must be gained in using more sophisticated authoring tools. Perhaps eventually we will need to develop the health training equivalent of a Pentagon War Game.

THE COURSE

The Diploma of Health Science (Nursing) is a three year (six semester) course with five major areas: Human Bioscience, Contextual Studies, Nursing, Nursing Practice and Clinical Practice. The anticipated intake is 100 new students per year, with the graduates able to be:

- Independent Thinkers (at the beginning practitioner level);
- Creative;
- Reliable, Accountable, and able to Accept Responsibility;
- Professional, able to work as members of a health care team, and able to be an advocate for health issues, professional responsibilities, etc.;
- Competent;
- Responsible for on-going personal education/training.

Graduates must be able to use (apply) the 'Nursing Process' in varied setting ranging from pre-conception to post-death support. The Nursing Process is a problem-solving approach of Assessment, Problem Identification, Goal Setting, Planning, Evaluation and Revision. This approach to health care is developed through a combination of knowledge and practice (skills and processes). The course concentrates on the 'Do Regularly/Must Know' knowledge and practice, however other areas are also important.

WHAT WE NEED

We are looking for learning solutions, authoring systems, that will allow us to achieve our objective of having a computer assisted learning program in place during 1990. We are also looking for copiable examples of innovative computer use in any discipline in tertiary-level education. Eventually we'll be looking for suppliers of a system which meets our needs.

We do know some of the potential courseware tools: 40% solutions like HyperCard(TM), HyperTies(TM), Ed-Cal, Pilot and Staf2; 80% solutions such as Course of Action(TM), an authoring system using the Mac for development and either Macs or DOS machines for delivery; low-cost scheduling tools using spreadsheets and database managers, and test bank managers; etc. I have two months to put together a plan for the next several years… I don't know all of the solutions… I don't even know all of the questions, but perhaps you can help us find a 90% solution… Call 360701, leave a message if I am not in… I'll get back!

Consultant's Interim Report, 26 July 1989

Excerpts from the Consultant's Interim Report of July 26, 1989. The first draft of the final report was attached.

To: [Dean and Associate Dean, Health Science and Head of Department of Mathematics and Computing]

From: [Author], Computer Consultant

1. The attached draft report [an early draft of Zelmer, 1989] is quite lengthy, thus I am sending it out early so that everyone can get a good chance to read it.

There have been two developments since it was duplicated:

- First, I hadn't integrated that the third year students may spend all of their third year away from the Rockhampton campus… [ellipses in original] this has some obvious implications for facilities and software delivery.
- Second, there is a stronger push to take the first year of the program to MacKay. If the first and thrid [sic] years are offered at MacKay, the second will not likely take that much additional support. Again, some obvious implications.

I will be working over the next couple of days to provide [the Dean] with some specific details of potential costs of this alternative [see next item in this Appendix] for her discussions with the Director, however they will not be incorporated in the consultancy report until the next draft.

Have I missed any other 'obvious' areas? What problems do you see that I have forgotten? What don't you understand about my interpretations of your needs?

3. The CML Working Party activities continues to provide information and views that are appropriate to our project as well. Most particularly,

- the staff and administrators have emphasised the desirability of a system for marking, preferably with a mark sensing system of some kind to eliminate the need for entering marks, etc.,
- the difficulties with disk based systems where there is a large amount of disk/file handling… [ellipses in original] just as much problem as with the manual marking systems,
- the inappropriate use of multiple choice questions,
- the difficulty of getting students to use the CML materials unless there is some compulsion, with the best compulsion being the total integration of the materials into the subject,
- etc.

Off Campus Needs

Draft memorandum from Consultant [Author], prepared at Dean's request for input into Faculty planning document.

Draft 27 Jul 89

Off Campus Delivery for 3rd and Other Years

The delivery of all or part of the Dip.Hlth.Sc.(N) to a branch campus or regional centre has obvious implications for the use of CAL/CML. As explained below, it is assumed that most third year students will spend all or part of their third year away from Rockhampton. They, and their instructors, will need full support, particularly as a reasonable estimate would be that fully 50% of their non-clinical activities would depend upon computer availability for CAL/CML.

It is essential that a decision about authoring software, the courseware delivery platform (computer type) and CML facilities consider the type of computers available in other centres. It is inevitable that CIAE will have to provide suitable equipment, in addition to that currently available, for any location where more than one or two students will be located for more than one week.

Third Year Students

In the third year students have 3 non-nursing subjects. All are available through external studies and it is proposed that students not on the Rockhampton campus take these subjects in the external mode without any additional resource requirements.

To avoid overburdening the Rockhampton area clinical facilities and to expose the students to as wide a variation of clinical experiences as possible it is proposed that all third year students spend at least one term or the six week block in a placement outside Rockhampton. Some students might spend the entire third year outside Rockhampton.

The CIAE regional centres would form the ‘home’ for students in these placements, providing library access, study space, computer and communications facilities, group discussion facilities, instructor contact, etc.

In the regional placements it is likely that each student would spend some time in each of the two or three clinical facilities in the area. On-the-spot clinical supervision will probably be supplied largely by preceptors from the clinical facilities.

Capricornia staff would visit smaller centres on a rotating basis for lectures, tutorials, liasion with the preceptors, helping solve any student problems and general supervision of the program. If there are a sufficient number of students in any one centre to justify full-time staffing this will likely be negotiated on a contract basis.

Students would need to have access to (i.e., available in each regional centre): - a basic core of library references, - communication links to CIAE library facilities for reference, searches, etc., - easy E-mail/fax/phone access to CIAE lecturers and administration, - all teaching materials (simulations, cases, CAL) used in the third year.

Instructors would need to have access To: - the student clinical record system for updating, - good communication links to the Rockhampton campus for team- building/maintenance rather than creating isolated outposts.

Instructional delivery systems for the third year students would combine: - face-to-face lectures and tutorials (perhaps concentrated into 1-2 days), - TVI for special lectures, perhaps supplemented with teleconferences, - library work, - simulations and other CAL work (case studies, problem-solving, management, etc.).

First and Second Years

Instructional computer services (CAL/CML) for third year of the Dip.Hlth.Sc.(N) program are suitable for the first and second years essentially by expanding the facilities. Communications links, data storage, etc., may require expansion or speeding up; laboratories will require additional computers; instructor facilities must be added, etc. The limiting factors will usually be the speed and capacity of the communications links and the need for capital construction: classrooms, laboratories, offices.

Any consideration of an external delivery point must consider the impact of a new program on the usage of the current facility and equipment. CIAE MacKay, for example, has a 16 station lab of IBM-PC compatible machines. They are, however, almost fully booked for use by the current student load. The delivery of an introductory computing subject to 30 additional students at MacKay would likely require a new general purpose computer laboratory in addition to the CAL/CML delivery facility. As well, with three seperate sites, the initial installation costs for the communications linkages ($22,600 each site) and the annual rental ($13,200 each) would be triple that for a single site centre (see below for cost details).

Costs to Link from CIAE Rockhampton to Another Centre

Electronic communications with another campus can be accomplished in a number of ways. For example, the current CIAE linkage to MacKay uses a normal dial-up line, the TAFE Library dial-up link adds a second line for CIAE use. The service is inexpensive but slow; STD telephone charges are the major cost and will increase dramatically with more than minimal use. Frustration with the the slow speed connection will discourage use, however the service theoretically can connect to any computer with a modem and telephone connection.

Faster dial-up linkages can reduce the frustration but still depend upon a standard Telecom line, have the attendant potential for transmission errors, and be subject to sign-on delays. Again, the major on-going costs are for STD charges; and the computers can theoretically connect to any other computer.

Because of the volume of lesson, message and administrative data that would need to be transmitted daily to keep a remote campus fully integrated within the main campus, a full-time connection would be required. Slow speed connections would not allow reasonable file transfer times, real-time messages, remote program operation, etc., thus a 9600 baud connection is suggested. Never disconnecting the link will decrease sign-on delays, and will lessen the potential for data transmission errors. As might be expected the initial costs escalate drastically. As well, the linkage might restrict the branch campus access to external computer services (local bulletin boards, data banks) easily available through a dial-up link.

Computer Services suggests that the installation of higher speed dedicated linkages to the CIAE Rockhampton VAX is inevitable once computer usage at a branch campus or regional centre increases. It is probably then that the costs of installation and operation shouldn't be charged against any single program. Computer labs for the delivery of instructional materials, as different from facilities for general computing, would however likely be a cost to the program. With the exception of a once-off cost for an X25 switching unit for the VAX, the rough costs for adding a dedicated link to any centre should be reasonably similar.

The following cost estimates were developed with assistance from Ian Jenkins and John Voss, Computing Services. They assume the need for a 10 station CAL/CML laboratory and software to offer basic computing and support services but they do not include the CAL/CML software. Facilities for individual offices, library, etc., would be additional, although all machines connected to the local network would be capable of communicating with the Rockhampton VAX. It is further assumed that the remote Packet Switch Interface (the remote file server) would be capable of providing at least 400MB of local file server capability as well as controlling all communications.

• X25 Switching Unit (one-time cost)	25,000
• Telecom DDS line installation	2,600
• Packet Switch Interface	20,000
• Annual Telecom rental (9600 baud)	13,200
• 10 station networked lab configuration with furniture)	47,700 (minimum
• Software	20,000

Sub-Total	128,500
• Contingency @ 25%	32,125
	=========
MINIMUM FIRST YEAR ESTIMATE	$ 160,625

Vendor Support—Software/Courseware

Excerpts from a memorandum from the Consultant to the Dean, July 31, 1989

To: [Dean]

From: [Consultant], 31 Jul 89

Re: [Apple Computer staff's] Letter of 27 Jul 89

[The Faculty secretary] showed me [the Apple vendor in Brisbane]'s letter… I suspect that [local Manager]'s concerns have been making their way through the system. Of interest, I was also asked by [an academic staff member in Science] if the application for the teaching companies scheme meant that we had made a commitment to Macintosh computers, as he couldn't understand them going ahead unless there was a full commitment.

We still don't have enough information about Course of Action [later called Authorware] OR any other software product to justify our making a decision on any hardware platform AT THIS TIME [emphasis in original]. I would like to make a decision, however I would like to make informed decisions that I could support fully. Without the additional information that we have requested about Course of Action, etc., from Byte, and information about alternate systems to use as a comparison, I don't know how we can be expected to make a software decision.

I stand by an earlier statement that I made… the Macintosh appears to have the most sophisticated tools, the IBM/MSDOS machines appear to have the greatest amount of materials readily available, including tested software development tools.

I think that we can fully justify the letter to the local computer vendors. It is in our best interests, and in the best interests of [the vendor], that we look at all alternatives as it would be quite irresponsible for us to adopt an untested system if there were better alternatives. The [vendor] people were interested in our needs, however there doesn't appear to be any Australian expertise in the use of their software systems.

As you are very aware, the interest from other vendors has been minimal. Based upon their responses, I would suggest that we have a much better rationale for working closely with [the vendor] and Course of Action. However, I don't feel that I have all the software information we need to make a firm decision. I still want to see some working materials on Course of Action and/or the other courseware development tools in the Apple/[vendor] promotional materials.

I would be most reluctant to have [the vendor] drop their collaboration at this time… To be honest, I don't see any other alternatives on the horizon, however I understand that we don't necessarily make the final decision, even if we were able to do so at this time. We need as much ammunition as possible to get MAC [The university's Management Advisory Committee, predecessor to the Vice-Chancellor's Advisory Committee] or whoever to make the decision in our favour. You can certainly reassure [the Apple vendor in Brisbane] that we will not hold [them] to a commitment if we don't adopt a major role for the Macintosh platform, however now is not the time to pull out… either from discussions or funding requests.

Consultant's Report—Draft

Excerpts from the Draft Summary Report and Recommendations for the Consultation, September 11, 1989 (Zelmer, 1989, when completed).

To: [Dean and Associate Dean, Health Science and Head of Department of Mathematics and Computing]

From: [Author as Consultant], 11 Sep 89

Re: Summary Report and Recommendations for the Consultation

Draft Summary Recommendations

1. **Computer Lab**: The purchasing of the centrally funded computer lab is progressing through channels using our draft specifications… and I expect we will ultimately learn what type (and quantities) of computer is purchased. This lab should be operational for the beginning of classes.

2. **Software**: I would not recommend that we make extensive purchases CAL/CML software at this time, but that we should somewhat await Institute moves on CML… software options run as high as $250,000 for our internal and external needs.

I do suggest that we purchase copies of CT for both the Macintosh and IBM/MS-DOS, dBase III+, and limited programming software. This is in addition to a list of recommended tools for graphics, etc.

3. **Learning Lab**: I will be recommending that we purchase a combination of Macintosh and IBM/MS-DOS computers for the learning lab in a ratio of 5 Macintoshes to every 1 DOS machine (20 Macs and 4 DOS including spares?).

Staff Computers: I will further recommend that individual staff machines be Macintoshes unless the staff member has a specific need for another type of machine, and that administrative/support staff machines be IBM/MS-DOS.

Support Facility: The CAL/CML Support Facility will therefore need both types of machine.

4. **Building File Server**: I will be specifying the work load on the central building file server. It is obvious from the above that the server must be able to support both Macintosh and IBM/MS-DOS files and programs. Given the size of files anticipated (400MB minimum drive with good backup), etc., we may be looking at a MicroVax or small SUN system rather than a loaded 386 or MacII machine.

5. **Staffing and Space**: My minimum staffing recommendations will not change. Obviously they are minimums, extra funding will provide extra staffing and thus better productivity.

I have discussed office space with [the Associate Dean] and we have agreed that the two part or full time technical people should share a work room set up with benches and storage rather than desks to accommodate the 4-5 computers, etc. (situate file server here also).

I am also suggesting that I have a space in this building [the new Health Science building] set up as a tutorial room (with 2 or more computers) rather than as an office… this will provide me space where I can tutor students and an area where we can meet for instructional development activities.

Open Learning at UCQ

Excerpt from the report (CML Working Party, 1989, 8-10) on the adoption of computer managed learning systems at Capricornia Institute.

2.3 OPEN LEARNING PHILOSOPHIES

It is Institute policy to provide the broadest possible student access to Institute courses. This policy has been put into effect through the provision of distance education courses, the establishment of branch campuses and the adoption of a broad range of alternative teaching and learning systems. Many of these systems have taken advantage of modern communications technology and computer based learning systems.

The direction taken by the Institute in it provision of educational programs can be appropriately termed as open learning.

Open Learning is a term used to describe education and training programs which are designed specifically to meet the varied requirements of individuals. Open learning programs are student centred and have a focus on accessibilitiy to meet the needs of the learner.

As an approach to the delivery of education, open learning aims to give students more choice and control over the time, place, style and rate of learning and learning opportunities. Open learning delivery modes can include

- the use of audio, visual and electronic media, and computer-assisted-learning,
- off-campus tutored video instruction,
- the use of information and administration networking systems via electronic data banks, bulletin boards and teleconferencing,
- the use of computer-managed-learning systems,
- the use of local community facilities such as study centres, and
- self-paced learning and flexible attendance requirements.

The aims of open learning are to improve the quality, efficiency, effectiveness, responsiveness and flexibility of learning and at the same time improve access to learning.

In open learning freedom of time, place and method of learning are made possible by providing the student with a carefully planned, flexible study package which contains both tutorial and administrative support mechanisms.

Open Learning and Computer-Managed-Learning

It is generally accepted that new technologies will have an increasing impact on the mode and style of education provided by higher education institutions in the next decade. The quality of the impact will depend largely upon

- the skills of individual institutions in adapting to and using the technology,
- richness and variety of educational uses developed for the technology, and
- the level of planning and preparation for implementation of the new technology.

A present viewpoint of many educators is that more student learning should be based on self-instructional and self-paced materials to give to the student a high degree of independence and autonomy over the learning process. Accordingly, in an increasing number of courses, more extensive use is being made of self-instructional materials supported by CAL and CML packages.

Student Projects,1990

To: [Two Mathematics and Computing staff], [Associate Dean], [Dean]

From: [Author as Project Manager], 8 Feb 90

Re: Potential Student Projects with Health Science CAL/CML

This list represents some of the current possibilities for student project work within the framework of the CAL/CML project in Nursing. As you can see, there are both 'content' and 'process' topics… a student with the right background might be interested in combining the two.

1. Nursing Management or Clinical Case Studies: An almost infinite number of possibilities based upon the student's prior experience and abilities. Approval of topic required to avoid duplication. Under some circumstances this could be done quite independently.

The purpose is to develop interactive case materials for Hypercard, Oyster, or CT on the Mac, Black Magic or CT on the PC. Materials required would include:

- text and illustrations for all the potential choices,
- a 'map' of choices, routing, and options for use by the programmer,
- discussion questions (and answers), text references, etc., for follow-up instructional use, etc. In other words, everything up to the actual coding stage.

Students should be directed to 'Rufus' [an interactive learning program, written in Oyster—see below—and received as a sample from Apple] on the Mac and/or an interactive paperback novel for examples of the technique.

2. Nursing Instructional Units: Prepare resource materials to fit specific instructional topics. These might include:

- subject notes, assignments, study questions and answers,
- reading lists,
- summaries of topical articles,
- evaluation and selection of audio-visual materials,
- preparation of audio-visual materials, etc.

Approval of topic required to avoid duplication, and assignment of content area supervisor subject to availability.

The purpose is to develop instructional materials in nursing for CAL/CML use. Some of the materials might fit a single lesson topic, others might fit within the larger subject or course. Ultimately it is intended that the computer system will both manage the student's progress through the subject (complete with testing), but also present some of the content material interactively.

3. CAL Programming: Coding of above using Hypercard, Oyster, Black Magic and CT.

4. Computer training support: Development of training materials for students and faculty on the use of specific CAL/CML tools, learning laboratory, etc.

- CAL units, HyperCard Stacks, etc., that can be used for self-paced learning, instructional support and review.
- Support materials for same: instructional videotapes, handout materials, overhead transparencies, cassette tapes, etc. Priority for internal use but also for distance ed.

5. Network Documentation: Development of documentation for using, maintaining and training in the use of the network system in the learning laboratory.

6. Instructional support tools/templates. Developing specifications for, and prototypes of, support tools and templates that will assist the instructional staff in their work.

- Spreadsheet templates/formats for student marks, etc., to ensure consistency between staff members.
- Formats and transfer programs/techniques to download student names, etc., from VAX and load into spreadsheets or data bases.
- Develop data formats for integrating HyperCard stacks into School/University CML records.

7. Machine Scoring: Development of master "mark" sheet, testing OCR software, and developing techniques for machine marking of multiple choice and similar tests. The School will have scanner(s) and OCR software, and wants to do machine marking.

8. Bar Code Technology: Investigation of bar code technology for specified uses within the School.

- Student management.
- CML data input.

See also Subject Outline notes for Nursing Projects within School of Health Science.

Appendix B

Recommendations from the Consultant's Report

The following recommendations have been excerpted from the author's 1989 report (Zelmer, 1989, 17-45) to the Faculty of Health Science.

RECOMMENDATION: CAL/CML Development

It seems reasonable that a CAL/CML approach, while requiring extensive support at all levels, would be feasible for the CIAE nursing program at this time.

RECOMMENDATION: CAL/CML Software

The School of Health should NOT make any major purchase of CAL/CML software at this time. Budget allocations for such software should be made from operating funds for future years. The immediate needs are for tools which will allow the lecturers and support staff to develop materials as easily as possible using available user-friendly systems.

RECOMMENDATION: Student Computing Facilities

The School of Health Science needs to ensure that their students have adequate access to computing facilities for instructional delivery and student support (assignment preparation, etc.) through:

- access to a centrally funded and administered general computing lab,
- a dedicated Learning Lab, and
- free-access computing facilities in tutorial rooms and common areas.

RECOMMENDATION: Hardware Platform

The major hardware platform for the School of Health Science Learning Lab and offices should be Apple Macintosh machines.

Individual lecturers should be allowed to make an argument for either type of machine [Macintosh or IBM/MS-DOS] in the event of special needs.

The School should continue to use the current HP Vectra machines (fairly IBM/MS-DOS compatible) for administrative needs until they need replacement.

The centrally funded computer laboratory should be either Apple Macintosh or machines which are 100% IBM/MS-DOS compatible.

RECOMMENDATION: Hardware and Software Replacement

Computing equipment in general use lab should be budgeted for replacement every three (3) to five (5) years.

Computing equipment used by individual faculty members should be replaced or upgraded when needs change or the costs of maintenance justify.

Software should be upgraded (replaced with alternate software or upgraded versions) only when the costs involved can be justified by the need for the new functionality.

RECOMMENDATION: CAL/CML Support Facility

Space and equipment should be provided for a small technical unit of lab technician and programmer to develop and maintain the School's student and staff facilities (hardware and software).

RECOMMENDATION: Staff Facilities

CIAE policy should be to provide an individual computer and printer for each individual with appropriate network and communication facilities.

For the near future, each staff member in the School of Health Science requesting computer facilities should have access to a computer and printer in his or her office (on a portable trolley if necessary), access to computer messaging facilities in common areas, and assistance in purchasing computers for their home use.

RECOMMENDATION: General System Considerations

The General System Requirements in Appendix H [equipment compatibility, electrical power supply, network and communications considerations, air conditioning, security, and maintenance] should be minimal requirements for this facility.

In particular, it is very strongly recommended that Macintosh equipment be supplied by authorized Apple distributors only, and that IBM/MS-DOS equipment should be 100% compatible with the IBM/MS-DOS standard and capable of operating any IBM/MS-DOS software without special installation procedures or proprietary versions.

RECOMMENDATION: Staffing

Support should be given at the School and Institute level to ensure that courseware development is the responsibility of every School of Health Science staff member.

Support should be given at the School level to ensure that student input into courseware development is encouraged.

Provide additional minimal support staffing equivalent to two full-time staff (including student demonstrators) must be provided [sic] in the first year.

Priority be given to applying for funds for research funding, innovative projects, etc., to supplement CIAE funding for this project.

Appendix C

Excerpts from the

Department of Employment, Education and Training

National Priority (Reserve) Fund Application, 1990

Project Title: Development of Computer Assisted/Computer Managed Learning Materials for Dip.Hlth.Sc(N) and other Health Science Programs

Summary of Project: The project will provide for the production and initial testing of computer-Assisted (sic) Learning materials which will be used initially in the Diploma of Health Science (Nursing) program at Capricornia Institute. Following development and testing, these materials will be made available on a cost-recovery basis to other pre-registration nursing programs throughout Australia and overseas, as well as to re-registration, orientation and in-service education programs as applicable.

Purpose and Objectives: The development of teaching/learning activities which can be used independently by students will not only reduce costs in the long run, but will also assist students disadvantaged by distance to have access to the same type of teaching as 'regular on-campus' students. This is a particular advantage for institutions which teach over a dispersed geographic area (CIAE in particular, but this situation applies to many nursing programs where students must be spread out over a wide area to obtain adequate clinical experience). CAL and independent study approaches are also of particular advantage for other students who may be considered to be 'disadvantaged' in terms of their previous educational preparation. Independent study materials can be varied and repeated to meet the needs of particular individuals without 'holding up' the rest of the class.

The project has three major objectives to be accomplished in the proposed two-year time span:

1. To develop and test (to the point of being ready for routine use) Computer-Assisted Learning materials for the Dip.Hlth.Sc.(N) program. Particular attention will be given to materials which can be used independently by students on their own schedules and in 'branch campus' or other distance learning settings.
2. To develop and test (to the point of being ready for routine use) Computer-Managed Learning support materials. Particular attention will be given to developing materials which will be supportive of the management of independent learning activities, scheduling of dispersed clinical education and recording of individualized programs for non-traditional students.
3. Dissemination of information about currently available materials to other nursing education programs in Australia.

The overall objective of these activities is to increase both the efficiency and effectiveness of teaching in nursing education programs.

Description and Timetable

This project is part of an overall program of development of CAL/CML at Capricornia which encompasses the following four thrusts:

1. The development of the 'usual' teaching materials required by any program. In the School of Health Science as much of this effort as possible will be channelled into activities related to this project., always bearing in mind that there are responsibilities to students in a professional program which must be met (by conventional means if the new materials and strategies are not 'ready' when needed.) (sic)
2. CIAE's nomination as a Distance Education Centre; and the concurrent development of strategies in the School of Health Science to make its existing and future programs more accessible to students who are not in a regular classroom situation in Rockhampton. These

same strategies will also be used with materials in the B.HLTH.Sc.(N) program currently taught on an external studies basis by CIAE.

3. A Teaching Companies' Scheme proposal (jointly submitted by CIAE School of Health Science and Byte Technologies, Brisbane) which would provide an impetus for the development of a major series of CAL materials.
4. This project would speed up the activities in the three previous categories by providing additional manpower and equipment at this crucial stage in the development of materials.

Appendix D

Interview Schedules for Staff Interviews

Interview Schedule for Initial Staff Interviews, 1990

To:

From: [Research Assistant], 9 Feb 90

Re: **Dip.Hlth.Sc.(N); Review of Computer Assisted/Managed Learning Project**

Educational development projects are often poorly documented; sometimes we lose materials, it is often more interesting working on project activities than in documenting them, and we forget what happened over time.

We hope to overcome this through individual and project work logs, maintaining a duplicate file of relevant documents (project proposals, etc.), semi-annual staff and student evaluations and a series of oral recordings with selected individuals.

Because of your involvement with project we would appreciate being able to interview you sometime over the next two weeks. The interview will likely take about an hour. The tapes will form part of the history of the project, however the tapes will be set aside for about six (6) months before being reviewed. You can feel free, therefore, to respond to the questions knowing that your discussion will not affect current activities and relationships.

Interview Questions:

1. What is (has been) your involvement with the CAL/CML project?
2. What do you perceive to be the aims of the project?
3. What do you see as the most exciting aspect of the project?
4. What difficulties, if any, have you had in working with the project?
5. Describe what you think will be the most important outcome from the project.

Thank you for your help in making this project successful.

