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A review of a project to introduce educational technological approaches
to the provision of higher education both on and off-campus.

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1.0 Introduction:

1.1 The Multi-Modal Learning Project reviewed¹ and reported in this paper, commenced in 1992 at Mooroolbark Campus of Swinburne University of Technology, Victoria, Australia as a pilot project for introduction of educational technological approaches to provision of degree courses to be offered at the Lilydale Campus from 1996. The pilot project has introduced strategies and facilities to permit use of teaching and learning techniques similar to those more frequently used by distance education, in addition to enhanced traditional procedures for use with students who attend campuses frequently for classes of one sort or another. This paper reviews a range of aspects of Multi-Modal Learning. Different aspects of MML have been targeted and implemented at varying times over a three year period and advanced at varying rates. However, even aspects which are well advanced are being refined continuously in a total quality management process, whilst newly implemented or yet to be implemented aspects are in planning or establishment phases.

1.2 Techniques and facilities used now include:

- student use of personal portable [laptop] computers in any location on or off campus;

- electronic communications to and from students' homes, learning centres, any campus and world wide;

- development and publication of learning guides [study guides] in print and by electronic means;

- curriculum renewal and enhancement using Computer Managed Learning, Interactive Multi-Media, Computer Based Learning, Learning Contracts, video/audio recordings and out-sourced teaching programs as well as lectures, tutorials, text books and group or individual field work assignments.

1.3 The Multi-Modal Learning Project also includes the provision of

academic and support staff training and development and creation or adaptation of software and learning resource materials in any media.

1.4 Multi-Modal Learning is the term given to the style of resourced based flexible delivery program used on and off-campus at Swinburne. It has been defined as:

"A multi-modal course consists of a planned and selected variety of methods and media of instruction arranged for the learners to maximise opportunity to learn the material. A variety of learning approaches is orchestrated by the lecturers in charge of the subjects to help learners achieve the educational intentions of the course. That is,

the means of instruction is chosen to facilitate learning of particular parts or outcomes of a subject. Where a lecture is the optimal method of synthesising or providing motivational interest in a topic then that should be the method of choice. Where skills of application are required, students should be provided with those means which will help them "experience the learning" which is needed. Where debate and discussion are required to enhance student understandings of the subject matter or techniques, then group meetings are axiomatic.

Multi-modal Learning plans are documented for the benefit of learners. At Swinburne we have adopted the term Learning Guide for such documentation. Learning Guides document the plan for learning and the choice of resources to be used by learners wherever they are located on a core campus, sub-core campus, local learning centre, or at home." [Jeffery and Anderson 1992].

1.5 The project began in 1992 with a grant from DEET at Mooroolbark Campus which commenced teaching that year in several degree programs. Staff from Learning Services and the Mathematics Department² [Mr Keith Anderson and Associate Professor Peter Jones] joined in an effort to develop a comprehensive and integrated suite of progressive educational strategies based on the provision of learning guides and resourced based learning but also including revision of in-class teaching using portable computers for each student in any class. The introduction of MML also involved the Department of Computer Science³ led by Professor Doug Grant who became the Chairperson of the MML Steering Committee.

1.6 MML was planned as a pilot project to try and refine [on a complete degree which was provided by two academic departments] arrangements for progressively changing teaching of all courses at Swinburne's eastern campuses and perhaps, through migration and copying of example courses and teaching at Swinburne's Hawthorn Campus. The order of implementation of the suite of comprehensive changes envisaged under MML, was negotiated with teaching staff with leadership from Chancellery through Learning Services and Project staff. At the time

of writing new changes are being trialled or used as teaching staff, students and infrastructure are ready for additional challenges. At all times the interests of students have been held paramount and all changes have been implemented with the intention of continuance after investigation by staff and small trials negotiated with groups of volunteers. The project has been viewed as a pilot for more widescale introduction of the techniques rather than as an experiment.

1.7 The pace and focus of MML has been negotiated with and decided by the MML Steering Committee which has predominantly user group representation and control. Leadership of the MML effort was exerted by Learning Services, moderated and enhanced by input from academic staff. The Steering Committee worked well, overcoming multi-campus and time availability problems for full participation by the use of telephone conferencing and email facility. The large assembly of all involved at two locations simultaneously although highly valuable initially, was replaced [in the third year of the project] by an Executive Committee meeting of key personnel and less frequent full meetings of all stake-holders. Although administratively expedient, there is some unease at the exclusion of some people from all discussions.