Interview Schedule for Second Round Staff Interviews, 1992

- What is your current involvement with the preparation of computerised teaching materials in the School of Health Science?
- How did you get involved in computers in the School of Health Science?
- What are your impressions on the overall use of computers for learning within the School of Health Science?
- How do you think students feel about the computers?
- What use do you make of computers within the rest of your work?
- What difficulties, if any, have you had in working with computers?
- What skills do you need to make greater use of computers?
- What other computer uses would you like to see?
- What are your reactions to the use of Email, the electronic mail system?
- Would you comment on the following statement: ‘The provision of computers to individual staff has meant that many individuals now prepare their written materials rather than using clerical staff.’
- How do you work or cope when the computer system and/or the electronic mail system fails?
- Are there any other comments that you'd like to add to this interview?

Thank you for your help in making this project successful.

Request for Staff Response to Draft 'Results', 1992

This memorandum was sent to all Health Science staff who had participated in the development of the CAL/CML project, and who were still either employed at UCQ or readily available to the author.

To: Health Science Participants in the Review of Computer Assisted/Managed Learning Project

From: [Project Manager], 22/9/92

Re: Responding to the First Draft of the 'Results of the Review'

As part of the review/evaluation of the Health Science CAL/CML activities, I promised the Health Science participants (interviewees) that they would have an opportunity to see and respond to the first draft of the compiled responses.

I have completed the first draft of the primary chapter containing responses from Health Science staff. As you will see, it will eventually be preceded by a chapter on study procedures (summarised in a single page with the draft), and followed (not included with the draft) by a chapter setting out a timeline of events and excerpts from project documentation, and another of analysis. The latter chapter will include comments from individuals (UCQ administrators and others) outside Health Science.

Copies of the draft, and a form for individual written responses, will be available from [clerical staff] in the Health Science offices from 24/9/92 to 29/10/92. I would appreciate your taking the time to read the draft and respond on the form provided. [The clerical staff] have agreed to control the distribution of copies so that none get lost and all interviewees wishing to respond may do so. I apologise for the limited number of copies, and the size of type— it is simply too expensive to make dozens of copies of a draft document.

The response requested is:

Are your views represented in the range of opinion expressed in the draft document?

If not, what is missing?

Other comments:

As you can appreciate, different people have different views, therefore I am not asking whether you agree with everything said, nor if you, yourself, have necessarily been accurately quoted (the views come from transcripts of interviews). but simply whether your views have been represented.

You do not necessarily have to identify yourself on the response, however I need to know whether the response is from an academic or a support staff member.

This chapter will, as you know, form part of my PhD thesis. As I am working to a very tight deadline, I would appreciate receiving all responses to the draft by Thursday, October 29th. As well, I would appreciate your cooperation in not copying or otherwise using the information in this work at this time.

Thank you again for your continued cooperation in this activity-- together we are achieving something quite remarkable.

(signed)

Pro Forma for Staff Responses to Draft 'Results'

This pro forma was available to all Health Science staff reading the draft as requested in the memorandum above of 22 September 1992.

To: Health Science Participants in the Review of Computer Assisted/Managed Learning Project

From: [Project Manager], 22/9/92

Re: **Responses to the First Draft of the 'Results of the Review'**

You do not need to identify yourself, but please check one:

Academic [ ] Support [ ] (ex-)Project Student [ ] Other [ ]

Please also check as many years as necessary to indicate your involvement with Health Science:

Pre-1988 [ ] 1988 [ ] 1989 [ ] 1990 [ ] 1991 [ ] 1992 [ ]

Are your views represented in the range of opinion expressed in the draft document?

If not, what is missing?

Other comments:

Appendix E

Reports on the Health Science NPRF Funded Project Prepared for Submission to DEET

The submission of National Priority (Reserve) Fund reports are required at the end of the third quarter of the calendar (funding) year, thus the 1990 report was only an indication that activities had been initiated as scheduled. The 1991 report was the first comprehensive report on the computerisation activities within Health Science and signalled the end of external funding.

A similar report was not prepared by the author in 1992 by agreement with the Dean and the CAL/CML Academic Coordinator.

The draft of Chapter 5 of this thesis, circulated in September 1992 to participating staff members, was intended to initiate closure to the author's involvement with the Faculty as well as soliciting feedback from participants. While it did not report on 1992 CAL/CML Activities activities, it did provide a form of report to the participating staff on their activities.

First Annual Report, September 1990

School of Health Science

CAL/CML Project

In 1989 UCCQ, the School of Health Science (SHS), the National Priority Reserve Fund and Apple/Byte Technologies made a major commitment to Computer Assisted/Managed Learning through the SHS CAL/CML Project.

The CAL/CML Project Advisory Committee, representing UCCQ and industry expertise, meets regularly to oversee the Project. In addition, a small group of more technical support staff from UCCQ and Byte Technologies has begun meeting informally to assist this and other CAL/CML projects on campus.

The School of Health Science now has a dedicated computer lab, an internal Local Area Network (LAN) and connections to the UCCQ central computers, AARN, etc.; support staff have been appointed to the CAL/CML Project, they have installed staff and student computer facilities, and provided initial staff training; and the CAL/CML Project is developing tools for managing student schedules, presenting student materials, and assisting in the development of the instructional materials themselves.

A Macintosh HyperCard "stack" format has been developed for the preparation of instructional materials, a guide to instructors is in draft form and approximately 12 case studies have been prepared for student use. Videotaped demonstrations and other resource materials on the use of the standard stack have been developed.

In 1990 we will also:

Further develop a database of available CAL/CML materials for nursing and transfer the data base to a publicly-accessible system.

Further develop and trial a student management system for clinical placements. The system is currently undergoing final coding and testing.

Initiate development of second year materials. The current development tools are being revised and other tools acquired to better support the second year demands.

Support relevant student projects developing CAL/CML materials: B.Hlth.Sc.(N), B.App.Sc.(Computing) and Associate Diploma (Computing). There are currently two degree computing and several associate diploma computing students providing functional support to the Project as part of their educational program.

Promote and document the project for use by others. Project staff have made several presentations on the project at academic conferences and meetings, a brochure has been widely circulated, and several newsletters and journals have had articles or notices regarding the project. In addition, a documentation and analysis of the project's development has been accepted as a Ph.D. topic for one of the project's staff.

The decision to devote a major portion of the School's resources to CAL/CML techniques was, and still is, a gamble. Fortunately the nursing students have accepted the somewhat limited CAL materials with enthusiasm. The participation of the UCCQ computing students towards providing technical support to the project has been invaluable. Perhaps more importantly, the SHS staff have been very enthusiastic in their acceptance of the process and in their support. Their computer skills are improving daily and they have begun to accept ownership of the project.

CAL_DEET.911: 11/9/90

Second (Final) Annual Report, September 1990

Narrative Report on the Computer Assisted Learning/Computer Managed Learning Project for the School of Health Science, University of Central Queensland

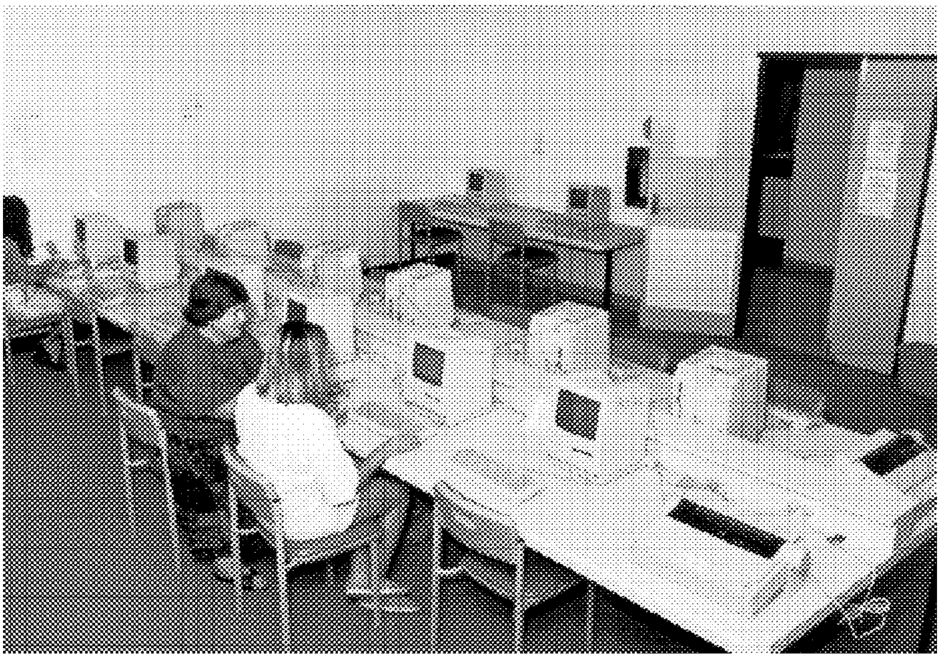
National Priority Reserve Fund

September, 1991

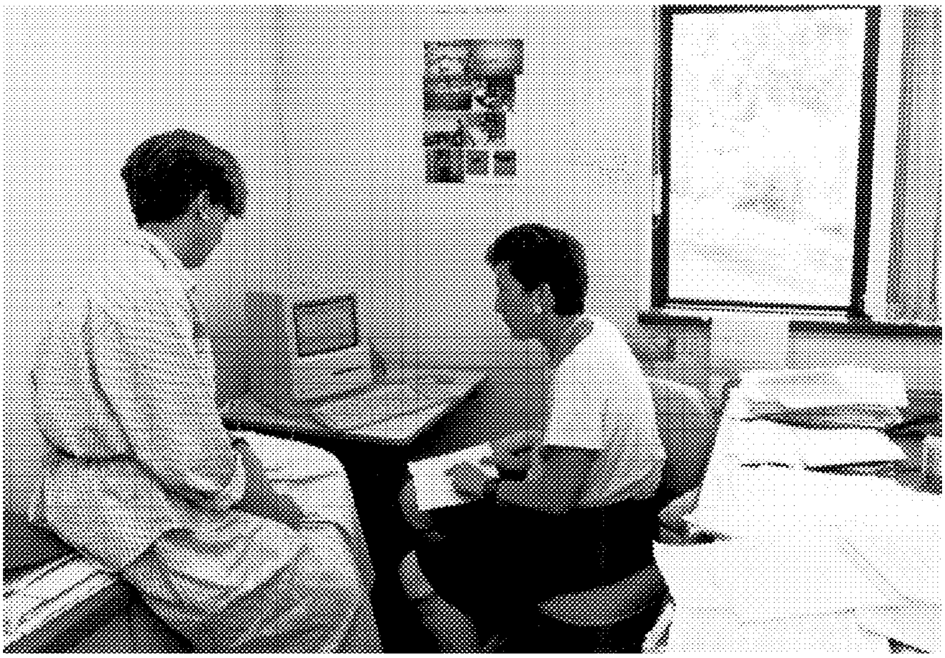
Introduction

This report was written mid-1991, two years after the receipt of a consultant's report (Zelmer, 1989) on using computer technology in the new nursing education programme at the Capricornia Institute of Advanced Education. The priority was to provide support for teaching internal students in what has become the Bachelor of Nursing (B.N.) programme in the School of Health Science. This report looks at highlights of the Computer Assisted and Computer Managed Learning (CAL/CML) Project of the last two years and the impact on the teaching programme.

This report uses the current designations for administrative and other units unless noted. For historical purposes it is useful to note that the Capricornia Institute of Advanced Education (CIAE) became the University College of Central Queensland (UCCQ) in January 1990 and used the designation University of Central Queensland (UCQ) from September 1991. The Department of Nursing was within the School of Science but effectively operated as an independent unit with dean-designate from mid-1989. It became the School of Health Science (SHS) in January 1990.



Health Science Student Computer Lab showing networked Macintosh computers, printers and security system; display area with "how to" information behind photographer



Two Health Science academic staff developing CAL Case Studies on a networked computer

Background

In mid-1989 it was obvious that deadlines were short and the new nursing programme was absolutely and relatively under-funded. (UCQ was one of the two worst funded tertiary institutions in Australia (Baldwin, 1990).) A January 1990 intake of 100 students was scheduled, to be followed by two more annual intakes of 100 students each before the programme would be fully operational. Initial funding, including the capital funds for a new teaching facility, came from the State government as part of Queensland's shift from hospital-based to tertiary-based nursing education. With this shift from the practice-based hospital programme to the more academic university course it was necessary to develop more efficient and effective teaching strategies.

The consultancy report in mid-1989 indicated that it was feasible for the nursing education staff to use computer assisted learning/computer managed learning techniques to help develop their teaching programme. One of the main reasons for this conclusion was the newness of the SHS programme; the teaching staff were having to find or develop all of their teaching materials in any event.

At that point, the small SHS staff was keen to develop a very good, innovative programme. The consultancy determined that there was a lack of appropriate computer-based nursing education materials for use in Australian programmes, however the staff believed that they could prepare computer-based materials with about the same effort as they would need to prepare paper-based materials provided they had appropriate support facilities (see Priority Reserve Fund application, 1989 and Zelmer, 1989).

As most of the staff had very limited computer experience a decision was made to adopt the Macintosh computer because of its short learning curve, consistent software interface (all programs function similarly, with similar commands), and development tools. From a development point-of-view, the Macintosh was the only computer which could easily combine text and graphics at a reasonable price.

A funding request was made to the National Priority Reserve Fund (DEET) and the School received $300,000 over two years, 1990 and 1991. The grant supplied approximately two-thirds of what was requested so even the extra funding was under-funding.

By the end of 1989, construction was underway on a new building for the School, staff were being recruited, computers began to appear on staff desks, the commitment was firm to prepare CAL/CML materials when time permitted, and the consultant was seconded for a one-third time appointment to coordinate the computer activities.

Table 1: Projected Number of Students 1992 - 1994

Year	1992	1993	1994
1	100	100	100
2	75	75	75
3	60	70	70
4 (Hons)		4	6
Total	235	249	251

Table 2: Projected Number and Level of Academic Staff Appointments*

	1991	1992	1993	1994
Professor	1	1	1	1
Assoc Prof.		1	1	1
Senior Lecturer	2	2	2	3
Lecturer	15	19	20	20
Tutors	2	4	4	5
Total	20	27	28	30

* The majority of academic staff will teach in both the BN and BHlthSc(N) programs. The School of Health Science also employs a number of support and project staff (5+ EFT in 1991).

Staff Commitment

In the year and a half that the School has had the Priority Reserve Funding, there has been a focus on developing resource materials and it has still not been possible to purchase any significant amount of material from other sources. The lack of commercial materials, and the success of our development, reinforces the need to continue developing materials that will be appropriate to the Australian health context. In addition, feedback from colleagues in Australia and overseas indicates that the materials being developed by SHS are also at the leading edge of nursing education courseware development.

The commitment has probably come about because of the drive from the half dozen people who were on the staff when the initial consultation was done, when they examined what was possible. The funding certainly helped, without it we might have made some inroads but we would not have had anywhere near the kind of success that we have had. On the other hand, we would not have accomplished anything if the initial staff had not wanted to make the project succeed.

The School could perhaps have developed a computer-based programme without the extra funding, but it would have required much more commitment from individuals, and would probably have required the staff to purchase their own equipment. Because of the grant we have been able to equip the students and staff with a significant computer resource; this has been a critical factor in the acceptance of computers. We have been able to provide a large student lab with twenty to twenty-five stations and individual staff computers (see Appendix D). Computers are everywhere and they are used!

The resources have given us the ability to involve almost everyone, staff and students. New staff understand when they arrive that the School has a greater involvement with computers than might otherwise be expected and they adapt. Students, for the most part, accept that computers are useful tools now and may therefore be useful when they graduate.

Infrastructure

The first priority of the computerisation has always been student facilities. The first student lab has 20 stations, mostly networked Macintosh computers, and another similar lab is planned for 1993. The student study room has another networked computer and there is a small work station with both DOS and Macintosh computers available for rush work outside of the lab.

Most of the current staff have a computer on their desk. Part-time staff also have access via two shared computers in their office and, by the end of 1991, there should be sufficient computers for all staff including the expected 1992 arrivals. In addition, there are about 8 other computers, including portable and hand-held units, available for the use of the staff.

Most of the staff computers are basic MacIntosh computers connected with an Apple-Talk network. The network allows staff to access software resources, to interchange and to print files and use electronic mail. The student lab is primarily Macintosh-based with learning materials, other software and printing facilities available via the network.

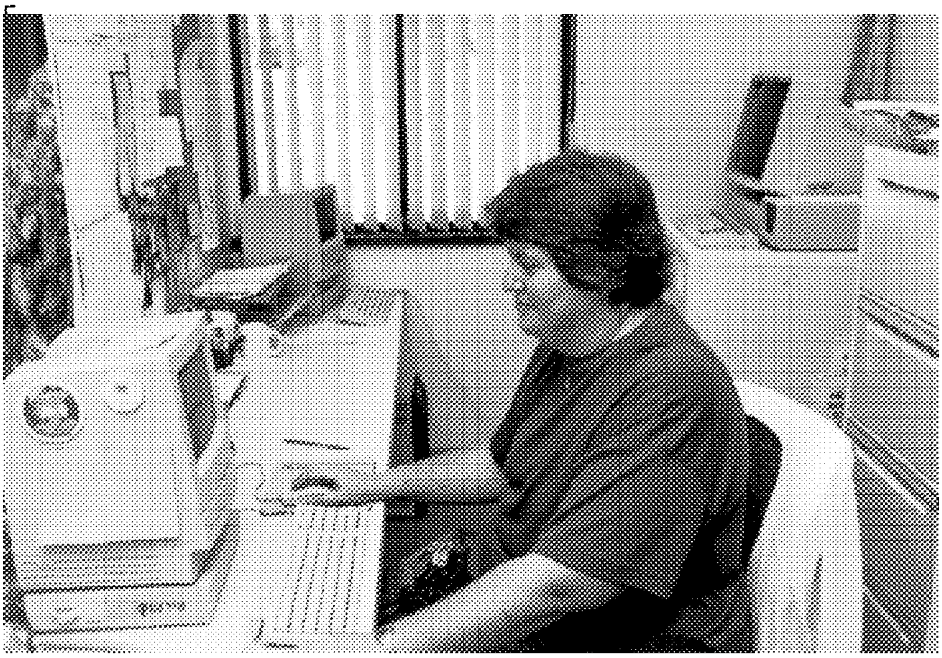
As well as supporting the staff with specific resources to help them in their every-day work activities, (word processing, spreadsheets, data bases, access to student records, access to the computerised library catalogue), the School is moving to providing support in specialised areas. The School has two laptop computers which are portable, but not sufficiently portable for use in clinical areas. We are therefore field testing hand-held units to determine their utility as a data entry system in clinical practice. We also have several other DOS computers available to students and staff and provide limited software and training support for staff on the DOS machines.

The current support staff includes:

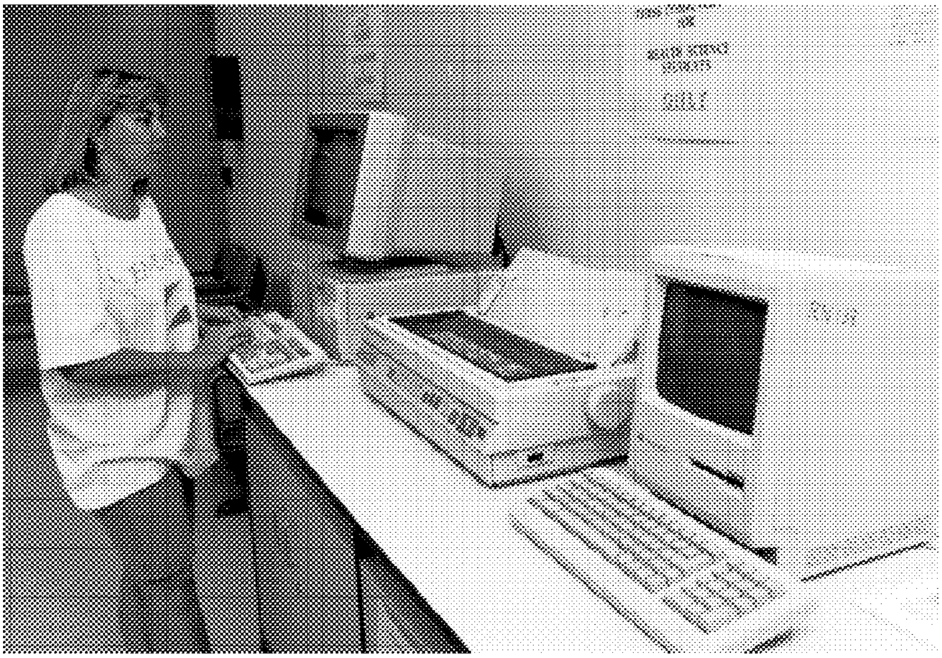
- a supervisor for the student lab (who also provides training and assistance with the staff),
- 1.8 individuals with programming and technical support roles,
- .3 of a seconded member of the Department of Mathematics and Computing for project management, and
- several computing students whose "Projects" provide technical and training support.

One of the SHS academic staff has the responsibility for coordinating academic computing activities and several staff have had released time for materials development.

Students have had an introductory computing subject during their first semester where they are introduced to word processing and database management on DOS style computers. With the change from the Diploma to the Degree structure this initial introduction will occur within the Health Science subjects from 1992. The student's introduction to the Macintosh computers occurs during their initial exposure to the nursing case studies and other computer-based learning materials. New staff receive orientation to the use of computers and additional training as required. While scheduled training sessions are often organised during the teaching semester, much training and support is on an individual basis when needed.



Student Lab Supervisor checking student completion records for CAL Case Studies; network file server in background



Student completing a "rush" assignment at the SHS "Hall Work Station" which provides both networked Macintosh and IBM/MS-DOS computers

Software Development

The most expensive teaching activity, time and cost, in nursing education involves repetitive, small group tutorials. At UCQ tutorial classes of 8-20 students and a tutor are used for discussion of materials presented in larger group lectures and/or to develop solutions to problems.

The changing nature of the institution, a need to free staff time for other activities, a desire to emphasise peer discussion of lecture topics, and the seeming ease of preparation of simple discussion case studies were reasons for deciding to use the computer to develop and present case studies for discussion that complement and supplement teaching activities. With a short scenario developed from teaching notes and a series of questions, the case studies could be used by individual students or in small groups to release staff from some of the repetitive tutorials.

Other priority areas quickly developed and resulted in the production of a number of tools, three of which are almost ready for distribution and use although only one has been tested or properly documented (see Appendix B).

- "CAL_Maker" is an authoring tool for novice CAL developers on the Macintosh. It converts a text file and graphic images into a student presentation using HyperCard. It allows several different presentation formats within a standardised screen layout; the text file must contain codes to indicate the presentation format, question prompts and responses, flow paths, etc. CAL_Maker started as a student Project and, with more than 20 presentations prepared using it, is the School's basic CAL development tool.

- "Questionnairy", a test bank management tool, can either present students with equivalent but unique test from a question bank or be used by the lecturer for developing class tests. It is currently being used with the nursing refresher programme. Questionnairy was started as a computing student Project in 1990.

- The Clinical Placement System is a scheduling and record keeping tool to manage student clinical placements. With three hundred students being placed in over 20 institutions in Central Queensland it is essential that students receive an optimum mix of placements, that placements are not duplicated and that adequate supervision is scheduled.

In addition to these tools and the case studies prepared using CAL_Maker (see Appendix A), we have a second CAL development tool (GHAP, Generic Health Application Tool,) which is at a stage where it can be field tested. We also have other smaller, more individual items (such as the pharmacology materials), which have been developed for a specific subject (see Appendix A).

Once students and staff find how easy it is to use the computer system the academic staff tend to get more involved in the development of the resource materials. Positive student reactions encourage the staff, and the more they do the more they find that they can do. Initially none of the academic staff had any real training or experience with developing computerised training materials, now several of them have become involved with the design of materials; and sometimes ask for some pretty sophisticated features.

These are not necessarily features which are beyond the capabilities of the tools that we have, but are beyond the tested functioning of the tools at the moment. The specifications for our CAL tool, developed through discussion with the staff at the time, included many of the features now being requested; the programmer(s) just have not had enough lead time to keep ahead of the staff's own development curve.

A critical component of the development programme has been the support of computing students (Department of Mathematics and Computing). We have had approximately equal amounts of paid technical staff time and student Projects. The students assist with developing tools, organising training, or preparing documentation. They get a supervised training experience which they could not otherwise obtain.

School of Applied Science
Newsletter, September 1991

STUDENT PROJECTS PROVIDE REAL-WORLD EXPERIENCE

Computing students in the Department of Mathematics and Computing are gaining skills for solving computer problems within Australian industry and Government service. Providing experiences for students to practice these skills is not simple. However, most students take "Project", a supervised opportunity to practice computer problem solving skills on a "real world" problem.

External part-time students often develop projects for their employers. Sometimes these projects solve specialised problems that can't get enough funding for assigning to the regular computer support staff. Others result from special interests of the student or solve some irritating problem that has evaded the regular staff. Alternatively, the project can be the first stage of a larger project that will keep the individual involved for several years.

In 1990 students worked on projects that included designing database systems, preparing systems documentation, programming resource allocation systems, developing an automatic referral system for school students who were late or absent and developing computer assisted learning tools.

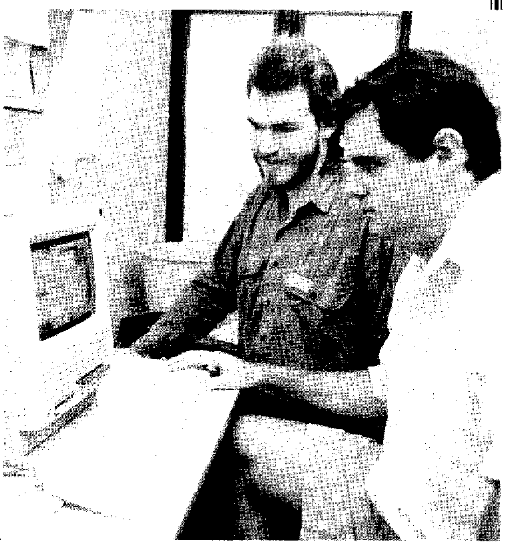
Full-time internal students often have the hardest time finding appropriate projects. Since they aren't currently employed, they typically don't have industry contacts and lack the skills and resources to offer their services as "consultants". These students are encouraged to assist UCCQ academic staff in their teaching and research. In this way, the School of Health Science's Computer Assisted Learning Project has become the single largest provider of project opportunities for students.

In 1990 two Degree Computing students developed applications Health Science during their full-year projects. Gavin Wiseman's work supported the installation of a computer marking system by UCCQ, as well as Health Science's optical scanning facilities. Bruce Young's revised authoring tool is called CAL-Maker and will be distributed commercially later this year. Several Associate Diploma in Computing (ADC) students also developed a multiple choice test bank system, training materials and documentation, and evaluated the use of the School's laptop computers.

In 1991, five computing students are working with Health Science. Michael Weare is responsible for maintaining Health Science's computer network; Steve Kirby is programming a second authoring tool using HyperCard; Margie Haines is providing CAL support to staff; Glen McKenna is writing software to integrate the electronic mail and students records systems; and Alan Ursinus provides database support to the academic staff.

It is anticipated that ADC students will again be working with the School during the second semester. Their work should include the development of a model Nursing Information system and a system for the assessment of clinical nursing skills using hand-held computers.

Bruce Young, programmer with the School of Health Science, discussing Project activities with Steve Kirby, a 1991 computing degree Project student.



Observations

Staff are becoming comfortable enough with their basic computer functions that they can move to other things. The goal of saving staff time will not be generally realised until additional teaching materials are prepared, however staff are committed to preparing these required materials and are building student computer activities into the curriculum and teaching programme.

Sometimes the introduction of new ideas has progressed slower than staff would prefer. Staff generally do not realise the time and development stages required to move a concept through to an operational student unit. Our staff development process has enabled them to realise their abilities, and limitations, and is both arduous and exciting. As a consequence, staff are now able to make more informed decisions about priorities and have, for example, requested a continuation of technical support within the School, even if it means less teaching staff.

The students are also generally very positive about the case studies and the direct applicability of the case study materials to their studies. The School has bought, and will continue to buy, outside resources when they are appropriate and can be adapted to the Australian context. However, from the comments we have received, the quality of our work is comparable with materials developed elsewhere.

Both the School and the University have put additional resources into the project (see Appendix D), and the Project has benefited from the support and encouragement of various national and international academics, Apple Computers Australia and the local Macintosh computer vendor (Byte, Rockhampton).

A major development resulting from the computer exposure generated by the Project has been the development and introduction of a Graduate Diploma in Health Administration and Information Systems (Health Informatics). This development would not have occurred without the CAL/CML activities and associated technologies within the School. The SHS enthusiasm for the new programme has been reflected in over 200 inquiries for the twelve quota places (6 EFTSUs) available.

The Future

A preliminary budget which should maintain the momentum begun with the Priority Reserve Funding has been prepared for 1992. New staff and students will continue to require orientation to computers and the use of computerised learning materials; both new and on-going students and staff will require training to begin to use the computer and to improve their skills. The need for a training schedule is more important in 1992 since programme and time constraints dictate that new students will not have the previous introductory computing subject as an individual subject, and thus will probably require more extensive and different support from the School.

It is the goal of staff to continue the development of tools and learning materials for integration into the curriculum. The completion of the Priority Reserve Project and subsequent decreased funding will likely slow down the development of new tools, the acquisition of specialised equipment, and the consequent CAL/CML materials development.

The CAL/CML tools and techniques developed by the Project are being used within the School of Health Science, have been adopted for use in other Queensland institutions, and through Conference presentations and journal articles, are beginning to be known nationally and internationally (see Appendix C).

References

Baldwin, Hon Peter, MP. **Assessment of the Relative Funding Position of Australia's Higher Education Institutions**. Canberra: Higher Education and Employment Services. August 1990, Appendix D.

The Minister's paper provides retrospective statistics for 1989 on a per student load basis. UCQ's relative position was the same for 1988, 1989 and 1990.

Zelmer, A. C. Lynn. **Computer Assisted Learning/Computer Managed Learning Development Project for Dip.Hlth.Sc.(N) Program, School of Health Science, CIAE.** Rockhampton: Department of Mathematics and Computing, CIAE. 1989.

The consultancy report which served as the basis for the 1989 National Priority Reserve Fund grant application and subsequent development.

Appendix A: Software Development

Instructional Materials Completed 1990-91

Case Studies/Discussion Units Developed using CAL_Maker
These materials have been developed for use with specific curriculum topics (see Appendix E) and have been revised through at least one field testing.

Al Fresco
Food poisoning, preparation and handling of food for a private party and the resulting types of food poisoning when care is inadequate.

Apple a Day
Preventative health techniques.

Being Different
Immigrant assimilation into Australian society with an emphasis on cultural differences in young people.

Coping
Stress in young adults in a sporting situation and individual coping strategies (alcohol, etc.).

First Born
Introduction of the first born infant into the home, changes in lifestyle, etc.

Flatmate
Aids, common misperceptions and coping with living with an HIV positive individual.

Growing Old
Alzheimer's disease, treatment in the home and assistance to the caring partner.

Ned Kelly
Schizophrenia, an initial diagnosis, drug therapy and lifestyle treatment.

Play Safe
Safe sex and contraception for young adults (pre-marital sex).

Smoking
Recent data and general discussion for and against smoking in young adults.

Spotting Trouble
Measles in young children, prevention, symptoms and treatment.

Tradition
Conflict in lifestyles between first and second generation immigrants as they assimilate into society.

Trauma
Child safety in the home and playground. Emphasises simple care and environmental awareness.

Stand-Alone Teaching Materials (CAL)
These materials are designed for direct instruction on specific curriculum topics, or as an adjunct to specific curriculum activities, and contain competency tests which must be successfully completed as part of the subject assessment.

Pharmacology, Year 2, Semester 1
10 modules on basic calculations of drug dosages.

Pharmacology, Year 2, Semester 2
10 modules on drug mixing, advanced level calculations.

Nursing Care Plan/Client Profile, Year 1, Semester 2
Proforma for inputting client details gathered in clinical placement for use in clinical debriefing. Client details will be fictionalised and used as input for the GHAP simulation (see below).

Databases for Use Through Questionnairy
Question sets for use testing individuals or class groups.

Continuing Education: Nurse Re-entry Program
A series of question sets for each module in this non-award course for nurses seeking reregistration. Student assessment is based on unique exams drawn from a set of appropriate questions to ensure each student is assessed at the same level while maintaining exam integrity.

Videotaped Training Materials
Produced by Educational Media Services, UCQ, as a cooperative project of the School of Health Science and the Department of Mathematics and Computing.

Introduction to Computing
A series of 15 videotapes which provide a basic introduction to computing using Amiga, IBM/MS-DOS and Macintosh computers for students and staff. Includes tapes on computer ethics, using Questionnairy, exam marking with the Optical Mark Reader, using various application packages, and an introduction to the CAL/CML Project. These tapes are available through the UCQ Library and one of the tapes, a compilation of techniques for the IBM/MS-DOS computer, is available for purchase through the UCQ Bookstore.

Instructional Materials Under Development 1991-92

CAL_Maker Case Studies/Discussion Units

Approximately 20 additional topic units are currently under development by academic staff. Additional topics have been identified for future development and it is assumed that output will be reasonably continuous now that CAL_Maker is a stable development/authoring tool (see Appendix for list of topic areas).

Authoring Tools Under Development 1991-2

GHAP (Generic Health Application Program)

A tool for students to explore the effects of clinical interventions using alternate nursing strategies. The student will be presented with simulated patients through their hospital records, lab reports, etc., and the results of interventions. GHAP will use fictionalised records developed from actual student observations made during clinical placements and will be able to present a variety of typical clinical situations for the students to manage.

As with any simulation, student interventions will affect the patient's situation (vital signs, amelioration or deterioration of clinical problems, etc.) and provide a "safe" situation for experimentation. GHAP will maintain a record of interventions and provide expert feedback on the effectiveness of the interventions.

Appendix B: Published Research Note Describing CAL/CML Software

Interactive Learning International, Vol. 7, 261–263 (1991)

Research Note

CAL_Maker, Clinical Placement and Questionnairy

A. C. LYNN ZELMER
University College of Central Queensland

The pre-registration nursing programme at the University College of Central Queensland (UCCQ) has a commitment to the use of computers to support teaching and administration. A dedicated student lab containing Macintosh Plus computers, Macintosh and IBM/MS-DOS computers for lecturers and staff, and a software development programme form part of this commitment.

In 1989 the School of Health Science (SHS) decided that the most feasible development strategy was to work on computer assisted learning (CAL) materials that could be used in tutorial sessions after a topic had been introduced in class. Small group tutorial time is at a premium and the CAL materials would allow the students to engage in conventional tutorial activities without requiring the physical presence of a lecturer.

A Case Study format was selected to present a brief description of a clinical situation and manage the questions which arise from it. It was agreed at that time that the Case Studies should allow an individual or small group of students to use their knowledge for solving the problem presented and to expend their ideas about the situation.

The initial instructional design was very flexible as many of the staff lacked experience using computers and/or developing CAL materials. As staff gained experience developing resources they have become more critical of their own work and have expanded their skills in instructional design. Twelve case studies were available in 1990 and student acceptance of the materials has been very good.

CAL_Maker is a software tool for converting a lecturer's text file into the case study format for student use. CAL_Maker, a HyperCard application for Macintosh computers, accepts a text file with plain English formatting commands as input and produces a HyperCard stack as output. The tool was developed by Bruce Young, a UCCQ computing student as his computing degree 'Project' and is typical of the support that SHS has received from students within UCCQ.

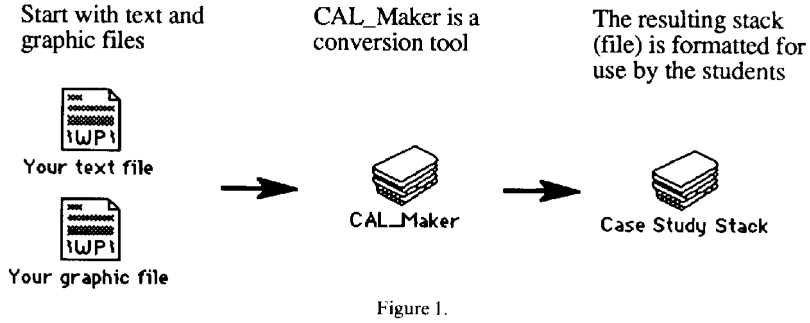
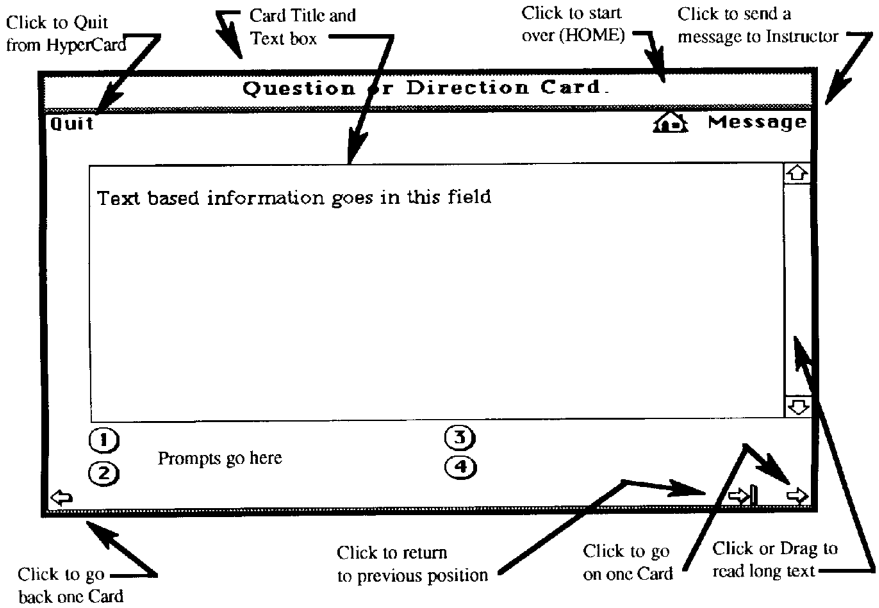


Figure 1.

0748–5743/91/030261–03$05.00

CAL_Maker allows for the presentation of textual and graphic information and has a variety of question formats (2–4 response multiple choice or true/false, multiple choice selection from a list of up to 14 alternatives, matching from 2 lists, etc.). Feedback for student responses is required and students may send a message or short written response to the lecturer for delayed feedback. This allows the preparation of a number of instructional units that are fairly consistent, and will remove the need for instructors to be more than minimally aware of how HyperCard works.



Response buttons: 1, 2, 3, 4. Click anywhere on numbered circle or prompt.

Figure 2: Screen design for a question card.

UCCQ nursing students spend significant amounts of time each semester in clinical observation and practice. These hands-on sessions are scheduled at roughly 40 cooperating health agencies throughout Central Queensland, an area roughly the size of the United Kingdom.

The **Clinical Placement System**, using dBase III+, was developed by SHS programmer Merv Connell to assign students and staff to clinical sessions. The aim of the system is to avoid duplication of clinical assignments, efficiently schedule student and supervisory time, minimise transportation difficulties and cater to individual needs.

This scheduling software is currently being tested within UCCQ and three other nursing education institutions in Queensland in both DOS and Macintosh (FoxBase) formats.

Questionnairy is another dBase III+ application that assists with formative testing and was developed by four UCCQ computing students as their Associate Diploma Computing 'Project'.

Multiple choice, true-false and short answer question sets are prepared as standard database files. The software enrolls students, generates unique tests for each student according to parameters set by the lecturer and, if used on-line, assesses the student's responses. A record is kept of each test created so that a student's test can be recreated if required. Tests can also be prepared for distribution on paper.

ACKNOWLEDGEMENT

Funding support for this development was received from the National Priority Reserve Fund, Australia and UCCQ. Additional support was received from Apple Australia and the Byte Centre, Rockhampton. The software reviewed above is still under development and is not available for commercial distribution. Nursing education institutions may obtain review copies of selected software materials on an exchange basis.

Address for correspondence: A. C. Lynn Zelmer, School of Health Science, University College of Central Queensland, Rockhampton, QLD 4702, Australia.

Appendix C: Promotion

The School of Health Science produced and distributed a simple brochure describing the CAL/CML activities funded by this project (copy attached). Distribution of the brochure included the UCQ campuses, health and health training agencies in Queensland, and participants at various conferences, workshops and poster sessions where the CAL/CML activities were presented.

- Queensland: CINSIG, QLD Clinical Coordinators Group (Nursing Education) and other Nursing Education groups, in person and via teleconference, 1990, 1991.
- Rockhampton: International Conference, Health for All by the Year 2000: Nurses and Others, 1990.
- Brisbane: HERDSA, 1990.
- Sydney: ANZAME and WCCE/90, 1990.
- Central Queensland, ABC Radio, 1990, 1991.
- Melbourne: Nursing Informatics '91.
- Edmonton and Calgary, Canada: University consultations, 1991.
- Rockhampton: CRANA 9th Annual Conference, 1991.

Academic Publications

In addition to the academic publications listed below, at least three UCQ academic staff are engaged in higher degrees and/or research work based on the SHS CAL/CML activities.

Zelmer, A. C. Lynn. **Research Note: CAL_Maker, Clinical Placement and Questionnairy**. Interactive Learning International (UK), Vol. 7, pp. 261-263, 1991.

Zelmer, A. C. L., M. A. McLees, and E. E. Zelmer. "A Progress Report on the Use of CAL/CML in a Three Year Pre-Registration Diploma Program" in Hovenga, E. J. S. et al (Eds). **Lecture Notes in Medical Informatics #42**. Berlin: Springer-Verlag, pp. 1991.

University College of Central Queensland

Health Science CAL/CML Activities

School of Health Science
University College of Central Queensland
ROCKHAMPTON MC, QLD 4702
AUSTRALIA

LZ: 4/91

[A copy of this brochure follows the last page of this report.]

Appendix D: Hardware and Software Summary Inventory

Macintosh Computers

- 48 only Mac Plus or Classic computers*
- 1 only A4 monitor
- 1 only SE20 computer*
- 2 only SE30 computers
- 1 only LC computer
- 1 only Apple CD-ROM Player, SC Plus
- 1 only Mac Tape Backup unit
- 6 only external floppy disk drives*
- 6 only external hard disk drives*
- 9 only Imagewriter printers
- 2 only Laserwriter printers
- 1 only Stylewriter (Inkjet) printer
- 1 only HP Scanjet Plus flatbed scanner

IBM/MS-DOS Compatible Computers

- 2 only 286 (HP Vectra) desktop computer systems*
- 2 only 386 (Arrow) desktop computer systems
- 1 only HP Laser Printer*
- 5 only assorted dot matrix printers
- 1 only T1200 laptop computer
- 1 only T1600 laptop computer
- 4 only Atari Portfolio hand-held computers and accessories*
- 2 only HP150 computers, printers and accessories*

Network System

- SE30 Macintosh file server with 200MB hard drive (student lab)
- PhoneNet connectors and cabling for AppleTalk network
- DEC DS2100 File server with 200MB and 650MB hard drives
- Webster multigate box and other network interface hardware
- Uninterruptable Power Supply
- Digicard lab server (not currently in service)

Miscellaneous

- Furniture for 20 station student lab*
- Furniture for 4 technical staff offices*
- Student "express" work station
- 6 only computer carry cases

* SHS funds purchased 16 Mac Plus or Mac Classic computers and assorted DOS hardware. Building construction and SHS funds furnished the lab and offices. Apple Australia donated an SE20 and Byte, Rockhampton have loaned a hard drive and a floppy disk drive. Additional hardware and software is being purchased, primarily from SHS funds, as this report was being written.

Partial List of Software Purchased By CAL/CML Project Funds

Accutext (Text scanning S/W)
Clinical Nursing Concepts S/W
Canvas (Drawing S/W)
Computing Tutorials (Training, set of 6)
Digital Darkroom (Drawing S/W)
FASTAT for MAC x 2 (Statistics)
Fox Base Developer (Mac) (Programming S/W)
Goldfields S/W
HyperCard 2.0 Upgrade (Programming S/W)
Maxspitbol (Programming S/W)
M.E.D. Graphics Disk (Application)
MGVP Phase 2 Upgrade Kit (Network S/W)
MSWord Network (Mac) (Application S/W)
MS Works (ED NET Pack) x 2 (Application S/W)
MSWorks Network (Mac) S/W (Application S/W)
Norton Utilities For Mac S/W (System Utilities)
Norton Utilities (DOS System Utilities)
Subject Specific Software (Lab Packs)

- MacPrimate Forensic
- Mindlab
- Neuroanatomy Foundations
- Cells
- MDNA
- Human Electrocardiogram
- Eppie
- MacDiet Student Version

System 7 Group Upgrade (System S/W, CDRom)

Partial List of Ancilliary Materials Purchased with CAL/CML Project Funds

MacAcademy Videos (Training)

- How to Master the Mac
- MS Works
- Hypercard

Health Care Graphics - 3 Vols.
Australasian WHEELS for the Mind (Developer Journal)
Apple DEVELOP (Developer Journal)
Various reference books and manuals

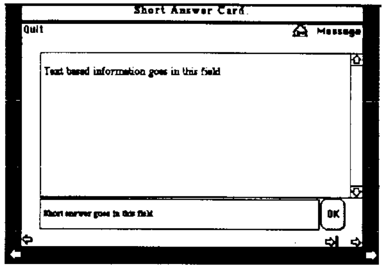
Partial List of Software Purchased with non-CAL/CML Project Funds

Lotus 123 for DOS
2 x MS Word for DOS
MSWindows for Arrow 386
Word Perfect for DOS
dBase III+ for DOS

Appendix E: Subject Headings for Computer Case Studies

VICTIMS OF VIOLENCE
MULTICULTURALISM
DRUG AFFECTED / PHARMACOLOGY
A.I.D.S.
FOOD POISONING
DIET CHANGES / ABERATIONS
TRAUMA
INFECTIVE DISORDERS
OCCUPATIONAL HEALTH
HOME/RESIDENTIAL SAFETY
REPRODUCTIVE/SEXUAL FUNCTIONING
STRESS
PREGNANCY AND ABORTION
CONGENITAL INFLAMMATORY
DEATH AND GRIEF
MENTAL HEALTH
CONGENITAL PHYSICAL DISORDERS
CONGENITAL DISORDERS - MENTAL
DEGENERATIVE DISORDERS - CARDIOVASCULAR
DEGENERATIVE DISORDERS - RESPIRATORY
THE CHALLENGING PATIENT
LEGAL ISSUES
HEMOPOIETIC
SKIN
DEGENERATIVE - ENDOCRINE
DEGENERATIVE - GASTROINTESTINAL
CANCER
ENVIRONMENTAL HAZARDS
DEGENERATIVE DISORDERS - MUSCULOSKELETAL
DEGENERATIVE DISORDERS - NEUROLOGICAL
DEGENERATIVE DISORDERS - RENAL
FIRST AID

Brochure from Page 23



Why at UCCQ?

The School of Health Science at the University College of Central Queensland has a rare opportunity to develop its programs "from scratch". The staff of the School have made a deliberate choice to put a great deal of their effort into developing new, more effective, approaches to learning rather than simply re-developing a standard nursing education program.

The School is expected to provide initial professional preparation for nurses in the Central Queensland area. While there is a great wealth of potential clinical experience available to students and their instructors, the large geographic spread of these resources does mean that we are under pressure to develop imaginative ways of linking students, staff and resources.

Who is Involved?

In one way or another, the entire staff and student body of the School of Health Science, seconded staff and students from the Department of Mathematics and Computing and Computing Services, and our local and regional computer vendors.

An Advisory Committee meets regularly to review progress and provide management support. The CAL/CML activities have been funded by the School of Health Science, the National Priority Reserve Fund and UCCQ, and has received equipment and other support from Apple Australia and The Byte Centre (Rockhampton).

Further Information

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School of Health Science

Dr. Mary Ann McLees, Associate Dean
Coordinator, Bachelor of Nursing program

A.C. Lynn Zelmer, Coordinator
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University College of Central Queensland

Health Science CAL/CML Activities

School of Health Science
University College of Central Queensland
ROCKHAMPTON MC, QLD 4702
AUSTRALIA

LZ: 4/91

Computer Assisted Learning (CAL): The use of computers within the learning environment to deliver instruction. The computer is used as tutor, peer advisor, simulator, etc., is inherently directed toward the student (not the instructor) and might be available lesson-by-lesson or on demand for independent learning.

Computer Managed Learning (CML): The use of computers to assist in the management of the learning environment. This includes maintaining class lists and grades, maintaining lists of clinical assignments, testing and remediation, and directing students to appropriate learning materials.

CAL/CML Within the School of Health Science

The School has made a commitment to improve the effectiveness and efficiency of nursing education, and is making a concentrated effort to develop Computer Assisted Learning Materials and Computer Managed Learning tools.

The School received a grant from the National Priority Reserve Fund in 1990 and 1991 to develop materials for the [then] pre-registration Diploma of Health Science (Nursing) program (now Bachelor of Nursing).

Materials have also been developed for in-service education programs for practicing professional nurses and will ultimately be developed for the post-registration degree program.

Why do it?

Student nurses must learn a great deal of factual material, and must be able to apply their learning quickly and safely in a wide variety of clinical situations. Nursing education has often consisted of students copying what they saw other nurses doing; in today's high-tech world this is neither safe nor effective. Students must know what they are doing— and why— before they begin their clinical practice.

- **Safety**: Patients don't suffer from a wrong decision with a computer exercise but students graphically see the consequences of their decisions.
- **Repeatable**: Computers are infinitely patient. There are only limited opportunities for repeat practice in the real world.
- **Experimentation**: Real world practice, as it involves people and expensive resources, does not lend itself to "what if…" scenarios.
- **Individual Pacing**: Those who need more time and practice can do so without penalty.
- **Independent Learning**: Computers can save scarce staff resources for situations where an instructor must be present; i.e., practice in the real world.

What has Resulted?

Students and staff are enthusiastic about project results.

- **Computer Facilities:** SHS students have access to a dedicated, Macintosh-based, CAL lab and computers in tutorial areas as well as the other university computer resources. Staff use networked Macintosh computers and IBM/MS-DOS based laptop computers for preparing course materials, electronic mail, research, clinical reports, etc.
- **Software**: A small but growing collection of computer-based case study materials has been developed to extend classroom lectures. The content for these cases has been developed by the lecturing staff. The tools for producing the student resources has been developed primarily by UCCQ computing "project" students.
- **Management Resources**: Project students and staff have developed a clinical scheduling system and a test generation system. Tools are currently being developed to begin integrating record systems and electronic mail facilities.
- **In the Future**: New instructional tools are being developed, perhaps leading one day to an instructional "Hospital in a Box", increased emphasis is being placed upon graphical support, and both students and staff are increasingly getting involved with the production of materials.

Appendix F

Budgets for Health Science CAL/CML Activities

These budget documents indicate the type of expenditure included within the Health Science CAL/CML activities, the rationale for some items, and the extent of supplementary funding from other areas of the Health Science Budget. While 1991 and 1992 budgets are labelled draft, they were the working budgets for those years. The 1993 document was a draft proposal from the CAL/CML staff that went to the Faculty for discussion. It should be noted that the actual 1993 budget differed from this draft, although probably not in any significant manner. A copy of the actual budget was not available to the author.

The documents have been slightly reformatted from the originals and names have been replaced with titles or other designations to preserve anonymity.

1990 Revised Budget

UNIVERSITY COLLEGE OF CENTRAL QUEENSLAND

School of Health Science

MEMO

TO: [CAL/CML Coordinator], MANAGER CAL/CML PROJECT

FROM: [Dean], DEAN, SCHOOL OF HEALTH SCIENCE

DATE: 27 February, 1990

RE: REVISED BUDGET

This memo is to confirm our discussions regarding the changes in financing for the Reserve Fund CAL/CML Project as a result of the decrease in the grant for 1990 from the original request.

For 1990 I have allocated:
Equipment - for learning lab and support
    facility (combined)............................$85,000
Supplies (including software)........................ 10,000
Contract programmer(s)............................... 20,000

The balance of the available funding will cover staffing costs for the secondments of you and [Computer Centre programmer]. The cost of the Admin Asst position will be covered from regular School of Health Science funding.