1.8 Swinburne's Lilydale Campus commences teaching in March 1996 at Mooroolbark Campus pending completion of new buildings being erected on a site overlooking the Lilydale Lake. Students enrolled in 1996 will occupy the new campus sometime after the middle of 1996. Many aspects of the MML innovation will continue in the educational

provisions for Swinburne at Lilydale [particular learning guides and extensive use of electronic communications with students] and preparations are now in progress to implement aspects of individualization of instruction by an adaptation of PSI [Personalized System of Instruction] Keller 1968.

1.9 Full and detailed records have been maintained by the project officer as the innovation progressed and formative research has been carried out continuously. Reports have been made through the MML Newsletter to staff, students and the wider community as the project achieved various landmarks. Academic staff have collected and summarized data on various aspects in papers for conferences and other events. A little summative research has been undertaken on aspects which have been substantially or totally completed but this really needs the attention of a consultant educational researcher with time dedicated to the task. The technique of reporting on MML through the MML Newsletter has not been appreciated by all people who seek information. Too few academic papers have been prepared by the project staff or academics involved to date.

2.0 Educational Technological Approaches:

2.1 This term is used rather than simply educational technology because the latter tends to be confused with applications of hardware in education rather than encompassing the systematic development of curriculum and methodology inherent in the term "educational technological approaches" to provision of learning opportunities. However, the project is strongly influenced and assisted in operation of crucial teaching and learning innovatory practices by modern educational hardware availability.

3.0 Distance Education Teaching and Learning Techniques:

3.1 Several studies have indicated the positive benefits derived by utilization of teaching techniques which are used by necessity in distance education, in situations involving predominantly on-campus students. As Taylor [1995] says, "By and large, distance educators have embraced these new technologies, [for enhancing the quality of teaching] while the application of such technologies to conventional on-campus education has been primarily piecemeal and rather limited."

4.0 Enhanced Traditional Teaching Procedures:

4.1 Staff have engaged in a conscious effort assisted by Learning Services, to introduce progressive educational techniques such as learning contracts and student group projects alongside lectures which are more direct teaching and tutorials similarly geared to assisting individuals and groups to learn.

4.2 It is in the context of changing lectures to direct teaching and learning experiences that student use of personal portable [laptop] computers has been a significant innovation because mathematics teachers and students can use programs such as Maple and Minitab and others in any classroom or other location. Thus in essence any meeting of teachers and students is aided by access to personal computers carrying mathematical tools for sophisticated operations. This constant availability of computers has changed the way in which teaching is conducted and the learning behaviour of the students. Students use their computers and programs to solve case study problems

and perform exercises in ways similar to real life operations in business - as readily available tools to get a job done.

5.0 Electronic Communications to and from Students' Homes:

5.1 As reported [Jeffery 1994] Swinburne has established a

communications service to students in the pilot project. Staff and students use electronic communications for learning, administration and social purposes with the balance determined by staff and individual student preferences since traditional communications modes to and from staff have been maintained in parallel to the electronic modes. There is little doubt however that the availability of extensive email and other services accessible by modem or direct connection to Swinburne's network in the Library and other places has proven to be a valuable additional learning facility for students.

5.2 In addition to email, students have access to full unix operating systems and the Internet as well as library catalogues and similar sources.

6.0 Learning Centres:

6.1 Swinburne established the first of a series of Learning Centres⁴ at Glenfern Secondary College, Ferntree Gully. It is intended that there will be a network of centres serving students from several campuses but due to unforeseen circumstances, establishment of the second and subsequent centres has been delayed.

6.2 Students were expected to use the centres for "drop-in" purposes to access high capacity computer services such as programs which are available economically and efficiently on the Swinburne network for example SAS, or to use printers and other devices not usually found in all student homes at present.

6.3 Staff and students were expected to also use the centres to conduct small group tutorial type meetings for group project work on case studies or for teaching to and from the centres to other locations. This would reduce the travel time for students to campuses and increase their available study time. A not insignificant saving in travel costs would also have assisted students and staff if appropriate time-tabling could be managed.

6.4 In practice to date, there has been little use of the single centre for any purpose. The centre facility had to be re-located shortly after initial trial uses to another part of the host school buildings, and staff in the pilot project found it difficult to incorporate a single centre for a few students whilst maintaining operations for the remainder of the group.

7.0 Development and Publication of Learning Guides [Study Guides]:

7.1 As in full scale distance education operations, it was considered appropriate and necessary to document for the learners' benefit, all

the resources and modes of learning available for each section of each subject. Since the Swinburne model envisaged continuing frequent face to face [on-campus] meetings with students and their access to normal on-campus facilities, it was not necessary for the entire content of a course to be written for students to study from. Hence the term

Learning Guide was adopted in preference to Study Guide since the former indicates for whom the document is written and its role in mapping out the ways and resources to be used. Swinburne Learning Guides are not intended to entirely obviate attendance at lectures and similar nor are they intended to replace extensive use of other learning documentation in print [texts] or other media.