For 1991 (assuming that the further $150,000 is received) the allocations are expected to be:
Equipment...$30,000
Supplies (including software)........................ 10,000
Contract programmer(s)............................... 20,000

The balance of the avaiable funding will cover staffing costs, including the possibility of a greater proportion of seconded time and the full costs of the Admin Asst salary. If all of the funding is not required for these purposes, then it will become available for other costs (supplies, equipment) related to this project.

Also, would you please advise all staff carrying out any activities for this project that the photocopying costs should be definately identified as "CAL Project Costs" so that we can make an appropriate internal transfer of funds. (I would hope eventually to have a Resource Card for the project, but in the meantime we will have to use paper-and-pencil records.)

(signed)

1991 Draft Budget

This document was circulated as an electronic mail message.

To: Dean, SHS; A/Dean, SHS; [Academic CAL Coordinator]; CAL Staff

From: [CAL/CML Coordinator], 14/9/90 [sic, actual date 2/2/91]

1991 Budget

The following budget was approved by the CAL Advisory Committee in September following discussion by the CAL staff and deanery. The $10,000 for Staff h/w is being provided from the Reserve Funds for computers on staff desks; some of the $10,000 for Network h/w was expended in 1990; and two computers that were to have gone in student areas (at least one in the student study room) have already been allocated to staff. In addition, [Work Study Student]'s salary and the 1990 overexpenditure of roughly $2,500 will come from the 1991 budget.

Reserve Fund monies of $150,000. Additional monies from UCCQ, student "Project" staffing, etc., will supplement.

Staff	[Programmer]	28,000	
	[Part time programmer]	29,000	
	[CAL/CML Coordinator]	15,000	
	10% on-costs	7,200	
			79,200
Part-Time			10,000
Travel/Promotion			5,000
Consumables			2,000
Computer Consumables			2,000
Computer Software			10,000
Computer H/W	CD/Graph	10,000	
	Network	10,000	
	Staff H/W	10,000	
	Misc.	5,000	
			35,000
Miscellaneous			6,800
TOTAL			150,000

Proposed Budget Revisions

I would suggest the budget be revised as below, please advise [Work Study Student] before 8 Feb. of any suggestions that you have regarding the revisions so that she can have ready for discussion at the next CAL staff meeting (12 Feb 90: 0800-1000 hrs).

Staff			79,200	(1)
Part-Time			10,000	(2)
Travel/Promotion			5,000	
Consumables			2,000	
Computer Consumables			2,000	
Computer Software			10,000	
Computer H/W	CD/Graph	10,000		(3)
	Network	2,500		(4)
	Network	7,500		(5)
	Staff H/W	10,000		(6)
	Misc.	5,000		(7)
			35,000	
Miscellaneous			6,800	(8)
TOTAL			150,000	

Notes:

1. No change
2. Includes [Work Study Student], extra programming assistance, disk copying, hardware maintenance, etc. In other words, the kind of things that we hired students and others to do last year plus a place for maintenance costs.
3. Will likely have to include another "development" machine.
4. The 1990 over-expenditure.
5. Larger disk drive for SE/Server, network cables, power conditioning, etc.
6. To be supplemented by SHS funds for staff computers.
7. Security cables, carry bags, diskette storage boxes, etc.
8. Our only flexibility.

1992 Draft Budget

Memo and Electronic Mail

To: Colleagues

From: [CAL/CML Coordinator], 23/5/91

Re: 1992 Teaching Support (Computer Activities)

DRAFT BUDGET

This DRAFT budget has been prepared as a basis for planning the 1992 and onwards costs of computing support for the School of Health Science. Costs are projected from current expenditures and have been reviewed by both the SHS CAL staff and the SHS CAL/CML Advisory Committee. [The Dean] suggests that a School discussion of this draft should form part of the 1992 staffing discussion on 16 July.

Rationale:

The School of Health Science has started building an infrastructure which provides computer support to on-campus students and staff. This has included the provision of hardware and software for individual and School use, the development of authoring tools for the preparation of teaching support materials, and the teaching support materials themselves. The important point is that the School has started the process; the infrastructure will need strengthening and continued inputs if the School is to make effective use of the investment.

Staffing DRAFT Budget:

The centrally funded computer support staff (primarily the Computer Centre) are unable to provide the level of support that the School requires to be efficient in its computer use. Some of the extra support can be hired as needed (maintenance and programming), others require in-house staff whether paid or student "project".

- 1/3 time academic coordination
- 1/3 time project management
- Full time lab supervisor
- Equivalent 1 mid-level in contract programming
- 1/2 time clerical
- Equivalent 1/2 time student labour (paid)
- Equivalent 1 computing students projects
- 1/5 time graphics student

This DRAFT will provide 2.1 regular staff for computer support with student (project and paid) and contract hired staff as required. Actual dollar values have not been included deliberately.

- The academic/nursing coordination is the role that [the Academic CAL Coordinator] has been doing this semester and should probably be expanded to include academic staff orientation and training. In time this may need to be extended to another person(s) to coordinate the B.Hlth.Sc.(N) and/or Grad Dip/M. activities.

- The project manager includes staff/financial coordination and evaluation as well as preparation and supervision of contracts.
- The lab supervisor also has responsibilities for providing staff support, hopefully with the assistance of some of the computing project students. [The two computing Project students], for example, are currently providing support for HyperCard and database activities respectively. As the second lab is installed in 1993 this position will probably include the supervision of student labour for lab security, as demonstrators, etc. Consideration in the future should also be given to the establishment of an "SOS" service for staff and student queries, probably through hiring senior students or honours (computing) projects.
- Contract programming, or other specific computer support, could be provided by the Computer Centre, Maths & Computing, or the professional computing community (Rocky, BNE, etc.). This could include installation of new facilities, maintenance, programming for specific software needs, etc. Contracts would be let on a completion basis rather than open-ended employment. This budget figure should be supplemented by specific funding for services required as part of individual projects/activities/programs. For example, research projects or other individual staff initiatives should have a cost item built into their budgets for hiring programming or other computer support, software purchase and installation, etc.
- The student project support for SHS computer activities has been excellent and should be continued. The School has been able to provide "real life" projects that benefit students and School alike. We do need to remember that, while student project labour doesn't require a cash outlay, it does require an outlay of time to be effective as well as the provision of physical facilities and development tools (the student project room, for example).

Non-Staff DRAFT Budget:

The non-staff DRAFT budget has several areas of cost. First, there is a necessity to plan for increased staff and their computer needs; we have assumed a fixed sum per staff member as a reasonable average. Next, we must plan for the "care and feeding" of the computer system. Finally, there is a need to plan for increased student facilities by 1993, remembering that additional student labs will also increase the overhead costs.

Computers/printers for new staff	$ 2,200 per new staff member
Travel/Promotion	$ 5,000 p.a.
Consumables	$ 2,000 p.a.
Computer Consumables	$ 2,000 p.a.
Hardware Maintenance 92-3	$10,000 p.a.
(add $5,000 p.a. after 1993)	
Computer Software	$10,000 p.a.
Miscellaneous	$ 5,000 p.a.

New lab, 1993		**$82,500**
Hardware	$70,000	
Software	$10,000	
Furniture	$ 2,500	

Notes

- The per staff provision includes computer and roughly 1/5th of a printer, furniture has already been purchased, offices are cabled.
- The travel/promotion figure is to ensure that the School can keep up with computer developments and promote the School's computer activities.
- The consumables include standard office supplies and photocopying as well as normal replacement of computer ribbons, diskettes, etc.
- The hardware maintenance figure is based on the cost of "rolling over" the Mac+ machines at the end of their warranty period, normal maintenance, etc. Note that by 1993 the School will probably have at least 80 computers.
- The software costs include version upgrades, site licenses, special software for staff and student needs, authoring software and some purchased software for instructional needs. This figure is also based on the assumption that the School wants to use only software that it has a legal right to use.
- The costs for the new lab assume that HS1.6 will become available in January 1993 and the current undergraduate facility will move to that room as a 24 hour facility. The new lab would use the space currently devoted to the CAL lab and would include software development facilities as well as computer lab support for advanced students.
- The costs to support the Grad.Dip/Masters programs and hand-held computers for clinical supervision, etc., are not included above as these costs cannot reliably be estimated at this time.

DRAFT

Finally, this is only a DRAFT. It represents our best guess at what the costs might be to continue the current computer support program for the School of Health Science, albeit at a somewhat lower level of support, for the coming years. It hopefully recognises the financial realities of the School while providing an adequate level of support that allows the staff and students of the School of Health Science to build on the infrastructure development that has been occurring for the last two years.

1993 Draft Budget

This document was circulated as an electronic mail message.

To: Colleagues

From: [Project Manager], 22/9/92

Re: 1993 Health Science Computing Budget

At our meeting of 17/6 we agreed to the following basic budget for 1993 Health Science computer activities.

Permanent Staffing	No change	
Facilities for new (93) staff: 6 @ 2,500?	Exact # unknown, can some be 92 purchase?	?
Computer for professor (PB140 to Dean)	5,000	
		5,000
Networking & Maintenance		
Ethernet Upgrade Continuation (10)	5,000	
AppleCare for Macs	3,000*	
Pinjel	2,000*	
Shiron	400*	
Other	2,000	
		12,400
Upgrade staff Mac+ to Classic II 4/40, assume $600 trade-in (10)	14,000	
		14,000
Software	12,000	
		12,000
Consumables	10,000	
		10,000

External Services (staffing, EMS, etc.)	5,000	
		5,000
Travel (for CAL-related activities only)		
CAL staff	3,800	
Non-CAL staff	1,200	
		5,000
Communications/Public Relations	2,000	
		2,000
		======
TOTAL		65,400

Next Meeting: 8:00 am, Friday, 25/9/92 to discuss budget for new Mac lab.

Appendix G

Identification of Training Needs, May 1990

In May of 1990 the SHS staff, both general and academic, were surveyed with a questionnaire to determine their training needs. On the basis of this questionnaire and follow-up discussions, a number of training events were scheduled to address specific needs.

The results of that questionnaire are summarised below. Eight staff responded to the survey.

Computer software (programs) that I use:

MS WORKS	5/8
MS WORD	5/8
MYSTAT	1/8 * One other individual indicated should be using.
HyperCard	3/8
UCCQ:	
Student Records	4/8
Library System	5/8
Admin System	2/8
EMail:	
UCCQ only	2/8
External only	–
Both	3/8
Other (specify)	–

Please indicate the way in which the use of this software helps in your work:

- Very effective word processing unit which is primarily what I use it for.
- Quick. Not repetitive, no duplicating. Assist with development CAL.
- Typing letters, memos (academic and students), production of articles, study guide materials. Hopefully spreadsheet work later.
- Mostly using word processing at the moment, would like to know about the other programs.
- Helpless without it!
- All ways! If it works…

- HyperCard – video catalogue. MS Word – everything else.

Computer software (programs) that I want to be able to use:

MS WORKS	–
MS WORD	1/8
MYSTAT	5/8
HyperCard	3/8
UCCQ:	
Student Records	3/8
Library System	3/8
Admin System	1/8
EMail:	
UCCQ only	3/8
External only	–
Both	1/8
Other (specify)	1/8 Spreadsheets

Please indicate the way in which the use of this software will help you in your work:

- Library System will facilitate literature searches. MyStat will familiarise me with stats program.
- Reduce admin load, save prep. time, assist with my cont. ed. Understand this bureacratic organisation?

Appendix H

Selected Computer Training Materials

The following pages provide a selection of the paper-based training materials prepared for use by the Health Science staff and students. The materials illustrated are the 1992 versions and were circulated in both A4 and A5 format. Some were also prepared as A3 or larger posters for display in the student laboratory.

A series of videotapes illustrating computer basics—setting up the computer, printing documents, using the word processor, electronic mail, database, spreadsheet, and statistical applications, et cetera—were also developed for staff and student use. Copies were available from the student Laboratory Supervisor and the UCQ Library.

SHS Computer Basics: **Macintosh Basics**

The "Introduction to Computing" series of videotapes, available from the lab supervisor, includes several with Macintosh information. The three tapes of most interest to Macintosh novices are:
- Using the Macintosh;
- Using Electronic Mail; Setting Up Electronic Mail; and
- Word Processing/Database/Spreadsheet on the Macintosh.

The Macintosh system is designed to be fairly intuitive. Practice with the basics until you can format a disk, create a new folder, copy files, trash files, etc., then build your application skills.

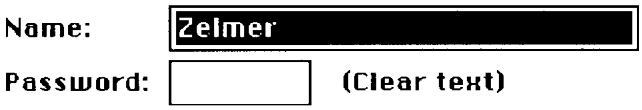
The Macintosh and application program manuals are available to assist you in using your computer. The "SHS Computer Basics" handouts cover many of the same materials in a more usable format. See the lab supervisor for details.

This document starts with the basic operation of the computer itself (starting up and shutting down). You may need to familiarise yourself with the information which follows on using the mouse, etc., before you begin.

Starting Up
Ensure that
- the Macintosh is connected to the "network",
- you have a personalised "net boot disk" and a valid username and password.

A net boot disk identifies you to the computer system. [The CAL Lab network boot disk may be called a "lab boot disk".]

- Turn on the Macintosh at the power switch located on the back left side of the computer,
- insert the boot disk with the label side up into the floppy disk drive,
- check that your username is displayed (type in your username if necessary),
- type your password into the appropriate "box" and click on the **OK** button.



If your signon id is not displayed in the name box, move the mouse into the name area, holddown the mouse button and dragto highlight the wrong name. Type in your correct name, press the **tab** key (the password area will highlight), type in your password and either press the **return** key or click on the **OK** button to continue.

Saving Your Work
The computer stores your active work in its internal memory. When you turn off or reset the computer you lose this work. Save your work regularly (at least every 20 minutes or so). **Save** is an option under the **File** menu.

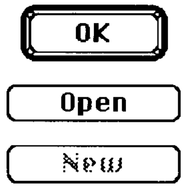
How to Quit and Shut Down the Computer
Save your current work and **Quit** from the program. **Save** and **Quit** are options under the File menu.

Select the **Special** menu, move the mouse pointer down until the **Shut Down** option is selected and release the mouse button. Any open programs and files will be closed, diskettes ejected and the computer prepared for shut down.

Turn off the computer and any other equipment before leaving.

Remember, computer security is everyone's responsibility. Make sure that you lock up!

The Mouse
Macintosh computers use a mouse to select items, answer queries from the computer, etc. The mouse symbol (pointer) on screen varies from program to program and may be a 'finger', an arrow, a vertical "I", etc. Practise physically move the mouse across any solid surface until you can put the mouse pointer where you want it to be on the screen.

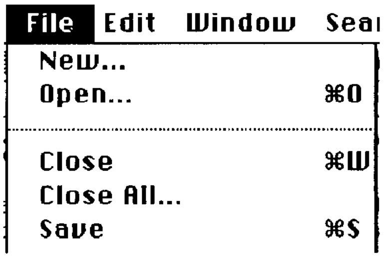


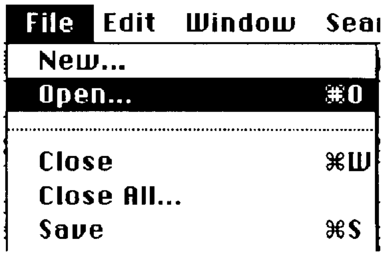
Pressing (clicking) the button on the mouse activates the mouse.
In Macintosh jargon a "mouse click" occurs if you press the mouse button. The mouse pointer needs to be over a screen "button" such as **OK** and **Open** (see right) to 'click' on the button. Normally the button will turn black when it is "clicked to provide visual confirmation.

The double line around the Open OK button here indicates that it is the default option; pressing the 'enter' or 'return' key on the keyboard will select that option. Shaded text (see new button) indicates that this option is not available at this point in your work.

Many activities require you to "double click" the mouse. Click twice lightly but quickly.

Other activities require "dragging" the mouse with the button pressed. For example, move the mouse to the top of the screen and hold down the mouse button to display the menu (see below left). Continue holding down the mouse button, drag the mouse until the required option is highlighted (see below right), then release the mouse button to make the selection.





Menus
Menus are reasonably consistent between programs so that the OPEN option, for example (see above), is always found on the File menu in every program. Menu categories vary from program to program and even at different points within the same program (see the two menu bars below).

File Edit Window Search Format Spell Macro

File Edit Window Format Fill Pattern Line Pattern Macro

The Keyboard
The computer keyboard is very similar to a typewriter keyboard, however there are a few new keys and some of them work differently.

shift key
The shift key works exactly the same as on a typewriter. Hold it down while pressing letter keys to type upper case (CAPS) letters. Press the **caps lock** key once to set the keyboard to all upper case letters, press it again to revert to lower case letters. Note that the special symbols above the numbers can only be typed using the **shift** key.

return/enter key
The **return** and **enter** keys generally are interchangable. They have two roles. The first is the same as the carriage return on a typewriter, to make a new line. Since text normally flows from one line to another on the computer screen you only need to press this key at the end of a paragraph. Pressing this key a second time leaves a blank line between paragraphs.

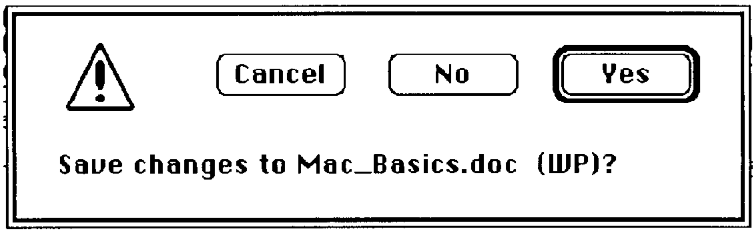
The second purpose is to indicate to the computer that you have completed a command. You can normally press this key at any time that you need to click on an **ok** button.

command (⌘) key

This key works the same way as the shift key. Hold it down and press one of the letter keys to perform special functions. In most programs holding down this key and pressing the "S" key will save your current work. Many menu options display these alternate keystroke combinations that you can use as you become more proficient.

⌘S
⌘P

⌘Q will usually quit out of the current program, usually with the option of saving your current work (see dialogue box at right).



Click on **Yes** to savebefore quitting, **No** to quit without saving, and **Cancel** to abort the quit procedure.

cursor, arrow and delete keys to move around the screen

The cursor is the marker that shows where you are currently entering data. The cursor can have several shapes, depending on the program, but is usually a flashing vertical bar. The four arrow keys allow you to move the cursor around in the document for making corrections, etc. Moving the mouse pointer and clicking at the new location also shifts the cursor. The delete key also moves the cursor, erasing characters as it passes over them.

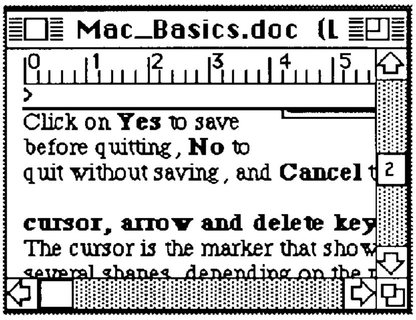
esc, option and control keys

These special keys work similar to the shift and command keys for performing specific program shortcuts. In combination with the letter keys, the command key and the shift keys we can actually get about 200 potentially different key presses. This is particularly useful to obtain foreign language and similar extra characters. [see **Special Characters**]

Using the scroll bars

The information shown on the screen at any point in time may be only a small portion of the total file. The sliders at the bottom and right hand side of the object (document, graphic, directory) allow you to shift the screen image.

Click on the arrows to move a small distance, drag the white box (the side one often has the page number) to move to a user defined distance, and click in the shaded area of the bar to move a screen at a time.



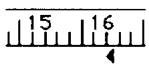
Highlighting text or graphics

A very useful shortcut for editing involves using the mouse to highlight text for deletion, changing, etc. Move the mouse pointer to the start of the material to be modified, hold down the mouse button and drag the mouse to highlight the material. Release the mouse at the end of where you want highlighted.

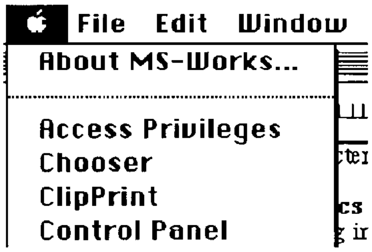
The highlighted material can be deleted by pressing the **delete** key, replaced by simply typing new text, or modified through menu or keyboard shortcut commands. For example, highlighted text can be changed to **bold** through the appropriate command (Format menu). The **Select All** option allows you to make the change on the whole file.

The Ruler

The ruler shows you the margins for your document. You can change the margins on highlighted text by dragging the ruler triangle.

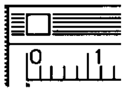


The Apple Menu
The Apple symbol on the upper left corner of the screen is also a menu item. Here you will often find help, specific information about the software you are using, and the "extra" utilities (useful programs) available on your desktop.

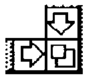


Chooser is used to designate the printer or network connection you are using. **Control Panel** allows you to change date formats, the loudness of the Macintosh audio speaker, etc. **Find File** (not shown) is a utility for finding the location of lost files. [see **Customise**]

The Close Box
Most applications can be closed by clicking on the square box in the upper left hand corner of the window (directory, document, etc.). With some applications this may throw away work without saving it.



Resizing Objects
Documents, directories, etc., may be resized by grabbing the small double box ("size box") in the lower right corner and dragging it to the new size.



Clicking on the double ("zoom") box in the upper right corner of the screen switches between the "normal" size (often full screen) and the new size.

Moving Objects
Most objects can be moved around the screen. Desktop icons such as the ones for diskettes can be moved by grabbing them with the mouse pointer and dragging them (remember to hold down the mouse button) to a new location. Open windows can be moved by grabbing them on the title bar at the top of the window and dragging them to the new location.

Trashing (Deleting) Files
Grab the file icon from the screen (window or desktop), drag it over the trash can so that the trash can is highlighted, and release the mouse button to delete the file. The trash can will bulge to indicate that the files in the trash can are still recoverable. Use **Empty Trash** from the **Special** menu to positively remove the file from your disk.

As long as the trash can is bulging the files can be recovered. Open the trash can by clicking twice on the icon and drag the files back onto the desktop or into a folder. Files that are still in use cannot be trashed (close the file if you really want to trash it). You cannot trash a locked file. Folders should normally be empty before you trash the folder. A dialog box may ask you to confirm the trashing of certain files.

The computer will often empty the trash as it starts a new activity.

Ejecting Diskettes
Grab the disk icon, drag it to the trash can, and release the mouse button to eject a diskette. The disk icon will disappear from the desktop as the diskette is ejected.

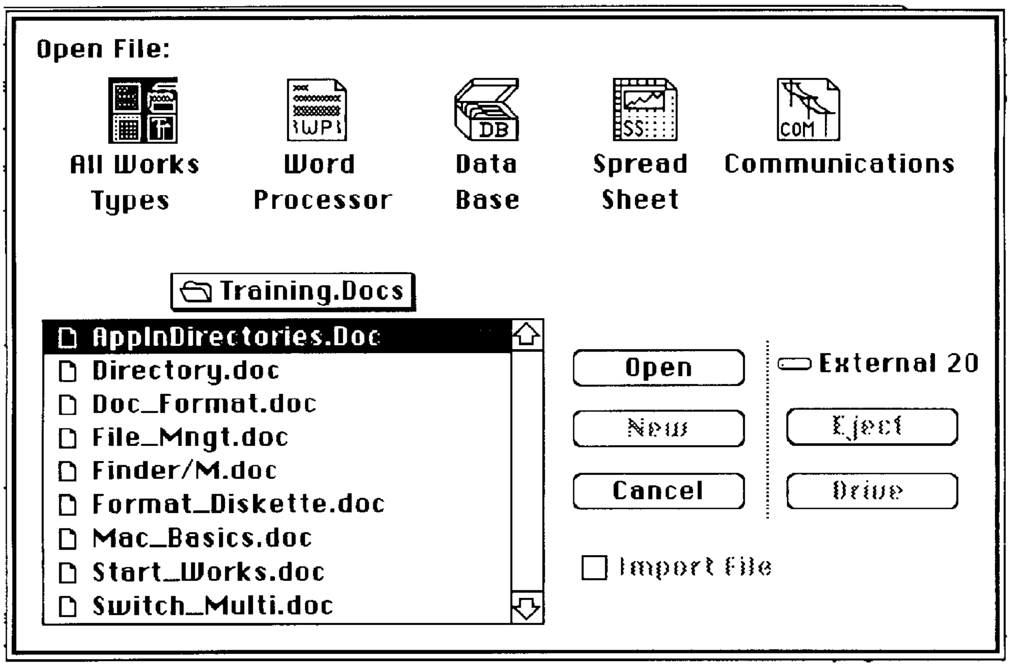
Alternatively, select the disk (click on the disk icon), and use **Eject disk** from the **Special** menu. A shaded disk icon will stay on the screen until you drag it to the trash can.

SHS Computer Basics: **Starting MS Works**

MS Works is the standard tool for word processing, database management and spreadsheet use in the School of Health Science. A variety of aids are available to assist you in learning to use Works, including a UCQ videotape, the MS Works manual and handout sheets such as this.

You will normally find the Works program in a network **Public** folder (or Applications area). Boot up the computer so that you are using the network and use **Find File** to locate the program if necessary. Your data files (the information files you create) can be saved in your **Work Area** or on a floppy data disk. You should not save files to the Public areas or to your boot disk.

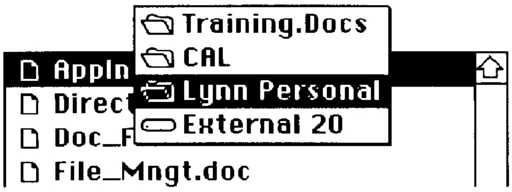
Starting the Program
Double click your way through the folders until you are in the directory with the MS Works icon. Double click on the icon to start the program.



This is the starting screen for MS Works. At this point you can choose to open an existing file (one that you created and saved previously) or start a new file.

Use the standard file tools to find the file you desire, select it, and click on the **Open** button. If there were other drive units "mounted",the Drive button (above) wouldn't be shaded; Click on an unshaded **Drive** button to change drives.

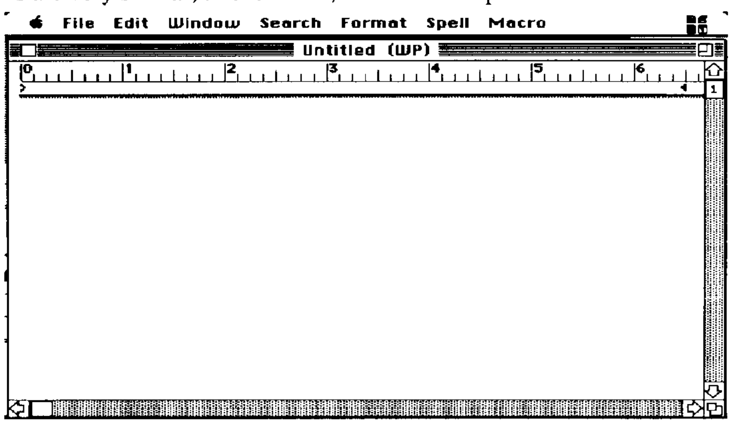
Click and drag on the folder bar to change folders on the current drive (see right).



You can "import" some type of non-Works files if you select the appropriate application (click on the application icon across the top of the dialogue box, Word processor, for example) and click on the **Import File** button.

If you want to start a new file, click on the appropriate application icon (Word processor, for example) and then click on the **New** button.

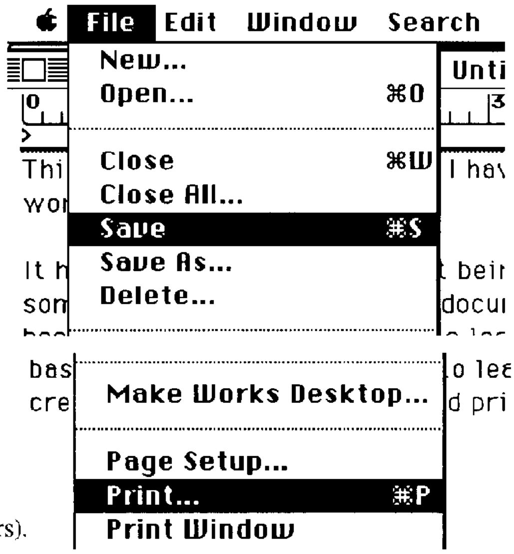
All of the Works applications are very similar, this is a new, untitled word processor screen waiting for you to type your document. The menu bar across the top allows you to use most of the standard word processing functions, although some may not be available at all times.



The spelling checker, for example, is not available unless you have adequate disk storage space for the dictionary and other files.

Type your file, correcting mistakes as required. Save your work frequently (at least every 20 minutes) to avoid losing too much work in the event of a network or power failure.

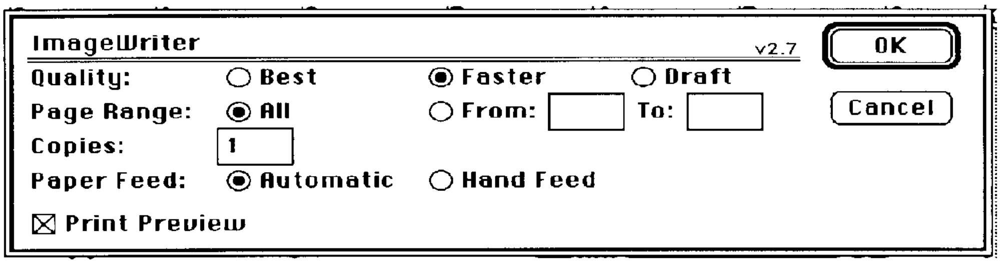
Saving a Works File
Select either the **Save** or **Save As...** options from the **File** menu, follow the prompts and save your file in the normal Macintosh manner. [Do not save to your boot disk!]



Files should be saved to your Work Area or onto a data disk. Use file names that identify your work. Including a date in the file name is sometimes also useful.

Always save your work before attempting to print the document.

Printing a Document
Select the **Print...** option from the **File** menu to print the document. A standardMacintosh print dialogue box (below) allows you to print the whole document (click on **Page Range** button for **All**) or selected pages (click in the boxes and type in the start & finish page numbers).



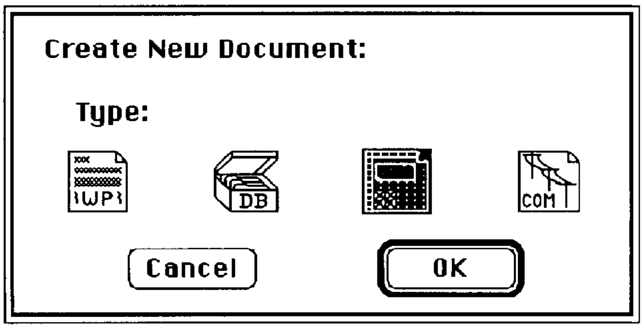
The number of copies can be similarly indicated. Click in the box (or **Tab**) and type the quantity.

Quality governs appearance: **Best** for final copies of letters and papers, **Faster** for normal work, **Draft** for internal memos/papers (default font, no graphics) and when the network is busy. Clicking on the **Print Preview** button allows you to view the document before printing. Remember, to change printers you must use **Chooser** from the menu and **Page Setup** from the **File** menu before selecting the **Print** menu.

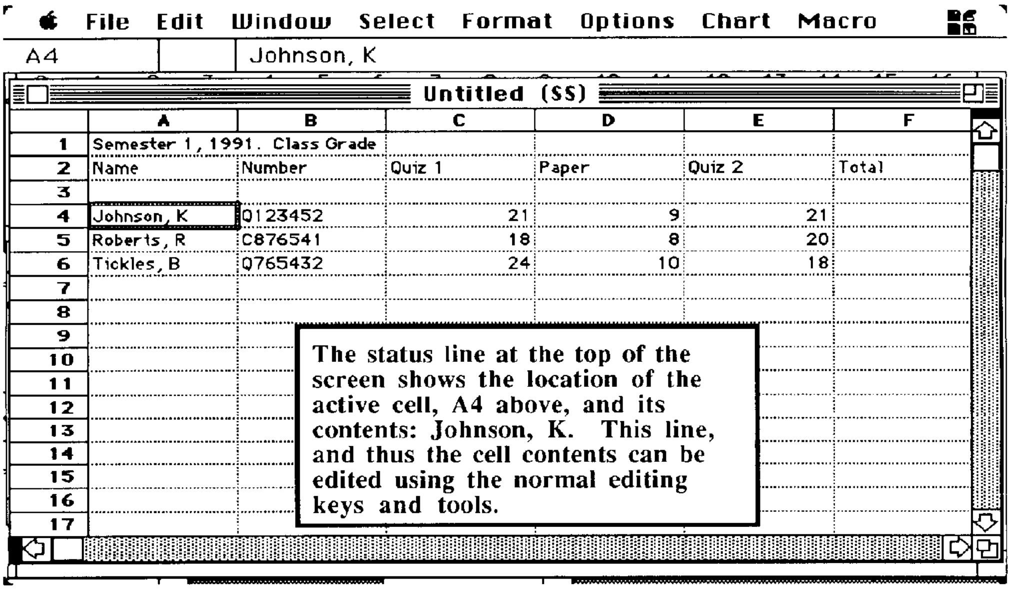
Quitting the program
Select the **Quit** option from the File menu. You will be prompted to save unsaved documents.

SHS Computer Basics: **Works Spreadsheet**

A spreadsheet allows you to work with numbers using a grid arrangement that resembles an accountant's spreadsheet, hence the name. You can put three types of information into the worksheet: text (labels), numbers (values) and formulas (functions and cell references). Formulas automate normal mathematical activities such as addition and multiplication.



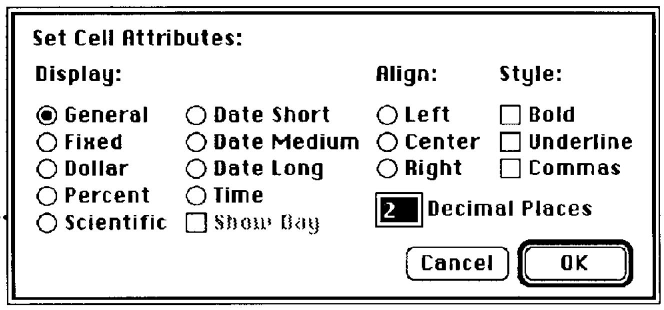
To create a new spreadsheet, select **New...** from the **File** menu and click once on the spreadsheet icon, then on **OK**, as above. Alternatively click on the spreadsheet icon and **New** when starting Works.



This spreadsheet is being set up to provide an electronic gradesheet and includes student information as well as the mark received on assignments. The information, and the labels, have all been entered by moving the mouse pointer to the "cell" where the information needs to be placed, clicking the mouse to establish the "active" cell, and typing in the information.

Text is automatically aligned to the left side of the cell and numbers to the right.

This can be changed by selecting the cell (drag the mouse pointer with the button held down), and **Format, Set Cell Attributes..** as at right. Do not use spaces to force justification.



Enter numbers without commas, dollar signs, etc. Again, use **Set Cell Attributes...** from the **Format** menu.

Change column widths by moving the mouse pointer into the row of alphabetic column labels. When you have the pointer on a column edge the double arrows will display as at right. Hold down the mouse button and drag the column to its new width. Releasing the mouse button will resize the column.

Un

A	B		
Semester 1, 1991. Class Grade			
Name	Number		Quiz 1
Johnson, K	Q123452		
Roberts, R	C876541		
Tickles, B	Q765432		

Note that text items, as in cell A1 (column A, row 1), will spill over into adjoining columns until there is actually something entered in the adjoining column. The cell will only display information to the limit of its set width, however the data in the cell is not lost when cells are too narrow to display the information. Cell widths can also be set under the **Format** menu.

Numbers are entered as numeric digits and decimal point only (no commas or signs).

Formulas must begin with an = sign, are often composed of references to special functions, **Sum** in this example, and the range over which the function is to act.

A range is defined by naming the starting cell and finishing cell, separated by a **:** sign.

F6 =Sum(C6:E6)

Untitled (SS)

	A	B	C	D	E	F
1	Semester 1, 1991. Class Grade					
2	Name	Number	Quiz 1	Paper	Quiz 2	Total
3						
4	Johnson, K	Q123452	21	9	21	51
5	Roberts, R	C876541	18	8	20	46
6	Tickles, B	Q765432	24	10	18	52
7						
8	Average Mark		21	9	19.67	49.6667
9						

=Sum(C6:E6) then specifies a summing of any numeric values in the cells between C6 and E6, inclusive. Exactly the same result would be obtained with **=C6+D6+E6**, however the Sum function is more efficient and ultimately safer to use.

Similarly, auditors never using a numeric value within a cell formula. If you wanted to price several items at a specified percentage above the cost price, both values should be entered into the worksheet as cell values and referred to by their cell locations.

A complete list of functions, and their required format, is available under **Window**, **Help**.

Here is the finished spreadsheet formatted with the numbers as **Fixed** with 2 decimal points.

Save, **Save As...**, **Page SetUp...**, **Print**, etc., all function as normal with a Works application. [See **Starting MS Works**, etc. for additional information.]

Untitled (SS)

	A	B	C	D	E	F
1	Semester 1, 1991. Class Grade					
2	Name	Number	Quiz 1	Paper	Quiz 2	Total
3						
4	Johnson, K	Q123452	21.00	9.00	21.00	51.00
5	Roberts, R	C876541	18.00	8.00	20.00	46.00
6	Tickles, B	Q765432	24.00	10.00	18.00	52.00
7						
8	Average Mark		21.00	9.00	19.67	49.67
9						
10						
11						

Cells, not individual numbers, are the reference points in a spreadsheet. Cells are identified by their location on the grid composed of column (letters) and row (numbers) designations. Cell F5, for example, identifies the cell in the sixth column (F) and the fifth row.
Ranges define groups of cells and are inclusive. C6:E6 defines three cells in row six. C6:E8 defines a block of nine cells.

SHS Computing Basics: **Overhead Transparencies**

Preparing overhead transparency masters is easy with MicroSoft Works as it has both text and drawing capabilities. Use the laser printer for printing and the masters can be copied onto special transparency film with most photocopiers. Good transparencies are really a question of design and layout rather than the availability of production facilities. [A HyperCard tool is also available.]

Lettering Size, Font and Style
Since transparency film is roughly the same size as a sheet of normal paper, many people use a standard typewriter or computer printer to make their transparency masters. Transparencies prepared this way will be almost impossible to read under most viewing conditions.

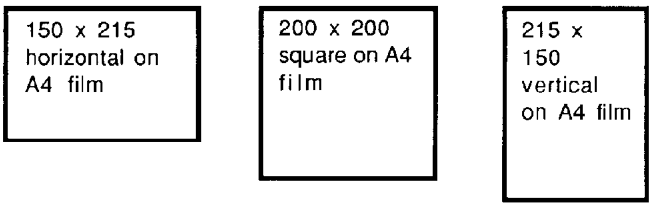
The minimum acceptable size for use on an overhead transparency is 18 point type. Larger sizes are permissible and often preferred. 24-30 point size should be the absolute minimum used for theatre projection; 36-72 point can sometimes be used for emphasis.

Use a simple plain font. **Bold** type is permissible, however you should avoid cursive scripts, underlining, shadowed type, etc., as these "features" make the text harder to read.

Courier bold, **Geneva bold**, Helvetica **(& bold)**, New Century Schoolbook **(& bold)**, New York **(& bold)** and Times **(& bold)** are acceptable fonts, although some are more useful than others. These samples are all shown in 18 point; note that they have different heights and line weights. For comparison purposes, `this is a standard 10 point typewriter style.`

Layout and Design
Transparencies can be either horizontal or vertical. Remember that the projector/screen used may cause some difficulty viewing large transparencies. For example, many viewers cannot see the bottom of a vertical transparency. Keep the actual image area to 150mm x 215mm (6" x 9") when you plan on using a progressive disclosure technique, otherwise 200mm x 200mm (8" x 8") (or even smaller) may be a more reasonable size.

These dimensions give an adequate margin on the film for holding, taping into a transparency frame, etc.



Content Considerations
Overhead transparencies should be aids to understanding your presentation, not a copy of your notes to be read aloud. Use an outline form with brief phrases for emphasis, to help the audience keep on the same point that you are on, or to understand a complex issue.

- Use single words or phrases rather than sentences.
- Use short quotes rather than long extracts from documents.
- Use summary lists (especially when dealing with figures).
- A list with more than 10 points should probably use more than one transparency.
- Use simplified diagrams with bold lines, icons or readily recognised symbols.
- Use bullets and other symbols for emphasis.
- Keep the transparency material brief.
- Check for spelling and other errors before use.
- Number the transparencies if they are used in a series.

Using Transparencies

- Book the equipment in advance and check it to ensure that everything is working.
- Talk to your audience, not the screen.
- Use the transparency to aid your presentation, not as a substitute for a verbal presentation.
- Stand so that everyone in the audience can see the screen.

Appendix I

Copyright Issues and Software Distribution

UCQ Copyright and Royalties Policy, 1978

The policy on the following page was originally approved by the Council of the Capricornia Institute of Advanced Education in 1978. The 1990 revisions changed the name of the institution to the University College of Central Queensland.

COPYRIGHT AND ROYALTIES

1. If a member(s) of staff creates, while in the University's employ, any material which is published or produced by the University, the copyright of such material is vested in the University Council.

2. It is the responsibility of the member(s) of staff to ensure that material included in works to be published or produced by the University does not infringe the copyright of other authors, publishers or organisations. Where necessary, the staff member(s) shall obtain written approvals from the holders of the copyright.

3. If, subsequently, the staff member(s) wishes to have printed material (to which the University holds copyright) published, produced or reproduced by an external organisation, the University Council, on advice from the Vice-Chancellor, may allow the material to be reproduced in full or in part.

4. Copyright of printed material (to which the University does not hold copyright) published or produced solely by an external organisation under the authorship of a member(s) of staff of the University shall not be determined by the University Council.

5. Member(s) of staff producing printed material under (1) above, shall not normally be entitled to any royalties from the sale of such material.

6. All royalties from (3) and (4) above shall be retained by the member(s) of staff.

7. If the material produced is a computer program or audio-visual item which has been developed using University facilities, copyright is vested in the University Council and nett proceeds from the sale shall normally be:

   7.1 retained in full by the University where the material has been developed by a member of staff specifically employed for that purpose;

   7.2 divided equally between the University and the staff member(s) where the development was carried out incidental to the normal duties of the staff member(s) concerned, once outstanding expenses have been recovered. Up to that time, the staff member(s) shall receive 15% of the gross return on sales.

Draft Health Science Policy

The following memorandum and draft policy was circulated to the CAL/CML Project team for a meeting on 4 June 1990. It was subsequently forwarded to the Dean, Health Science, who forwarded it to the Bursar, the University Officer responsible for copyright and royalties.

The policy was not adopted by the Health Science, on instructions from the Bursar, pending the development of a revised Council policy on copyright. This revision would, Health Science was advised, depend upon the outcome of an AVCC (Australian Vice Chancellors Committee) investigation of copyright and intellectual property.

The Bursar subsequently referred the Health Science request for assistance to the Academic Board.

To: CAL/CML Project Team

From: [Project Manager], 31/5/90

Re: Copyright, etc.

The question of copyright ownership and the use of University resources is one that hasn't been fully answered on the UCCQ campus. Most copyright queries in the academic world seem to revolve around the question of "who profits".

- The institution (employer generally) has concerns about the use of institutional resources for individual profit. Resources in this context would include office space, computing and library facilities, exploited student labour, etc.
- The individual often counters that much of the creative work (which includes time for thinking, etc.) was done on personal time. This argument is routinely made, even if the departmental secretary typed the materials on a departmental computer, for duplication on the department's photocopier, and mailing using departmental postage.

In almost every case that I am aware of the conflict became important because either one party or the other has a potential for income from the publication, or the employer feels that its resources are being unduely [sic] ripped off.

> The copyright laws generally give ownership to the author unless the materials in question were prepared as part of a specific supervised job responsibility.

I don't want to see us become involved in any conflicts over copyright within the CAL/CML Project. The paragraphs which follow propose a policy that seems to me to be fair, practical and easy to administer. Note that I have kept everything in plain english, I think both UCCQ and the individuals have better protection if we adopt something simple rather than going to a legal document. They are being presented to the School of Health Science for adoption as School policy.

Draft Copyright Policy for CAL/CML Materials Produced within the School of Health Science, UCCQ

1. Materials produced for the CAL/CML Project are generally part of the assigned duties of the academic, technical or support staff (paid, volunteer or student) involved.

2. Copyright for all materials produced for the CAL/CML Project will be retained jointly by the author or programmer and the University College of Central Queensland.

3. The contribution of UCCQ, authors and/or programmers will be acknowledged on the title page, credit page, or similar area of the document (substitute card and stack, etc., as appropriate for Hypercard materials, etc.)

4. There will not be any royalty payments or other special compensation expected or paid to anyone when the materials are being used for UCCQ courses or by UCCQ students, whether on a UCCQ campus or not.

5. The School of Health Science will endeavour to ensure that UCCQ prices materials that are being sold or otherwise used outside the University such that the intellectual and technical costs are recogniszed. In other words, UCCQ should attempt to price any materials such that at least some token payment can be made for those costs, and where possible, a realistic cost recovery will be made.

6. Any such recovered costs will not be paid to individuals but will shall be paid to the School of Health Science "consulting fund" to support further instructional development and for use by staff to pay for travel, research projects, attending conferences, etc., at the discretion of the School of Health Science.

7. This policy shall form part of the general policies of the School of Health Science. In the event of conflict arising over the interpretation of these policies the normal School of Health Science processes of appeal shall be followed.

8. All individuals (student or staff) developing materials for use within the School of Health Science CAL/CML Project will be asked to sign a letter of agreement to abide by these policies as part of their participation with the Project.

Concerns over Referral from Academic Board

To: President, Academic Board; Bursar

cc: Secretary, Council; Dean, SHS; SHS CAL/CML Project Staff

From: [Project Manager], SHS CAL/CML Project, 8/8/90

Re: Copyright Concerns

I understand that at its last meeting the Academic Board referred the question of UCCQ Copyright Policy to the Council.

I am concerned that the issue apparently came to the Academic Board without the background information to indicate why the issue was being raised, and trust that the situation will be corrected when referred to Council.

When the Bursar and I discussed the issue some weeks back I was aware that there were a number of different constituencies on the campus with their own needs and concerns about copyright. The SHS CAL/CML Project's concerns are probably not unique, however they may conflict with those of another constituency. The UCCQ Copyright Policy must recognize the concerns of all parts of the academic community; I trust that the various constituencies will all be able to be involved in the Council's investigations. One mechanism to do that would be to co-opt individuals to a working group, others would include asking for written submissions from interested parties, general meetings with staff, students, etc.

As I have previously indicated, UCCQ needs a policy that recognizes the intellectual input of staff and students developing materials through avenues such as the SHS CAL/CML Project. The current policy may have worked well for protecting CIAE's rights under the old Copyright Law, an important concern for Council when the Policy was written. However the Copyright Law and UCCQ have both certainly changed, and individuals also have rights in their own intellectual property. Until the respective rights have been clarified I am somewhat constrained in the development of our project materials.

I am therefore most interested in a full and prompt examination of the issue, and would again offer the resources of this unit, as far as is consistent with our resources and mandate, to achieve this objective.

Copyright Referral to Advisory Committee

Date: Fri, 17 Aug 90 09:36:30-1000

From: [Project Manager]

To: [Health Science Staff]

Subject: COPYRIGHT

The copyright wheels are turning, albeit slowly.

Copyright Policy at UCCQ has been referred to the VC's Advisory Committee from the Academic Board (NOT to Council as reported at the Staff Meeting).

As well, I have been received materials from the President of the Academic Board ([name]) that the AV-CC (Australian Vice-Chancellor's Committee) has been discussing. It would seem that the issue is becoming more apparent all across the country and our needs are quite timely.

On 11 April, 1990 the AV-CC circulated a memorandum about "Intellectual Property" seeking input from all institutions. Their final report on this issue has not yet been released so far as I know.

Some excerpts from the accompanying background discussion paper prepared by Daniel Dwyer appear below. Please note - The excerpts have been deliberately chosen to stimulate interest and discussion. While they should not be so far out of context as to distort their meaning, they do not present the more complete and balanced view of the entire paper.

Excerpts from "Ownership of Intellectual Property in Australian Tertiary Institutions: A Background and Discussion Paper Prepared for the Joint AVCC & ACDP Copyright Committee" by Daniel P. Dwyer, Feb/90

p. 5 - "...academic staff engaged in research involving inventions and patents may query the equity of the intellectual property produced by their expertise and skill belonging to the institution while other staff involved in areas of copyright can not only claim ownership but can also exploit and control development of the property. To illustrate further, it may be asked why an historian employed to research only should be entitled to full ownership and exploitation rights for a product produced using institutional facilities and resources as well as a living wage whereas a scientist cannot make a similar claim in relation to scientific work which produces patentable inventions. The issue may lie dormant until...the historian produces a best seller for which the only return for the institution is indirect enhanced reputation (not that this is never a relevant factor to consider)."

p. 9 - "The law under the Copyright Act 1968 is that the copyright in materials prepared pursuant to the terms of employment under a contract of service belongs to the employer. [s.35(6)]" .... "...most academics would continue to find it inconceivable that an institution would be able to claim proprietary rights in books, lectures and public addresses produced or given as part of teaching or research."

p. 12 - "...literary is a term of art in copyright law encompassing computer programs and a range of written works which would be considered clearly non-literary in academic circles. .... "Accordingly, it can come as a surprise to institutions (and, at times, staff) that the legislation or guidelines also vest ownership of copyright in computer programs, films, sound recordings, compilations and directories in the respective authors."

p. 13 - "The issues involved in relation to student ownership of copyright depends upon a number of variables. For example, students may also be employees and demarcation between copyright in material produced as a student as distinct from being produced as an employee might be difficult."

What are your views?

The complete paper is available in my office, however it is needed for a couple of meetings so shouldn't be taken too far away.

Academic Staff Association Update

The following document is a draft version, a final version was not available in the electronic files.

DRAFT

To: [President, Academic Staff Association]

From: [Project Manager], 24/8/90

Re: Copyright

As requested, this an update on the status of the current investigations into the ownership of Copyright and intellectual property on the UCCQ campus.

The development of computer software for Computer Assisted and Computer Managed Learning within the School of Health Science CAL/CML Project resulted in several questions relating to the ownership of intellectual property. A draft proposal for a policy that would recognize the intellectual input (students, academics and general staff), the university's resource contribution and the distribution of any resulting income was developed within the School.

After reviewing the draft, the Bursar indicated that Council had a long standing policy that was contrary to our proposal, and that if the School/Project wished to pursue the matter it should ask the Academic Board, through its President, to consider the issues involved.

The question was raised through the President of the Academic Board, with the eventual result that the Board referred the question to the Vice-Chancellor's Advisory Committee.

The issues of intellectual property, ownership of copyright, etc., is not solely a local issue. The Joint ACDP/AVCC Copyright Committee recently commissioned a report on intellectual property to enable the institutions to develop a more consistent system-wide approach. The V-C's Advisory Committee is awaiting the receipt of this report before proceeding further.

Within the SHS CAL/CML Project we are still faced with the need to use, and distribute, software that was developed in such a way that we come into conflict with the UCCQ Council's policy. We have already distributed some materials without the situation being clarified, and have sales prospects for others. If the situation doesn't come to a satisfactory solution reasonably soon this School at least may be unable to continue the preparation of some student learning and management materials without violating both existing laws and common justice.

One Staff Member's Dilemma

The following is an excerpt from a letter dated 7 January, 1991, from a Health Science staff member to an advisor at another institution where the staff member was registered as a student. Both the University [College] of Central Queensland and the other institution claimed copyright ownership for the work in question.

UCQ'c claim was on the basis of the individual being a staff member, the other institution's claim occurred because the copyright for all student work is automatically claimed by the institution.

In regard to our conversation this morning (Monday 7/1/91), on the copyright of materials developed by myself whilst an employee of the University College of Central Queensland *and* [emphasis in original] a student at the University of […], I wish to furnish you with further details.

I spoke to [an employee of the University and another from the Copyright Agency Limited]. Neither has been able to shed much light on the situation, of who claims responsibility.

It is my proposal that I make a copyright declaration to the effect that U.C.C.Q and myself hold copyright. This should furnish you with data to seek professional counsel on. I would then anticipate that if the [University of …] is in agreement with the declaration, we could proceed with the project as a supervised study.

I am in the dilemma, that if this is not resolved, I may not be able to continue with this as a study project as it is the intention of the School of Health Science, U.C.C.Q to eventually market the product, thus the further need for ratification.

Software Distribution Alternatives

This document was circulated through the Health Science electronic mail system.

To: CAL/CML Colleagues

From: [Project Manager], 25/2/92 [CAL_SALE.SHS]

Re: SHS Software Distribution Alternatives

We have been talking for some time within Health Science about the wider distribution of software that we have produced, both the tools like CAL_Maker and CASS and courseware developed using those tools (Safe Sex, Trauma, etc.). The issue continues to be clouded by problems of intellectual property rights but that these can be overcome, albeit differently depending upon what happens within UCQ's so-far non-functioning Working Party on Intellectual Property and which distribution channel we choose.

I prepared this discussion paper to look at the alternatives for distribution as I see them at present, describing each with its pros and cons. Your comments are invited.

Background

I cannot see any distribution channel which will return significant amounts of revenue to UCQ or SHS. This is as true for software distribution as for academic books, and for most of the same reasons. The market is not large, production costs are (relatively) high, especially when the costs of development and user support are factored in, and the sale price needs to be kept low enough to discourage wholesale theft.

Academic publishing has never returned enough money to cover the real costs of producing the materials. It is only when an employer subsidises all of the development of publication-quality materials, and lets the 'author' have all of the economic benefits that accrue, that there is more than a token financial return. The university presses, where even the publishing and distribution costs are subsidised, usually pay in prestige only; commercial firms will seldom pay more than 10% of the wholesale price of a publication as a royalty.

To understand the current situation it is useful to briefly look at the history of software distribution. In the beginning were the mainframes, then came the minicomputers…. When computers were large and expensive, and when the computer priesthood was much more powerful than it is today, the computer manufacturers and computer centre managers effectively controlled the software in use. Proprietary operating systems guaranteed that software couldn't be moved from one computer type to another and most large users maintained a stable of programmers to develop for the needs defined by management.

Universities and research establishments, and to a lesser extent private consultants, developed some products that made their way into the general market, but these were in the minority. Most organisations used the software tools distributed (and therefore approved) by their hardware manufacturer and used them to develop applications specific to their own needs. User support, if available at all, was primarily in-house.

The microcomputer changed all that, permitting computers to be used as personal tools, and creating a demand for software products that has led to a billion dollar industry. The software developer of the late seventies and the early eighties was usually a computer user/hobbyist who was developing tools for his own use in a market that didn't yet exist. 'Public domain' software (software that was freely distributed for the common good) was common AND surprisingly good. Documentation, however, was minimal and distribution was commonly via hobbyist Bulletin Board systems (computer systems accessible via modem without charge and operated as a hobby, often by ham radio operators).

A commercial market slowly developed and has been characterised by meteoric rises and falls. Digital Research of the USA distributed one of the first non-proprietary operating systems (CP/M) but failed to recognise the importance of IBM's entry into the micro market and all but disappeared from the commercial scene. The developer of VisiCalc, the first commercially available spreadsheet program, wasn't so lucky. When Lotus Corp. poured tens of millions of dollars into promoting Lotus 1-2-3, and incidentally copying the functionality of VisiCalc, the first of the 'look and feel' software infringement cases was lost through a corporate buyout. Vulcan, the first general purpose microcomputer database manager has survived into the nineties as dBase, however Ashton Tate's recent acquisition by Borland may spell its demise.

Borland and MicroSoft, two of the current giants of the software industry, unfortunately provide the model that most software developers seem to think is feasible. In both cases the companies started very small (isn't that the same with almost all companies?), had a good idea that they could capitalise on (again that is the same with all budding entrepreneurs, especially university developers, isolated as they are from the normal commercial realities), and started with minimal capital resources (again…).

Borland's experience within the commercial market is very instructive. Prior to the release of Borland's first Pascal compiler, compiler prices ranged from several hundred to several thousand dollars (US$). Legitimate sales for some companies were likely in the low hundreds, although actual copies in use may have been ten times as large. Borland released its compiler for approximately US$40 and immediately started selling in the tens of thousands. With this many users bugs were discovered daily, forcing Borland to produce upgrades and revised versions, AND the gross number of users forced the company to begin providing an acceptable level of user support (probably the first time ANY compiler company had provided such support).

Today Borland and MicroSoft, and any respectable software developer, have large development staffs and a worldwide sales and distribution system-- big bucks, big staffs, big business. While Kahn and Gates may have become millionaires, the success stories are far outnumbered by the failures.

There are alternatives. Shareware developers took a different approach. They are mainly individual programmers who were unable to interest commercial firms in distributing their 'master pieces', yet they often had produced products with features the commercial products lacked, albeit usually with minimal user interface considerations and poor documentation. The solution, advertise in the classifieds in the computer magazines and distribute via the blossoming network of computer Bulletin Boards. The user seldom had contact with the developer except to (hopefully) send a cheque if the user liked the program 'well enough to use it on a regular basis'.

As with the commercial system, some shareware developers have become successful, some even crossing over the line to become fully commercial ventures. More commonly however, the 'good' shareware developer has a small staff of 2-20 people developing, copying, packaging and distributing their products. Often, the main creative genius behind the business retains a conventional job. Getting users to send in the registration fee, the company's sole income is the major problem as most users never register their products. Unregistered users however often are more demanding about user support than legitimate users.

Today, every software purchaser expects user support. If the selling prices are low enough, AND the customer is advised in advance of purchase, support can be minimal. Most purchasers of a piece of software costing $100 or more will expect individual attention upon demand-- twenty-four hours per day, seven days per week-- user support for every question from 'How do you copy a file on the Macintosh', and 'I don't know what command to use to start this program', to the more knowledgeable 'Why can't I enter dates in an Australian format', and 'Why didn't you use file structures that accommodate my alphanumeric student ID number?'

Documentation quality has improved significantly as well. Most commercial software houses still produce their reference manuals in-house. Their user manuals are often prepared by professional writers who (unlike the earlier in-house technical writers) use the product for practical work as they write the manual. This helps ensure that the result is both readable and useful.

In addition, the best mass market commercial (and occasionally shareware) products have generated a huge 'after market' in books that purport to explain the use of the software better that the original manuals. How true that is today is debatable; I suspect that it serves as much to support pirated copies of software as much as it supports legitimate users. After market books do have a real purpose; SHS, for example, buys such books to supplement the limited number of expensive manuals that come with our 'site license' arrangements.

Software Developments at SHS

The School of Health Science has developed a number of 'products' in the last three years. Some of the materials have primarily been the result of student 'projects', others the work of both academic and general service staff. All materials have been subsidised by the School and the University, through the provision of equipment and other resources, and also through the availability of technical support staff.

Our most stable product is CAL_Maker, developed primarily by [staff member] to SHS specifications, and involving approximately one person year of development and testing (staff member and student). Courseware produced using CAL_Maker (academic staff developed) is usable internally but requires editing and proof-reading before it can be released as anything other than 'demo' materials.

Questionnairy, originally developed by a group of students, has been cleaned up and is now apparently a reasonably stable product. The Mac version only needs some testing and better documentation before being able to be used outside the School.

CASS, developed by [two Health science staff], has also required almost one person year of development. It is a sophisticated and exciting use of the computer and has the most promise as a 'reputation-making' product. It still requires extensive testing and use, and probably major revisions, before release, especially if it is to allow the user to select the nursing care model to be used. My estimate is another person year of work yet.

The Clinical Placement System has been one of our most time- consuming developments. It is potentially a very useful tool for managing the student timetable but, even with more than one person year of work by a professional programmer, remains unusable because of bugs, a poor and inconsistent user interface, and inadequate documentation. Unfortunately, in our enthusiasm and naivety, we have already 'sold' copies of this program to other institutions and are facing a major support problem.

In addition, we have a variety of individual items, many of them aimed at specific topics within the B.N. program or that provide tools to solve specific staff needs ([staff member]'s OHP for Mac stack, for example). Most of them work acceptable for internal use but haven't been made robust enough for distribution.

Distribution Model 1: Unpublished, but Available

This is our current model. We have publicised our materials in a number of journal articles and conference presentations. Typically we also hand out diskettes containing sample copies of our work to interested individuals, often with copies of the documentation as well.

Other outlets for this distribution method include Apple's CD-ROM series containing interesting software for academic uses.

Pros: Inexpensive, easy to manage, encourages others to experiment and use materials in a similar manner, recognises that academics will 'reinvent the wheel' whenever possible.

Cons: Lacks coordination and doesn't necessarily get our materials into the hands of individuals who really could benefit from their use.

Distribution Model 2: Minimal Support, Self-Publish (CAPGraph)

CAPGraph is a software product developed by staff in the Department of Mathematics and Computing. A brochure and free advertising in academic publications provides enough sales to justify some professional looking printed documentation.

In many respects, this is the academic equivalent of shareware distribution, and can provide some limited financial returns to the individual (M&C takes all expenses, except salaries and overheads, out of the revenue, then splits the remainder between M&C and staff travel).

Pros: As with a small shareware operation, this model is reasonably inexpensive, it gets the software into a limited distribution system, provides some 'glory', any financial returns come back to the School/Department, and it avoids the problems of commercial distribution.

Cons: accessibility to preferred client depends totally upon where advertisements are placed, all costs of distribution and support are assumed by the School/Department, The product can/will be shipped with bugs that never get fixed, user support is minimal with users often waiting weeks for answers to simple problems, 'glory' (and control) may be minimal, and arrangements may be restricted by the necessity to get Administration/Council approval for financial arrangements (site licenses, etc.). With the minimal support provided to CAPGraph by M&C it really means that the original developers are responsible for all contact and work on the product with the exception of shipping. This sometimes interferes with normal work and can be neglected.

Distribution Model 3: Good Support, Self-Publish

The UCQ Printery, with the UCQ Press, is an example of this model. Support under this model would have to include professional testing and documentation before the product went out the door. Costs would obviously vary, but this model would require at least one programmer, one after sales support person, and one shipper/clerk. Additional costs include duplication facilities, telephone for user support, etc.

The sub-model of staff members setting up their own company to market a product is fraught with dangers for both the institution and the staff involved. Where institutional resources have been used for any portion of the production, and what product developed by a staff member hasn't had some support, there will be a legitimate claim for some of the revenue. The new company, on the other hand, has the same start-up, marketing and distribution costs. If the venture is a success the staff member (or the institution) eventually has to decide whether s/he is a university staff member or a commercial software distributor. Since the skills required to develop the software in the first place are very different from the skills required to run a small business, this kind of venture is unlikely to be very successful.

Pros: Good developer support, intention to provide a quality product with quality user support, School retains control, ability to charge whatever the market will bear and provide appropriate level of support, several similar products can provide cross-product advertising support.

Cons: Cost; developer loses control of product to system; a subsidised university system can go bankrupt as easily as a commercial venture, needs several products to be viable, users may see the product as overpriced, can become very demanding (tail wagging dog) if not managed well.

Distribution Model 4: Cooperative (Intellimation)

Apple Corporation recognised the problem of distributing academic software outside of the normal commercial system and made arrangements initially with Kinkos, and more recently, Intellimation to operate a cooperative academic publishing service.

The intention is to provide a single source for catalogues and demo disks for a wider variety of software than will be available from a single institution. Intellimation operates a quality control check (similar to the best and worst of the usual academic refereeing process), duplication and distribution system. A contractual arrangement governs the splitting of revenue however royalties are in the range of $1 per copy sold.

Distribution Model 5: Commercial Publisher

Commercial textbook and software publishers are often one and the same. In any event, commercial channels exist to promote and distribute a small percentage of the available software products. Every publisher has a market niche with only a very few controlling the overall market. A look at any of the major computer magazines will provide an indication of just how few products are used by most users and the range of prices.

Academic publishing addresses one niche market (software and book both) with the major players being either fully commercial operations or universities. The potential of Distance Education units as potential publishers has not yet been tapped (or even considered by the DECs). The best commercial potential comes from a textbook for a standard subject (and course) with a software product that is essential to understanding the topic or completing the subject.

Costing is based upon market considerations with much of the academic product being distributed through university computer centres at minimal cost and product support (Stanford) or through small commercial operations set up by individual staff (Carnegie Mellon).

Alternatively publication is almost always possible using the 'vanity press'. Increasingly regular publishers are asking authors to assume development costs (fully tested software and documentation for software products and on-disk camera-ready copy for books) and/or pay the reviewing costs (typically several hundred dollars). The vanity Press, on the other hand, requires the author to pay all costs of development, publication and distribution (typically several thousand dollars for 100-1,000 copies of a book).

Pros: All distribution headaches are handled by someone else; advertising and product support can be very good, 'glory' possible with the one in a million best-seller, users have a commercial location where they can be directed to obtain the software, no additional costs and may be a royalty (1-10% of wholesale cost).

Cons: All control is lost to distributor, glory may be limited, product support absolutely dependent upon publisher, distribution dependent upon promotion given to products (may be minimal), limited financial return (NEVER recoup most development costs).

Conclusion

I have not directly indicated any personal preferences in any one of the models above (although I suspect my biases may show quite clearly). I have had the experience of distributing printed materials and know how much work that can be. Software distribution, because it includes the obligation to provide service (when was the last time you wrote the author of a book or journal article for assistance in turning the pages), requires significantly more investment of time and energy.

I have also not directly addressed the issue of who 'owns' the software products developed through SHS. This will come through patience and the deliberations of the AVCC and UCQ Council.

Drafting the UCQ Copyright Policy

The following excerpts from an electronic mail message between the Dean, Faculty of Health Science, a member of the Working Party on Intellectual Property, and the Chair of the Working Party, 19 May 1992, is a draft of a proposed policy revision; the upper case comments are reactions to the draft.

This document had still not been submitted for campus-wide discussion or approval in August, 1993.

```
From:  [Dean, Health Science]

To:    [Chair, Working Party]

CC:

Subj:  RE: DRAFT: Copyright and Royalities

[Chair] - HAVE INTERSPERSED MY COMMENTS IN CAPS SO YOU CAN FIND THEM -- AND
ADDED AN EXTRA AT THE END....[Dean]


>[Dean] - Draft for your comments please -[Chair].

>1. If a member of staff creates, while in the employ of the University,
any material (with the exception of research papers, literary and creative
works)  I SUSPECT THAT THE DEFINITION OF 'CREATIVE WORKS' MIGHT CAUSE SOME
PROBLEMS -- I'M SURE THAT SOME PEOPLE WOULD SEE SLIDE/TAPE SETS,
VIDEOTAPES, AUDIOTAPES AND COMPUTER PROGRAMS AS FITTING THIS DEFINITION.
(I WOULD GUESS THAT YOU MEAN IT TO HAVE A NARROWER INTERPRETATION?) which
is published by or on behalf of the University, the copyright of such
material is vested in the University Council.  IN ALL CASES UCQ WILL
ACKNOWLEDGE THE ORIGINAL AUTHORSHIP OF THE MATERIAL TO WHICH IT HOLDS
COPYRIGHT.  PROBABLY ALSO NEEDS TO BE SOME PROVISION FOR THE AUTHOR TO BE
ABLE TO WITHDRAW THEIR NAME FROM FURTHER CIRCULATION -- FOR EXAMPLE IF THE
AUTHOR BELIEVES THAT THE MATERIAL IS OUTDATED AND SHOULD NOT BE FURTHER
CIRCULATED BUT THE UNIVERSITY WISHES TO CONTINUE TO USE THE MATERIAL.

>2. If subsequently, the staff member(s) wish(es) to have printed material
(to which the University holds copyright) published, produced or reproduced
by any external organisation, the University Council may, on advice of the
Vice-Chancellor, allow the material to be reproduced in part or full
WITHOUT CHARGE FOR NON-COMMERCIAL PUBLICATIONS.

>3. It is the responsibility of the staff member(s) to ensure that material
included in works to be published or produced by the University does not
infringe the copyright of other authors, publishers or organisations.
Where necessary, the staff member(s)> shall obtain written approvals from
the copyright holders.  I THOUGHT THAT IT WAS THE BUSINESS OF THE
UNIVERSITY COPYRIGHT OFFICER TO OBTAIN SUCH PERMISSION.  THIS WOULD SEEM TO
IMPLY THAT EACH LECTURER WHO IS PREPARING EXTERNAL NOTES WILL HAVE TO WRITE
TO OBTAIN PERMISSION -- THAT SYSTEM IS USED IN SOME PLACES, BUT I THINK
THAT THE CURRENT UCQ SYSTEM OF CENTRALISING THE COPYRIGHT CLEARANCE IN ONE
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PLACE IS PROBABLY BETTER PROTECTION. INCIDENTALLY I UNDERSTAND THAT UCQ IS IN THE MIDST OF A SERIOUS DISPUTE RE USE OF COPYRIGHT MATERIAL -- YOU MIGHT WANT TO CHECK WITH [Director, DDCE] FOR THE LATEST INFO.

>4. Copyright of printed material (to which the University does not hold copyright) published or produced solely by an external organisation under the authorship of a member(s) of staff of the University shall not be determined by the University Council.

>5. All royalities from (2) and (4) above shall be retained by the member(s) of staff. [Chair] -- THIS IS SEDUCTIVELY SIMPLE, BUT WILL NEED SOME FURTHER INTERPRETATION. FOR EXAMPLE, SOME MATERIALS MAY BE PRODUCED BY A COMBINATION OF STAFF, OR BY STAFF AND STUDENTS. I THINK WE NEED SOMETHING LIKE "NORMALLY, ALL ROYALTIES FROM MATERIALS PRODUCED BY UCQ STAFF BUT TO WHICH UCQ HOLDS COPYRIGHT WILL BE DEPOSITED IN THE APPROPRIATE STAFF MEMBERS 'CONSULTING' FUND IN THE AGREED-UPON RATIO IF MORE THAN ONE INDIVIDUAL IS INVOLVED. WHERE ANY INDIVIDUAL HAS LEFT THE EMPLOY OF UCQ OR WHERE THE ROYALTIES ARE ANTICIPATED TO RISE ABOVE $1,000 A SEPARATE AGREEMENT WILL BE NEGOTIATED BETWEEN THE INDIVIDUAL AND THE UNIVERSITY." I'M SURE A SOLICITOR WOULD PICK HOLES IN THIS BUT THERE MUST BE SOME WAY TO SAFEGUARD EVERYONE'S INTERESTS.

>6. Members of staff producing printed material under (1) above (with the exception of Distance Education Course Material?) I DON'T SEE A DIFFERENCE WITH DISTANCE ED MATERIAL -- PARTICULARLY AS MORE DIST ED MATERIAL IS USED TO SUPPLEMENT ON-CAMPUS LECTURES ON VARIOUS CAMPUSES, shall normally be entitled to royalities from the sale of such materials by agreement between the individual staff member(s) and the University once it has been established that there has been full cost recovery to the University. Where the integrity of such property and its future use are a concern to the staff member(s) then the University will provide for input from the staff member(s) on some practical and agreed basis to all future decision making.

>7. If the material produced is a computer program or audio-visual item which has been developed using University facilities, copyright is vested in the University Council UNLESS OTHERWISE NEGOTIATED PRIOR TO PRODUCTION.

>8. Where individuals develop Computer Assisted Learning (CAL) or Computer-Managed Learning (CML) routines or Distance Education Material their work will be acknowledged on all print or electronic copies of the material.

>9. Nett proceeds from the sale of computer programs, audio-visual material, patents and literary and creative works shall normally be divided equally between the University and the staff member(s) concerned, once outstanding expenses have been recovered.

> Until that time, the staff member(s) shall receive 15% of gross return on sales. IS THERE AN INCONSISTENCY BETWEEN THIS STATEMENT AND THE EARLIER ONE ABOUT ROYALTIES?

>10. In the case of patents or copyright of research developments, if the University is unwilling or unable to secure patents, to bring a product to market or to provide other appropriate support, the University shall surrender the right to such patents and/or copyrights to the researcher(s).

11. NORMALLY THE COPYRIGHT OF ALL MATERIALS PRODUCED BY MEMBERS OF STAFF OR STUDENTS IS EXPECTED TO BE ASSIGNED TO THE UNIVERSITY. HOWEVER, JUST AS THE UNIVERSITY MAKES PROVISION FOR INDIVIDUAL MEMBERS OF STAFF TO UNDERTAKE PRIVATE CONSULTING WITH APPROPRIATE SAFEGUARDS AND FINANCIAL RETURN TO THE UNIVERSITY, SO THERE MAY BE PROVISIONS FOR INDIVIDUAL NEGOTIATIONS RE

COPYRIGHT AND PATENTS WHERE THE INDIVIDUAL EXPECTS TO EXPEND SIGNIFICANT PERSONAL EFFORT BEYOND THAT NORMALLY EXPECTED OF A STAFF MEMBER OR STUDENT. INDIVIDUALS WHO ANTICIPATE BEING IN THIS SITUATION ARE ADVISED TO CONTACT XXXXXX AS EARLY AS POSSIBLE IN THE VENTURE SO THAT APPROPRIATE AGREEMENTS MAY BE PUT IN PLACE.

Appendix J

Sample CAL_Maker Documentation

CAL_Maker was the major CAL authoring tool produced through the project. The *Guide for Preparing CAL/CML Materials* was developed primarily for use with CAL_Maker and emphasises CAL_Maker features.

The Second draft which follows represents the document distributed to Health Science staff early 1991. The technical specifications which would have appeared on pages 17-22 were deliberated not distributed at that time because of staff feedback which indicated that they were too technical.

A computing Project student spent much of 1991 attempting, without much success, to develop a set of instructions for using CAL_Maker that would be acceptable to the staff (Haines, 1991). The Worksheet following the *Guide* was the most successful result of that endeavour as it allowed academic staff to prepare their materials in a ‘story board’ format for typing, illustrating, and coding by a support staff member.

The excerpt from the revised *Guide*, *Notes for using CAL_Maker*, following the Worksheet illustrates two unsuccessful formats, although the second was more acceptable than the first.

SECOND DRAFT

Guide for Preparing CAL/CML Materials

A.C. Lynn Zelmer, Editor

Major Contributors:

School of Health Science Academic and Support Staff

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ROCKHAMPTON MC, QLD 4702
AUSTRALIA

Contents

Suggestions regarding additional or missing materials should be given to Lynn Zelmer.

HyperCard(r)

HyperCard is a software tool on the Macintosh(r) computer that allows us to present information in a variety of ways. Unlike standard computer database tools, HyperCard presents textual and graphic information in either a linear structure or, more usefully, according to the order selected by the user.

HyperCard is a very versatile tool. With a little imagination and artistic ability, HyperCard can appear to be a set of file cards, a calendar, a diagram of the human body, or the flight control panel for a jet airplane. A HyperCard database functions like a stack of cards. You can move through the stack of cards from the first to the last, or you can start with one card and jump to others as you process the information contained on the cards. HyperCard provides the tools to associate one card with another to facilitate this jumping.

The source for Hypercard materials can be text files and/or illustrations, photographs, x-rays and other materials that can be digitized by the computer.

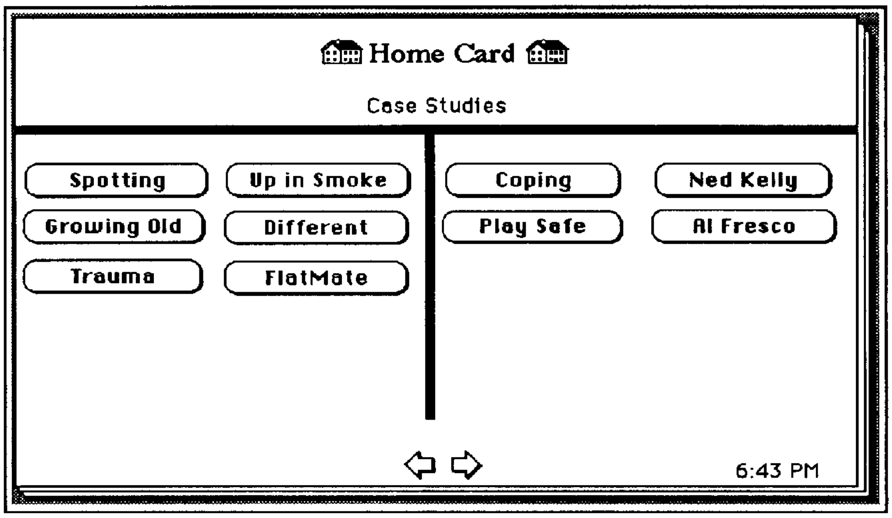
HyperCard was chosen by the SHS CAL/CML project because it is inexpensive (available free to the purchaser of any Macintosh computer) and is easy to use for both the developer and the user of the information.

HyperCard stacks also have the advantage that they can be designed to be easily modified by the user. This allows authors to develop open-ended applications where the user can make additions, deletions and changes to the information provided. An example could be a basic annotated bibliography provided by a lecturer with the student being able to add or delete items as appropriate.

Card: The HyperCard term for a single display screen, corresponding to the record display in database usage. The card can contain any combination of text, graphics, buttons, and display fields.

Button: The HyperCard term for a marked spot on the screen where the user can "click" with the mouse tool to cause some asction to take place.

The developer of a HyperCard stack identifies spots where such "buttons" would be appropriate to allow the user to conveniently choose options. Depending upon the kind of stack being developed, the button might enable the user to respond to a question, indicate a choice by clicking on a specific area of an illustration, move to another card by clicking on a direction arrow, etc.



Home Card (the starting card) for a HyperCard stack with buttons for selecting SHS Case Studies

Database: A collection of information arranged with a structure of some kind. Common databases include a telephone book (list of names, addresses and phone numbers), a recipe box (collection of instructions for making various dishes), and patient's records in a hospital (collection of information about individuals admitted, records related to their payment status with the hospital, medical records, etc.). As can be seen, databases don't have to be on computer.

Field: The HyperCard term labelling a screen area where information is presented, database usage of the term is similar.

HyperText: The term used to describe text (paragraphs, files, etc.) which has been organised for non-linear access. Typical HyperText applications have "hot spots" (buttons) where the user can "click" to access related information.

Script: Any HyperCard entity (stack, background, card, field, button) can have a script attached to govern the display, linking, etc. HyperTalk, the programming language associated with HyperCard, is used to write the scripts.

Script is also loosely used by the CAL/CML Project to refer to the text file prepared by academic staff which provides the input for developing a SHS Standard Stack.

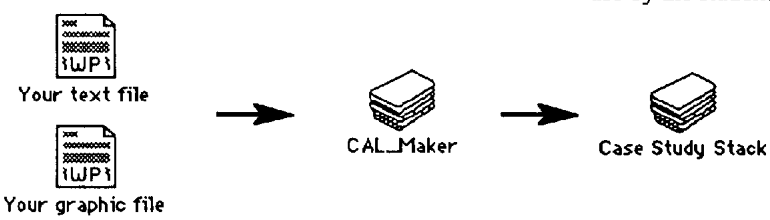
Stack: the HyperCard term for file containing a database, test bank, etc. The stack contains data, linkages between data items, and information for displaying the data.

SHS Standard Stack: The stack which results from the compilation of the special text files prepared by SHS lecturers when preparing standard CAL materials for student use. [See the section which follows on the **SHS Standard Stack**]

Start with text and graphic files

CAL_Maker is a conversion tool

The resulting stack (file) is formatted for use by the students



Text File: A standard file containing only words and numbers prepared using the computer. Word processor files usually also contain special codes to identify the fonts, character sizes and other format changes. Text files must often be saved using the **Save As...** option.

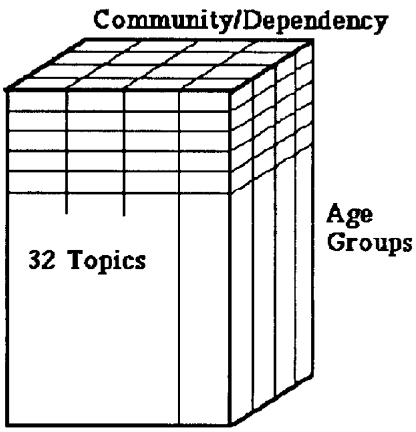
Case Study Topics for 1990-91 CAL Preparation

Brief descriptions of clinical situations with accompanying thought-provoking questions, called case studies for convenience, were selected for the initial CAL/CML materials development. All case studies were to be designed for use in lieu of the small group discussions (designated tutorial sessions at UCCQ) which commonly followed large group lectures. Case studies would be identified for specific lectures and students were to be encouraged to use the case studies for individual or small group consolidation of the lecture topic, with the Lecturer providing backup to individual students when required.

The topic areas (see list below) were chosen for the initial preparation of study materials because they represented the range of issues to be covered during the three year program. Almost every topic can be approached from several aspects: community (1st and 3rd years), low to medium dependency (2nd year) and high dependency (3rd year). They may also require different approachs for different age ranges .

These 32 topic areas then are the framework for 384, or more, case studies of varying complexity [32 topics x 4 aspects x 3 age ranges=384. As the age ranges in particular are not yet fixed 384 is simply an estimate, the diagram below shows four age ranges for 512 possibilities.]. The complete set of case studies could be thought of fitting into a niche in a box or set of drawers where the 32 topic areas designated layers on the front face, the four levels of service formed the layers on the second face, and the age of patient/client the third (see diagram below). Multiple case studies within a specific area would only be encouraged after there was at least one topic per slot.

1. Victims of Violence
2. Multicultural
3. Drug Affected/Pharmacology
4. A.I.D.S.
5. Food Poisoning
6. Diet - Changes/Aberrations
7. Trauma
8. Infective Disorders
9. Occupational Health
10. Home/Residential Safety
11. Reproductive/Sexual Functioning
12. Stress
13. Pregnancy and Abortion
14. Congenital Inflammatory
15. Death and Grief
16. Mental Health
17. Congenital Disorders - Physical
18. Congenital Disorders - Mental
19. Degenerative Disorder - Cardio-Vascular
20. Degenerative Disorder - Respiratory
21. The Challenging Patient
22. Legal Issues
23. Haemopoietic
24. Skin
25. Degenerative Disorder - Endocrine
26. Degenerative Disorder - Gastrointestinal
27. Cancer
28. Environmetal Hazards
29. Degenerative Disorder - Musculosketal
30. Degenerative Disorder - Neurological
31. Degenerative Disorder - Renal
32. First Aid



Authors should remember that this structure covers the content for the entire award course. With the variety of resource materials available and the need for variety in teaching techniques it is unlikely that CAL materials will ever be developed for every niche.

Preparing Materials

These notes are the result of approximately 18 months planning and developing CAL tools and Case Study materials for use within the Dip.Hlth.Sc.(N) (now B.Nurs.) program of the School of Health Science, UCCQ. During this time student materials were developed for a "standard stack" using HyperCard on the Macintosh computer. The initial instructional design was very flexible as many of the academic and technical staff lacked experience using computers and/or developing CAL/CML materials. As staff gained experience developing resources they also became more critical of their own work and have expanded their "ownership" of the Project to include more emphasis on instructional design.

Instructional Design

In 1989 the academic team involved with the CAL/CML project decided that the most feasible development strategy was to work on CAL materials that could be used for follow-up independent study tutorial use after the a topic had been introduced in class. Small group tutorial time is at a premium and the CAL materials would allow the students to engage in conventional tutorial activities without requiring the physical presence of a lecturer.

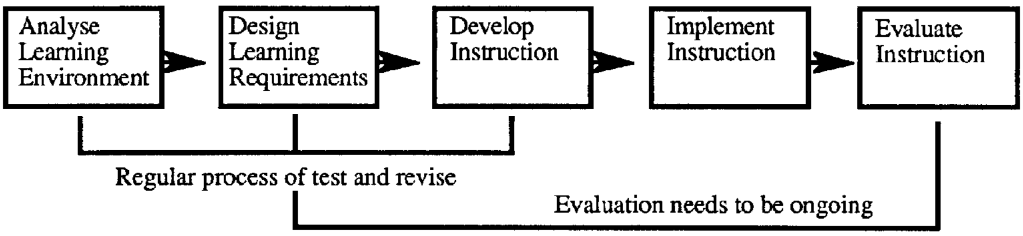
The Case Study format was selected to present a situation and manage the questions which arise from it. It was agreed at that time that the Case Studies should allow an individual or small group of students to use their knowledge for solving the problem presented AND to expand their ideas about the situation.

The current standard stack was developed to the team's specifications, as translated into working specifications by the Project Coordinator, and allows for the presentation of textual and graphic information/questions with minimal computing skills on the part of the author (the content material is developed in a standard text file with a minimum of special formatting or special characters). As part of the continued development of this tool Bruce Young, the Project's HyperCard programmer, has added a number of new options, including:

- bold facing or other text emphasis,
- multiple correct answers where several answers must be selected before proceding,
- matching lists.

At a review of the existing materials by academic staff late in 1990 it was unanimously agreed to confirm the 1989 decision and continue with the development of simple to medium complexity Case Studies and questions as the primary CAL tool for first year materials and basic materials for other years. [See **Case Study Topics for 1990-91 CAL Preparation** for details]

The design process we are using is simple, and details can be found in a number of texts on instructional design. In the case of the initial CAL materials development the initial analysis step was informal. The initial design and develop steps took roughly four months, with implementation in second semester 1990. The first formal evaluation was in November 1990 and included a second look at the analysis, design and develop steps.



Standard Design Elements and Rationale

The four main sections of the stack are:
- Preface
- Start Activity
- Other Activities
- References

From a technical point of view, Start Activity [the actual Case Study and Questions] should follow the other sections in the Case Study script (see sample scripts in theAppendix. This permits a clean exit from the Case Study upon completion.

Preface: The Preface includes the equivalent of a title page, and its reverse, plus an abstract.

There should be a common "series" title page to start every Case Study (including copyright notice, recognition of programmers, etc.). The title page and abstracts sections of earlier Cases is now combined into a preface section. Stacks should begin with this section so that students have to read through it, then continue with the other activities, however students should be able to return to this section at a later point in the Case Study.

- The name of the Case Study that appears on the title page will be taken from the first line of the script and should be "correct". Home card buttons can be descriptive/abbreviated.
- The Author is normally the individual(s) who has/have prepared a significant portion of the Case Study.
- Where appropriate, Prerequisites should indicate either the actual work (topics, activities, etc.) or the text book chapter that should be covered before using the Case Study.
- The Activity Modes designation is, in theory, wide open. It is however recommended that authors maintain some consistency between Cases. The designation is intended to indicate to the student that other activities or resources are required as part of the Case Study. For example, a Case might require the student to watch a specific video before starting (indicated in the Prerequisites), work through the Case Study, and submit a written report based on the student's own perception of the situation discussed in the video and Case Study.
- The Abstract is intended to provide a focus, a motivator, and a guide to ensure that the student is in the correct Case Study. Normally the Abstract shouldn't provide details of the Case Study itself, but rather indicate what the student will achieve through the Case Study. The Abstract will eventually form the entry for the catalogue of Case Studies.

Other Activities: Authors must ensure that students have the information to allow them to do the activities suggested, or that they are guided to information that guides them in doing the activity.

- Sometime the Other Activities might be as simple as directing the students to references in the Library. At other times the activities might be very specific assignments that the lecturer could assign for completion by some or all students on either an optional or compulsory basis.
- It should be remembered that most students will need an incentive of some type to do the activity. Authors might vary the activities depending upon the knowledge and preparation of specific students (individual study programs), but the assignments should probably form part of the assessment for their grades.

References: The 1990 review team agreed that students should be directed to specific study resources as they work through the Case Studies.

- Within a Case Study authors should use terminology such as "... as in your textbook", "Refer to your textbook...", or "Refer to Sawyer 1990, p. 7.".

- Authors should be quite specific in separating documents referenced within the Case Study from materials suggested for further study or reading.

- The referencing system should be the same system that we are requiring our students to use in their assignments, etc., referred to as the UCCQ reference system. The most current Style Guide in the Study Materials Development Kit (DDCE) should normally be considered the standard guide, however authors are urged to be consistent, with the simple solution chosen in case of conflict.

The ideal Case Study would probably be one which tied into a topic where a variety of resource materials were used, some prior to the use of the Case Study, some during, and some after.

Start Activity: This is the section of the script containing the actual resource materials. While the stack will normally contain a scenario and related questions, there is no requirement for scenario or questions. Indeed, the standard format can be used to present information of any kind and is quite appropriate for a HyperText style document..

- The card title field contain can contain roughly 19 characters from the first line of a new card script. The card title will display only the characters which fit into the field, ignoring any other infomation on the line.
- Authors should use the title line to provide the student user with "road map" information about their location in the stack. The use of "Question 1" is preferred to "Questions". The second and subsequent cards in a series should contain the same title as the first card (or a consistent abbreviation) plus the word "(cont.)".
- The standard stack allows textual material to be displayed that won't fit on the screen at one time through the use of a standard Macintosh "sliding bar" text window. Some individuals find switching from single screen to sliding vertical window distracting.
- The standard stack provides the facility for displaying large text blocks through the text window, however authors are encouraged to break their materials into individual cards so that no single card has more than about 150 words of text displayed. Breaking text in this manner requires the author to be more aware of the problems that some students have in remembering previously displayed information, and more aware of the grammatical structure of the textual information. In many cases authors must also be more precise as they present information in smaller segments.
- As authors become more familiar with the possibilities of the standard stack, and with using the hypertext facilities, it will become increasingly necessary to design each card (screen) as a complete and stand-alone entity. Just as an encyclopedia entries are written so that the user can start at any entry, true hypertext screens must be written so that the information on one can be understood without requiring the reading of a previous screen.
- Authors are encouraged to include illustrations within the stacks to add interest and amplify the Case information, etc. Authors will be responsible for obtaining copyright permission when using materials from other sources.

Lesson Types

There are several card styles currently available within the standard stack including a general information card (no questions allowed), the original 4 question card, a matching card, a card allowing up to 14 choices, a short answer and a graphics display card. Any or all of the cards can be used in the same stack. [See section which follows on the SHS Standard Stack]

To be expanded

Mapping the Lesson

To be added

Text

The standard stack displays text in 14 point Times. The heading, which can and should be unique to each card, is larger for emphasis. The display mechanism does not allow us to display normal text in italics or bold, although some underlining is possible.

We would prefer that text selections be short enough to be displayed on a single screen, however longer selections can be 'scrolled' by the user. The next section contains some notes on writing at the appropriate reading level.

Non-Sexist Language, etc.

Authors should be aware of, and follow, the UCCQ guidelines for the preparation of educational materials using forms of language that are non-sexist, etc.

Australian spelling and word usage, when consistent with the requirements for non-sexist language, etc., should be followed by authors. The standard reference dictionary to be used is the most recent Macquarie desk edition.

Materials that have been spell-checked with a standard computer dictionary (MicroSoft Word, MicroSoft Works, Word Perfect, etc.) may also be used provided that the document's spelling and usage is internally consistent.

Questions and Responses

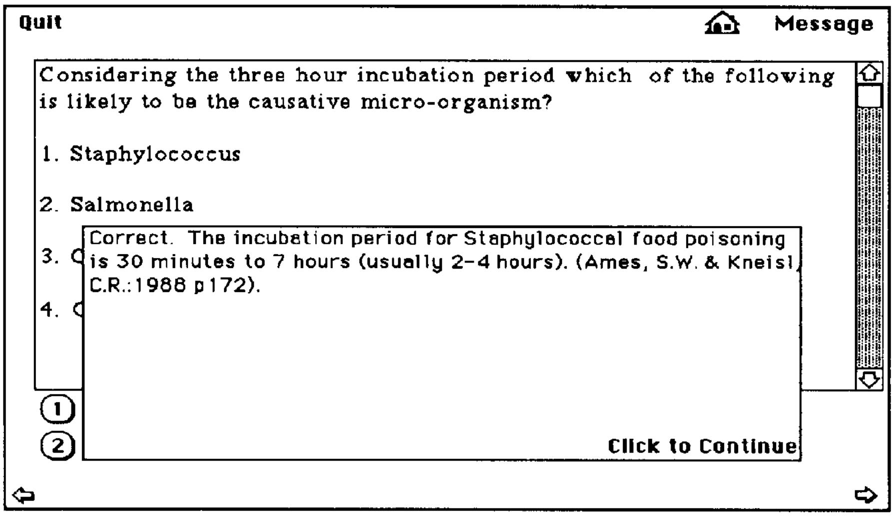
Good educational practice suggests that we should provide a response to every selection that a student makes. The standard stack allows a short motivator or reinforcing comment as part of the question 'prompt' format. Longer responses should be accommodated through a branching sequence.

Question Formats: There is no difference between writing questions for an exam or for a CAL Case Study.

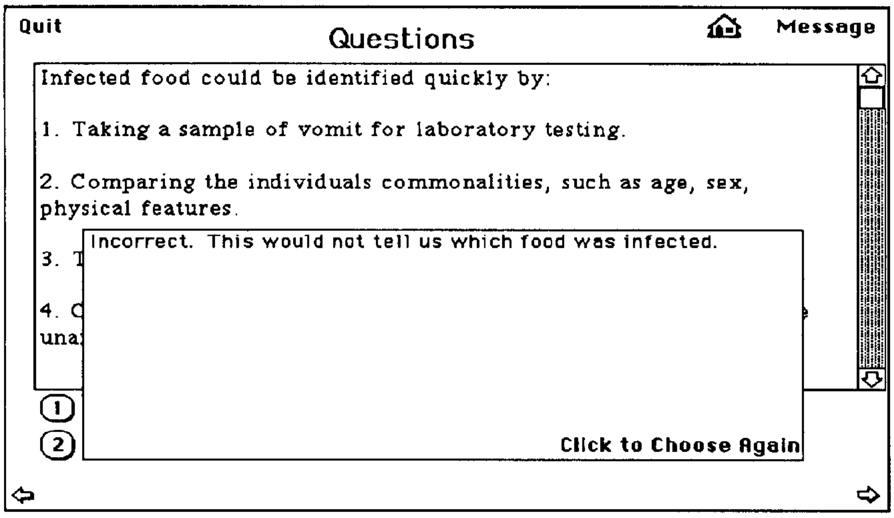
- Authors must avoid questions that use double negatives, and should avoid asking negative questions of any kind.
- Questions should normally ask for an objective response. When a subjective response is requested, the question should indicated that quite explicitly.
- Where there may be more than one response, but the Author is wanting only one of the answers, the question should be of the form "What is the best response?"
- Watch your terminology in the questions. The plural "responses" indicates that more than one response is correct. [Note that the standard stack has an option to allow students to indicate several responses, as in "Which of the following responses would be an appropriate response to this situation?"]
- Give directions to assist in answering the questions where useful.

Response Formats: In general, the Case Study materials are used to supplement in-class teaching, however they must be able to stand alone. Some students will not have attended the class and others may have misunderstood. The question responses will be the primary means of ensuring that these students gain from the Case Study materials.

- The response to a question should always start by indicating whether the student was right or wrong. Never use terminology such as "Right, but...". It would be more reasonable to respond "Normally this would be right, but...". Vary your responses but avoid being "cute". "Correct", "Good Choice", etc., are acceptable without being irritating over time.
- When the answer was correct, the response should reinforce the learning.
- When the answer was wrong, the response should give a rationale for rejecting the answer but not give the student the correct answer.
- Responses should always stand alone. Include references in the response if required to direct the student to the textbook, another reference, or another part of the Case Study.
- Normally questions require a specific response. Sometime however the situation requires the student to choose a branching option. While there may not be a need to provide a specific response in this circumstance, directions to students must be very clear in these situations. [Other similar situations arise with the additional options in the latest version of the standard stack. Hopefully their use will be fairly self-explanatory.]



Question with correct answer reinforcement



Question with incorrect answer chosen, user directed to choose again

Writing to be Understood

In Australia, as in many other countries, the level of written english is often not as high as we would expect given the speaker's level of education. Effective educational materials are written at a level that can be easily understood by the user. The text can challenge the reader with its ideas, however it should be at an appropriate reading level, neither too difficult nor insultingly simple.

- Use short sentences. Many readers lose the meaning of long sentences.
- Put each idea in one simple sentence. Do not combine several ideas into one sentence.
- Use simple familiar words.
- Use the same word each time that you refer to the same idea. For example, dwelling and house are words that mean the same thing. House would normally be the best word to use.

- Use precise words. Do not say `make flour' when you mean `grind the wheat'.
- Make positive sentences. Negative ideas are harder to understand.
- Make active sentences. Active sentences tell the reader what to do.
- Use the personal and imperative forms with few pronouns.
- Repeat words and ideas if necessary to ensure understanding.
- Keep comparisons simple.
- Put in connecting words such as `who', `which' and `that'.
- Avoid difficult and confusing constructions.
- Use simple tenses. When possible use the simple past or present.
- Explain things in a clear, logical order, and in time sequence.
- Write about things that happen to your readers in real terms. An abstract idea can be confusing.
- Break up your text by any means that you can think of. Make paragraphs short. Put things in lists. Use white space and illustrations to make the page more interesting.

These rules are adapted from an article by Felicity Savage and Peter Godwin, "Controlling Your Language: Making English Clear"; #4, Vol 75, 1978, The Transactions of the Royal Society of Tropical Medicine and Hygiene. Additional details come from Preparing Simplified Training Materials by A. C. Lynn Zelmer, International Communications Institute.

The Preparation and Use of Illustrations

It has been said that a picture is worth a thousand words. While this may be true in some situations, there are many situations where illustrations are not very effective. Research on the use of illustrations shows that people must learn to `read' illustrations just as they learn to read words. You must decide how much help your participants will need to use illustrations effectively.

In our HyperCard stacks we will use drawings, illustrations or photographs in three ways:

- to explain an idea that cannot be easily explained with words;
- to help set the mood for the topic; or
- to help 'involve' the student in the learning activity.

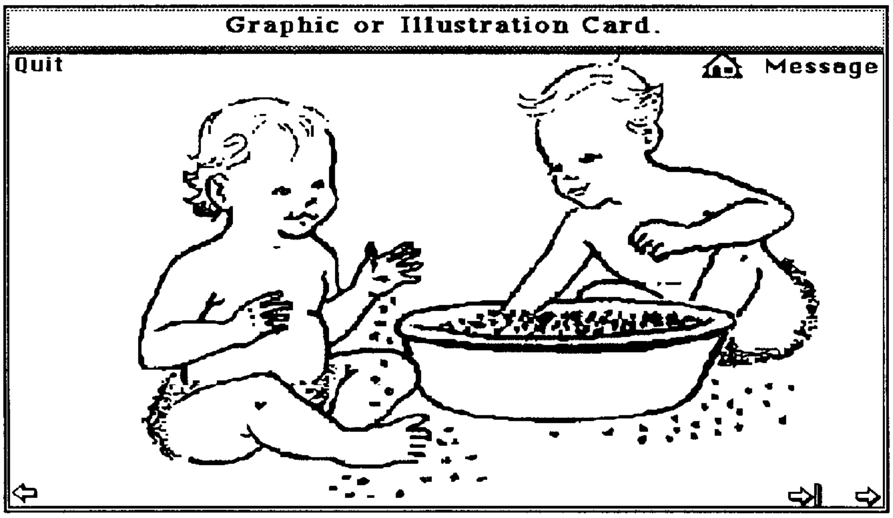


Illustration used to involve user. Requires "clicking" on an area of the illustration that demonstrates awareness of problem.

Use an illustration (drawing, photograph, etc.) as you would a photograph or slide in a classroom to introduce a topic or to help set a scene. Discussion groups may require larger illustrations which may be enlargements of the computer screen, slides or large posters. Our illustrations must be able to be clearly viewed, whether on the computer screen, on paper, or enlarged for larger group use. Keep them simple.

All illustrations should help explain the topic, they should not be a distraction.

- Even with high quality printing processes, many people do not recognize the content of photographs. Distractions from items in the background likely contribute to the confusion. Line drawings are often more recognizable than photographs.
- A single picture should not include a large number of objects, or attempt to portray several steps in a process.
- Drawings should be as realistic as possible. Omit non-essential background detail. Avoid the use of stick figures and similar stylization.
- Drawings may be taken quite literally by individuals who are not familiar with the `language of drawings'. Draw normal views of objects and include the whole object where possible. For example, the artist should normally draw a complete body for a person rather than using disembodied hands for an illustration. Enlarging an object or detail without explanation may lead to misunderstandings as well.
- Drawings are more likely to be successful if such things as clothing, buildings and surroundings are based on locally familiar styles.

This section is adapted from Preparing Simplified Training Materials by A. C. Lynn Zelmer, International Communications Institute.

Evaluating Materials

Producing successful materials is seldom an individual task. A team might consist of a subject matter specialist, a person familiar with the techniques of preparing learning exercises, and one or more persons to represent the user's point of view. We have found that showing the draft materials to colleagues and friends for their comments and suggestions has invariably improved the results.

- Do not be afraid to show your materials to colleagues or students. Authors become very involved in developing their materials, making it very hard to be objective about the faults of the exercise. Another person is usually able to see the faults better than the designer.
- Testing of the new or revised materials should be done with a volunteer group that is similar to the eventual users.
- Next, the materials should be given to another instructor to use independently; this will test the reliability of the exercise and its instructions.
- Revisions must be made and the materials tested again.

This material was adapted from Learning Exercises for Health Training, A.C. Lynn Zelmer, Editor, Voluntary Health Association of India.

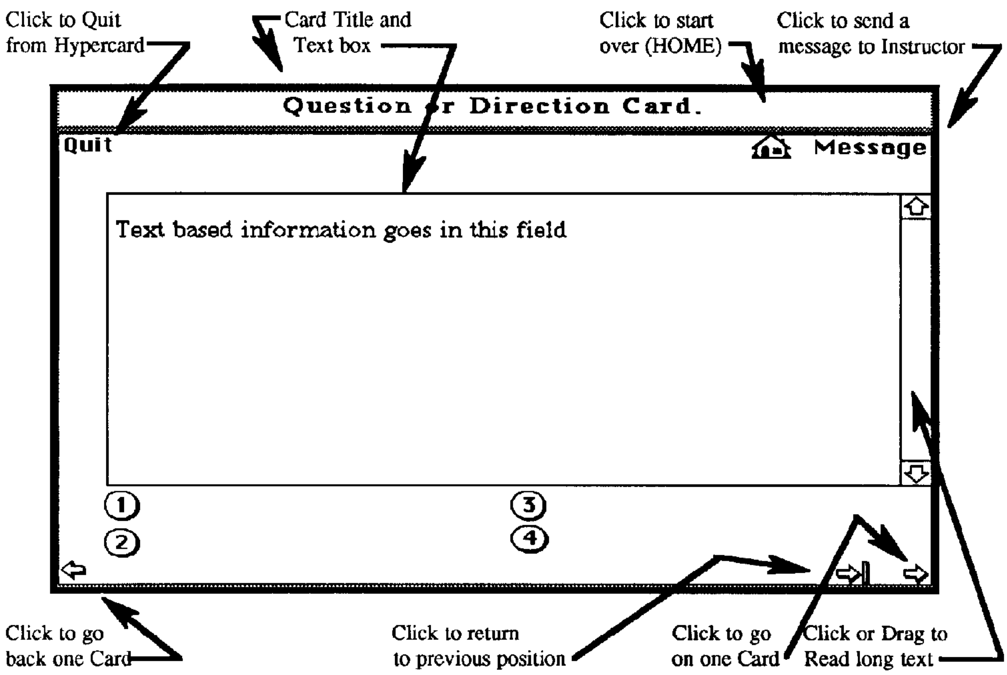
Resource Materials for Authors

Resource materials available for assisting with the Case Study development includes several dictionaries (we have standardised on the Macquarie Dictionary), The Elements of Style (Strunk & White), Style Manual for Authors, Editors and Printers (AGPS), Right Words: A Guide to English Usage in Australia (Murray-Smith), Study Materials Development Kit (DDCE) which includes a Style Guide, etc.

Some of the videos recently purchased by the School of Health Science would be suitable for introducing Case Studies, following-up on Case Studies, student-directed tutorial discussions, etc.

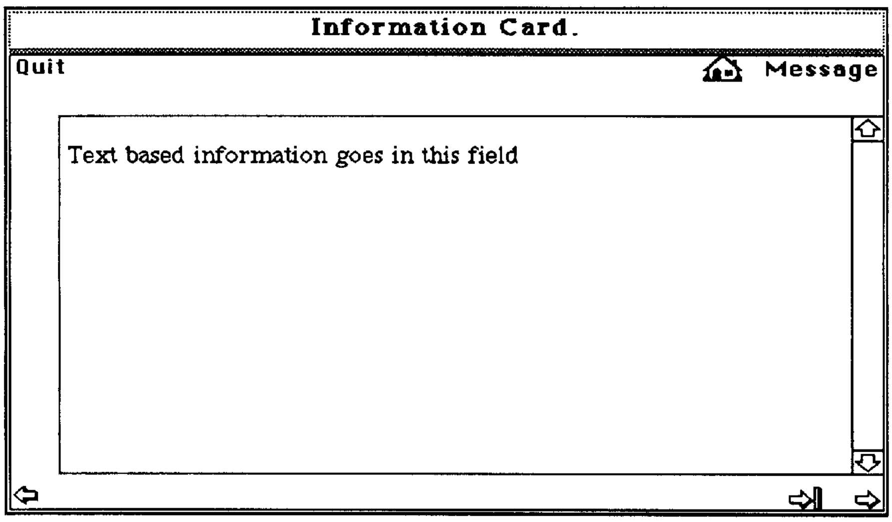
The SHS Standard Stack

The SHS CAL/CML development team has produced a standardized stack format for presenting our instructional materials. This will allow us to prepare a number of instructional units that are fairly consistent, and will remove the need for instructors to be more than minimally aware of how HyperCard works.



Response buttons: 1,2,3,4. Click anywhere on numbered circle or or prompt

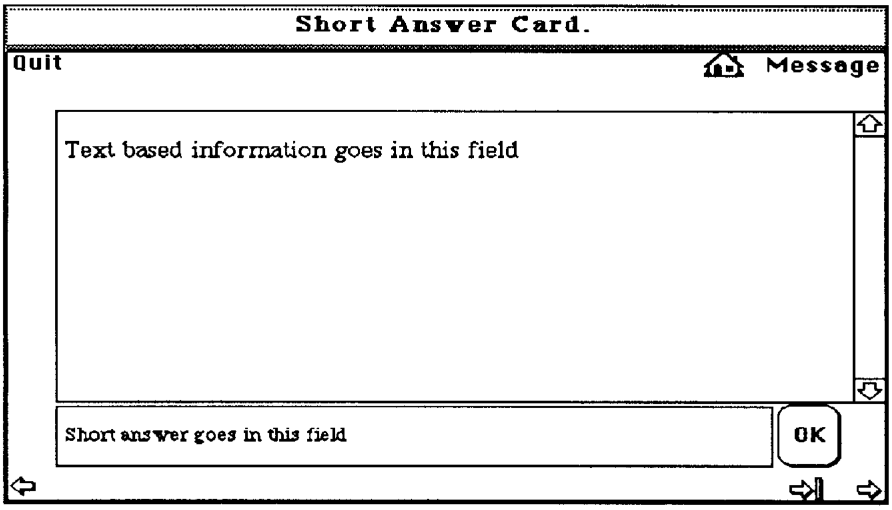
Question Card (above) showing four possible responses, text slider and return to previous position button. Basic Information Card (below).



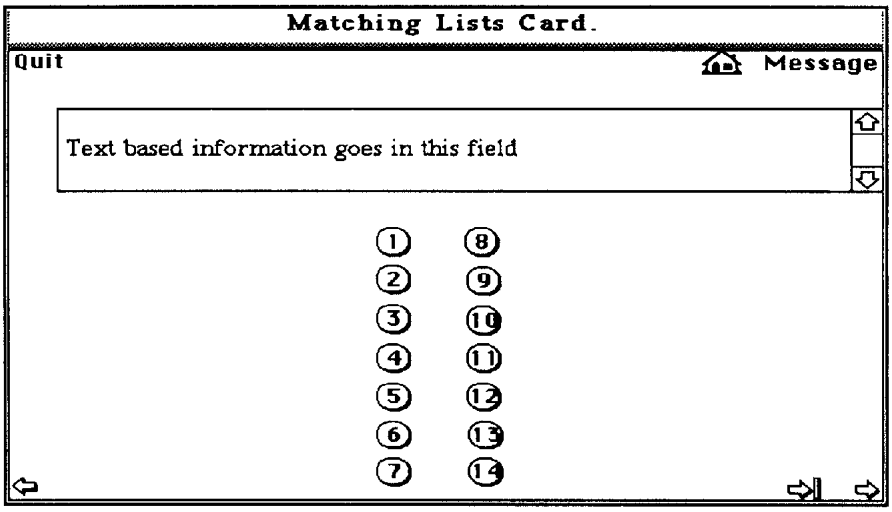
- The basic question format limits the developer to four options. This provides enough options for true/false and most multiple choice use. The display will show 4 numbered options (unused buttons will be visible).

- The basic direction card limits the developer to four choices. This card differs from the question card in the way that the user can move backwards and forwards in the stack..

- The short answer card stores the student response for later analysis. No evaluation of the response can be done during the presentation.

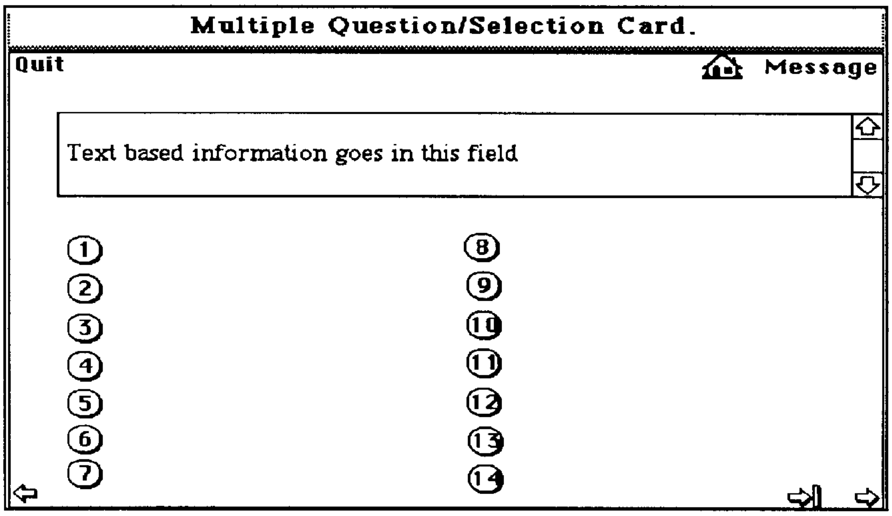


- The match card allows 7 possible pairs displayed in two columns. The number of correct matches required to advance is variable, however no response is given on error.

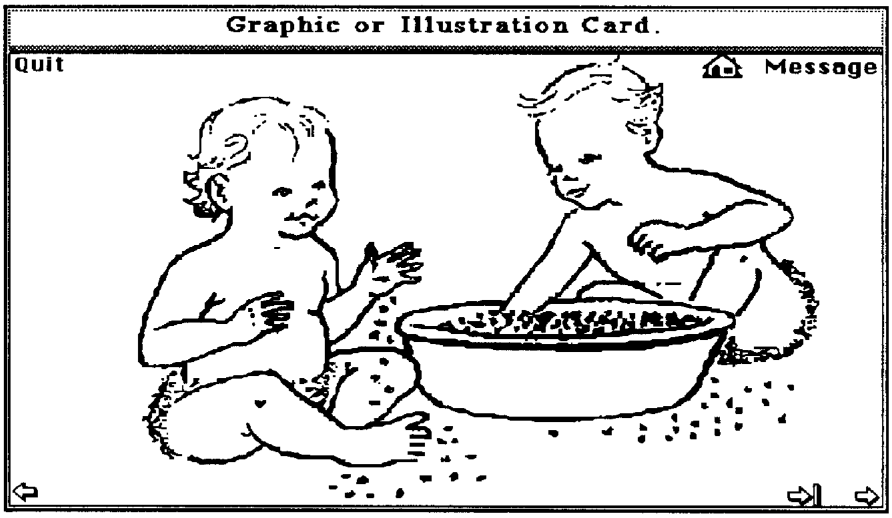


- Another variation allows 14 question choices, with or without responses, and permits the developer to specify a minimum number of correct responses to proceed (when selecting items from a list, for example). [See next page.]

- Automatic display of responses and the building of linkages from questions to answers, new cards, etc., is quite limited. (The developer can build more complex responses and linkages manually using the standard HyperCard tools.)



- Graphic presentation is limited to "bit mapped" images, manually inserted onto cards and manually located in the correct sequence. Space for graphic cards should be reserved, linkages are done with button scripts.



In order to maintain quality control and consistency in our materials we have set a number of parameters on the standard stack.

- The text for the teaching materials must be prepared using a standard word processor. SHS staff use MS Works for the preparation of their subject notes, etc., and expect to use the same tool for their instructional development.

- Student responses are computer scorable only for multiple choice or true/false style questions. Short or long answer responses are passed to a file for instructor marking. At present the scoring system cannot keep track of which questions have been answered to avoid repeated answering of the same question.

- Motion and sound are not allowed in the standard stacks.

- Students can send a message to the instructor at almost any time. This text message is keyed to both the stack and the card where the student sent the message.

- Authors often don't want students to modify the stack scripts, however the HyperCard tools were developed to allow a user to modify their own copies of the stack. The standard stack deliberately removes some of those capabilities, however in absolute terms security and integrity of the data files is limited. .

- The stack must only use standard HyperCard facilities. This means that the stack cannot use any of the extensions (XCMDS) to HyperTalk, the HyperCard programming language, that are available from 3rd party developers. This puts some limits on our stacks, however the restriction will ensure that the stacks can be used on any machine and avoids the payment of royalty charges on the XCMDs.

The standard stack uses type sizes and fonts that are a compromise between good typographical design, readability, and use of the screen. The stack currently uses 14 point type for the main textual presentation field, a larger type (condensed) for titles and a smaller type for messages. These sizes were chosen through the process of pretesting the standard stack. Similar graphic standards will evolve as graphics are used with the stacks.

- Text presentation is limited to a single type font and size. Enhancements such as bold face are allowed.

- Text display is done in a "slider" type text field with limited options for the changing display area, etc. Short texts will be visible as the card is presented, the user must scroll through longer texts using the standard Macintosh slider.

The standard stack was developed by Bruce Young, formerly a UCCQ Computing student and now on the Project staff. The first version was "frozen" at the end of Semester 1, 1990. The revised version is being released with the January 1991 Draft documentation. Instructional materials developed using any specific standard stack resources will normally exist in that form until they reach their normal revision date.

Pages 17-22 omitted deliberately

Copyright

Materials Produced by the CAL/CML Project

The CAL/CML Project is still investigating the "ownership" of the intellectual property, especially as regards the right to revise/withdraw materials that have become dated, etc. UCCQ and the AVCC are involved in discussion to define more clearly the rights and responsibilities of authors and institutions in light of recent changes in legislation and an increase in academic awareness of the issues involved.

TO BE EXPANDED, DETAILS UNDER ADVISEMENT

Copyright Clearance on Materials Used by the CAL/CML Project

CAL/CML materials must abide by the same type of copyright regulations that apply to the preparation of other educational materials.

The duplication of existing materials is bound by the 1968 Copyright Act and the 1980 and 1989 amendments to that Act. Although there are exceptions, this Act generally applies to the preparation of both print and non-print materials. In other words, the copying of words and illustrations, music and other sounds, film and video pictures, computer diskettes (including programs and data files), etc., is covered by the Copyright Act.

In addition, some materials may be protected by license agreements, foreign copyright, patents, registered trade marks, etc.

Copying Print Materials

The following information comes from UCCQ photocopy policies.

Section 40: "Fair Dealing"
It is fair dealing to make a SINGLE COPY, for the purpose of research or study, of one or more articles on the same subject matter in a periodical publication or, in the case of any other work, of a reasonable portion of a work. In the case of a published work that is of not less than 10 pages and is not an artistic work, 10% of the total number of pages, or one chapter, is a reasonable portion.

Section 135ZG: "Multiple Copies of Insubstantial Portions"
Multiple copies may be made of not more than 2 pages of a literary or dramatic work in an edition of a work or in an edition containing a number of works of which the work to be copies is one, or 1% of the total number of pages in the edition, whichever is the greater. Subject to this THE WHOLE WORK CANNOT BE COPIED. The literary or dramatic work to be copied MUST be for the purposes of a course of education provided by this university. No other part of the work can be copied within 14 days of the previous copy.

Under the University's Statutory License MULTIPLE copies of more substantial portions of text can only be made by the university photocopying officer located in the library.

To avoid any difficulties with copyright we should request permission to copy from the copyright holder or arrange to make a payment under the Copyright Act for every use of the software.

This is obviously not a problem for materials that we write ourselves. Any materials that are produced specifically for our use should be accompanied by copyright clearance from the author.

ADDITIONAL DETAILS TO BE ADDED

Copying Photographs and other Artistic Works

The Copyright Act seems to allow illustrations, photographs, etc., to be photocopied provided that we are (legally) photocopying a text portion of a work that refers to the illustration AND the illustration is required to explain that part of the work.

We can't get around the normal photocopy restrictions by redrawing, making modifications or converted a photograph or illustration to some other form. For example, using a photograph or illustration as the source for a drawing is not allowed, even when we have an artist draw the new work.

Any materials that are produced specifically for our use should be accompanied by copyright clearance from the author, artist, or photographer.

Note that under normal circumstances it is fairly easy to obtain permission for use of illustrations in educational materials, even where we intend to distribute (market) the results to other similar educational institutions. If in doubt, ask the UCCQ copyright officer or inquire from the author, artist or photographer.

ADDITIONAL DETAILS TO BE ADDED

Copying Moving Images

Not applicable at the moment.

Copying Sounds

Not applicable at the moment.

Copying, or Otherwise Using, Computer Program Code

The ownership of intellectual property as it applies to computer program code produced by the Project [Is it owned by the programmer or UCCQ?] is under review at UCCQ. The School of Health Science, UCCQ, and the CAL/CML Project endeavours to protect the rights of all parties involved in producing materials for the School.

ADDITIONAL DETAILS TO BE ADDED

Licensing Software

Materials produced through the CAL/CML Project are available to educational institutions in Queensland and Australia under the terms of **National Priority Reserve Fund** assistance received by the Project. Charges may be made to recover some or all of the costs involved and recipients may be asked to sign a standard license agreement covering the use of the materials.

Copyright materials used by the CAL/CML Project will normally be used under a license agreement from the developer or supplier. Such materials are not available from the Project but must be obtained from the Licensor.

The Project encourages users of materials developed by the Project to report possible violations of the Copyright Act or a License Agreement that relates to these Project materials. Legal action may result.

ADDITIONAL DETAILS TO BE ADDED

References

There is a considerable body of knowledge regarding instructional development, legibility, graphics in text, etc. The following references provide a brief introduction to the topics. Note that many of the references are to materials on paper based learning materials. This is partly a reflection of the fact that much of the research is based upon paper materials and also that the Macintosh computer provides the user with text and graphic images that rival printing technology with their quality and versatility.

[Note: The format of these references may not conform to the accepted standards required for SHS materials, however they are at least consistent. Notes on additional references welcome at any time.]

Communicating With Pictures in Nepal: Report of a Study by NDS and UNICEF, Kathmandu, 1976.

Goodman, Danny. **The Complete HyperCard 2.0 Handbook.** New York: Bantam, 1990.

Hartley, James. **Designing Instructional Text.** London: Kogan Page, 1978.

Lahore, James. **Photocopying: A Guide to the 1980 Amendments to the Copyright Act.** Butterworth.

Macdonald-Ross Michael, and Eleanor Smith. **Graphics in Text: a Bibliography.** IET Monograph No. 6. Milton Keynes, UK: Institute of Educational Technology, The Open University, 1977.

Savage, Felicity and Peter Godwin. Controlling Your Language: Making English Clear. **The Transactions of the Royal Society of Tropical Medicine and Hygiene:** #4, Vol 75, 1978.

Watts, Lynne and John Nisbet. **Legibility in Children's Books: A Review of Research.** Windsor, Berks: NFER Publishing Company Ltd., 1974.

Winkler, Dan and Scot Kamins. **HyperTalk 2.0: The Book.** New York: Bantam, 1990.

Zelmer, A.C. Lynn. **Preparing Simplified Training Materials,** Edmonton, Canada: International Communications Institute.

CAL_Maker Worksheet

__ of __

CAL_Maker WorkSheet **Project:** **Date______**

Card No:

Title

Card Type

Information

Graphic

Question

Direction

Short Answer

Match

List(14 Choice)

List(14 Destn.)

Response Information (if applicable)

GOTO:

CAL_Maker Technical Notes—1

QUESTION CARD.

NOTES	YOUR INPUT
CARD line 1 contains Card Title for top of card. This field contains roughly 19 characters. Only the characters which fit into the field will be displayed.	________________ ________________
LINE 3...LINE Z. The question is entered in this area, along with the options for up to 4 response choices.	________________ ________________ ________________ ________________ ________________ ________________ ________________ ________________ ________________ ________________
This is required to end text. Prompt, and response to user one after the other, separated by a vertical bar.	-- linking Option 1|Response to 1st option| Option 2|Response to 2nd option, may use several lines of text with any of the response options.| Option 3|Response to 3rd option| Option 4|Response to 4th option|
Indicates direction Required to end card.	Answer 2 goes to next card -- end question card

TECHNICAL INFORMATION.

NB. Information within { } is required
Information within [ ] is optional.

1. Do not use Tabs in your text file.
   Cal_Maker is not case sensitive.
2. Text to be enhanced must be enclosed with special markers: /U or /u for <u>underlining</u>, and /I or /i for *italics*.
3. {-- linking } obligatory - defines end of text.
4. Option n may be number(s) or word(s). Response n can also be either number(s) or word(s). A maximum of *four* response choices is allowable.Vertical bars of unused prompts(options) and responses must be listed. There are 2 vertical bars for each option /response pair. Destinations are listed on the next line.
5. Each Answer may have the same destination or entirely different destinations. Only some answers may have destinations. Those without a destination aren't listed in the destination descriptions. The writer can tailor card progressions to suit their individual needs.
   { [Answer] n [goes] [to] next [card] }
   { [Answer] n [goes] [to] [card] [+,-] n}
   { [Answer] n [goes] [to] end}
6. { -- end ques[tion] [card]} obligatory - defines end of card information and card type.
   First line following -- end *type* or, second line if first line blank, is the Title for the next card.

CAL_Maker Technical Notes—2

QUESTION CARD.

NOTES	SAMPLE INPUT
CARD line 1 contains Card Title for top of card. This field contains roughly 19 characters. Only the characters which fit into the field will be displayed.	Question 4
LINE 3...LINE Z. The question is entered in this area, along with the options for up to 4 response choices.	Eric considers his nutritional status. Which of the following would be likely to contribute to his tired and irritable state? 1. Eric eats a good breakfast with his wife and daughter every day. 2. Janice cooks an evening meal each night 3. Eric buys his lunch at the college each day, but classes often clash with his regular eating times and often he skips the meal 4. He doesn't snack between meals
This is required to end text. Prompt, and response to user one after the other, separated by a vertical bar.	-- linking Good breakfast|Healthy eating patterns include a healthful breakfast. This is not a problem area for Eric.| Evening meal|Janice has a background in nutrition so it would seem likely that the evening meal would be of a nutritious nature.| Buys lunch|This could be the area of concern. It is not unusual for students, because of class times and study schedules to forget about meals. It often takes a concerted effort to schedule times to eat regularly.| Snacks|Snacking between meals reduces appetite for regular meals, which can contribute to poor dietary intake and habits. This is not an area of concern for Eric.|
Indicates direction	Answer 3 goes to next card
Required to end card.	-- end question card

Appendix K

Proforma:

Student Evaluation of 1990-91 Computer Activities

During 1990 and 1991, the students in the Faculty of Health Science were introduced to computers during their first semester through a hands-on subject taught by the Department of Mathematics and Computing plus various computer activities required as part of their nursing subjects.

During the first two weeks of the following year the students were asked to evaluate their first year computer experiences. To facilitate analysis the questions were divided into two areas, their reactions to the computing subject, and their reactions to computer activities required for the Health Science subjects. Questions in both areas related to the student's self-perceived abilities and feelings plus an opportunity to make more general comments. Optical Mark Reader forms were used to collect responses to questions where a ranking response was required and comments were collected on the evaluation form.

Proforma

Please use the Optical Mark Reader form supplied and a 5 point scale where 1 = Poor and 5 = Excellent.

	Poor				Excellent
	1	2	3	4	5

Abilities

1. Please indicate your current ability to format a 5.25" diskette without assistance.
2. Please indicate your current ability to make a backup copy of a file, without assistance, on a second diskette.
3. Please indicate your current ability to use a word processing program, without assistance, to prepare and print a document.
4. Please indicate your current ability to use a database program to prepare, sort and print a list, again without assistance.

Feelings: Please indicate your personal feelings about the following items.

5. Enjoyment of the subject, 84133, Introduction to Computers.
6. Usefulness of the subject, 84133, to you personally.
7. Usefulness of the MS-DOS training in the subject, 84133, to your later use of Macintosh computers in the Health Science lab.
8. The Lecturer in the subject, 84133.
9. Student demonstrators in the 84133 lab sessions.
10. The textbook used in 84133.
11. The multiple choice questions based on the textbook.
12. The 84133 lectures in the large lecture theatre.
13. The 84133 word processing assignment.
14. The 84133 database assignment.
15. The essay assignment on Computers in Nursing.
16. The videotapes where the lecturer demonstrated the lab activities.

Future: Answer here

If I could change one thing about the subject, 84133, I would...

The one thing about the subject, 84133, I would not want to see changed is...

Use of Computers with Health Science Subjects, [Year]

Please use the Optical Mark Reader form supplied and a 5 point scale where 1 = Poor and 5 = Excellent.

	Poor				Excellent
	1	2	3	4	5

Abilities

17. Please indicate your current ability to use a Macintosh computer in the Health Science lab to assess, without assistance, one of the CAL Case Studies.

18. Please indicate your current ability to format a diskette, without assistance, on a Macintosh computer.

19. Please indicate your current ability to make a print copy, without assistance, of something on a Macintosh computer.

20. Please indicate your current ability to use a word processing program on a Macintosh computer to prepare and print a document without assistance.

Feelings: Please indicate your personal feelings about the following items.

21. Enjoyment of the CAL Case Studies.

22. Usefulness of the paper-based instruction materials on the use of the Macintosh computers and the CAL Case Studies.

23. Usefulness of the "on-screen" instruction materials on the use of the Macintosh computers and the CAL Case Studies.

24. Usefulness of the videotape demonstrations on the use of the Macintosh computers and the CAL Case Studies.

25. Importance of computers to nursing.

26. The CAL Case Studies contribution to the understanding of the nursing subjects.

27. The CAL Case Studies were exciting.

Exposure

28. How many hours per week did you use the Health Science lab (Macintosh lab) at your time of greatest use? 1 = 1 hour or less. 2 = 2 hours. 3 = 3 hours. 4 = 4 hours. 5 = 5 or more hours.

Future: Answer here

If I could change one thing about the use of the CAL Case Studies, I would...

The one thing about the CAL Case Studies I would not want to see changed is...

Appendix L

Orderly Change of Leadership

The Foundation Dean of Health Science was appointed for a term ending 31 December 1992. Early in 1992 the following memorandum formally indicated that the Dean would not be standing for another term.

TO: Staff - School of Health Science

FROM: [Dean], Dean

DATE: 92-04-14

SUBJECT: **Heard Any Good Rumours Lately?**

This memo is to try to ensure that each person has "the facts" about the future of the Dean's position after 1992, and is an expansion of part of the discussion at Monday's meeting on restructuring.

As I've indicated to several people, my term as Dean finishes 31 Dec/92 and I do not intend to stand for another term. My purpose in coming here was to get the School started -- which, I think it is safe to say, has been accomplished. The Dean's position is not a life sentence for either the incumbent or the School, and it seems to me that this would be a good point for someone else to take over.

While appointments as dean used to be for an indefinite term, most universities now make such appointments for a limited term (UCQ seems to be using three years as the normal appointment) with a possibility of reappointment. As a result, the process of selection and appointment of deans is now a normal part of academic life.

The transition process:

• It is always a little awkward with regard to planning for the future, but one of the benefits of having an organisation is a continuity of responsibilities and commitments. I anticipate making the arrangements for 1993 staffing before completing my term, and would expect that the next dean and the staff involved would all honour those commitments.

• The Vice-Chancellor is responsible for the appointment of the next dean. He has indicated that will consult widely with the staff of the School and whoever else he deems appropriate, but the appointment is his to make. While it is usual for appointments as Dean to be made from within existing staff, it is possible that the Vice-Chancellor may decide to advertise the position to ensure as wide a selection base as possible; a decision to advertise does not exclude the possibility of an internal appointment. Normally I would expect that the Vice-Chancellor would be consulting with the School about four months in advance of the decision, but I am sure that he would be willing to have an earlier meeting with the staff of the School if you wished to discuss with him the needs of the School and the characteristics you hope the next dean would have.

• As you will realise from the "Issues" paper concerning the restructuring of the Academic Board, there are still a number of open questions with regard to the role and function of deans in all schools within UCQ. The split of responsibilities between the dean and the chair of the School Board of Studies is one of the questions which will need to be considered in framing a position description and selection criteria for the next dean. The division (or overlap) of responsibilities with regard to academic leadership between the dean and other senior academic staff will also need to be considered.

• In some situations the selection of a dean can become a very divisive and draining issue. I would hope that staff in this School could avoid that situation and that the process goes forward with a straightforward consideration of all points of view and a recognition that on some issues there will not be total agreement.

Since I do expect to continue as a member of the academic staff of the School of Health Science, I too have a stake in seeing that the selection process and transition is as smooth as possible. Please let me know if you see any ways in which I can assist the process. I will keep you all informed of any developments of which I am aware.

Here's to the future!

[signed]

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