7.2 To date, approximately 30 Learning Guides have been prepared or are in preparation mainly for Applied Science [Management Science and Computing]. Some have been prepared and published for other degrees and some of the Management Science and Computing guides have been used in another Applied Science degree - Computer Science [and Psychology]. Due to changes in staff and structure of the courses, several learning guides have not been perfected and others are still being written.⁵

7.3 Learning Guides proceed through stages of development decided by academic staff involved in the project. The stages are: progressive publication, first trial edition, final edition and production edition. Each stage is a year if a subject is presented annually, shorter if the subject is presented every semester.

7.3.1 Progressive Publication was an adjustment to the realities of introduction of the innovation with no lead time for preparation. It comprises assembly of materials written by the lecturers as they proceed with teaching. At first appearances this sounds like merely a collection of the usual handouts with no quality control, but many lecturers actually do write their learning guide materials progressively [about 3 weeks ahead of student need] and their efforts reveal that they have taken cognizance of the difference between learning guides and lecture notes.

7.3.2 A first edition is where a lecturer has been able to anticipate a need for a learning guide for at least a semester in advance and prepares something that will suffice for a full scale trial with students and cooperating staff. These trigger revisions so that the next time the material is to be published, it reflects realities of instructional circumstances. This technique is close to empirical validation on learners of a similar standard to the target audience, which is espoused by educational technologists.

7.3.3 The final stages are self explanatory save for the rider that lecturers are very reluctant to ever admit that they have a "final" version capable of production for more than a year's needs. Genuine

concerns are expressed about changing needs of the subjects, students and similar, and most devastatingly [for hopes of economy productions] expectations that the university will change its structures and render much work redundant. Such unfortunately realistic expectations in a young developing university, erode willingness to commit the energy and expertise required for multi-modal learning preparations.

8.0 Video/audio Recordings:

8.1 Extensive use of video and audio recorded learning resources from external sources was expected when the project was established but it proved difficult in practice to identify, assess and use products from industrial training or other higher education institutions. The alternative, in-house creation of learning resources was contemplated and tried to a limited degree but the costs in provision of creative resources and additional demands on academic time precluded any but occasional sporadic attempts by individual staff.

8.2 Video recording was used briefly to provide material to students at Mooroolbark from Hawthorn Campus but met strong opposition from students at the receiving campus.⁶ MML is set in the context of a multi-sectorial, multi-campus university and theoretically procedures can be put in place to allow staff and students to use communications technology to allow teaching and learning across campuses. This would reduce the need for staff to travel between campuses to meet with student groups and thus relieve time pressures on staff. This is a not a vital part of the MML effort at this stage of the project.

9.0 Creation or Adaptation of Software:

9.1 Several adaptations or new programs have been compiled for different purposes and there is capacity within the educational computing applications support facility for more such work. An example is given below.

9.2 A creative educational applications software programmer at Swinburne has adapted IRC software [International Relay Chat] and by addition of extensive new code created a program called Remtute [for remote tutorial]. This software allows a teacher or tutorial leader to hold synchronous email tutorials with several students located elsewhere. Students can communicate to and receive messages from the teacher who can see a set of windows, one for each of the students on-line. The teacher may send to all or any selection of students who may reply to all or only to the sender. The students can send to each other and also to the teacher. Any member of the group can become the leader of the group for further discussion.

9.3 Remtute has been trialled on several occasions but as yet lecturers have not found it necessary to systematically build this method into their suite of presentation or discussion modes. It is possible that some objectives in social sciences curricular in particular may be facilitated by replacing direct face to face tutorials and discussions with mediated versions. Work is proceeding to investigate these matters.

10.0 Curriculum Renewal and Enhancement:

10.1 A transparently hidden agenda item for MML has been the potential and actual effects of the innovation for renewing and enhancing curriculum. Clearly, the requirement to introduce new methods and materials of mediated instruction has opened up the possibilities for new content and experiences. The requirement to commit plans and learning alternatives to paper for a learning guide sometimes with collaborative input from colleagues and experts in educational systems, has lead lecturers into studying the content, methods and strategies for each subject.

10.2 The opportunity to re-consider all matters pertaining to what is to be learned and how, fitted in well with the 1992 establishment of a partially new operation at the Mooroolbark Campus and is now assisting in the establishment of new subjects to be taught multi-modally at Swinburne at Lilydale from 1996.

11.0 Computer Managed Learning [CML] in MML:

11.1 CML is incorporated in the concept of MML because it provides a

form of tutorial support and testing/assessment features enabling students to take responsibility for their own learning. Swinburne's CML system has not been effectively implemented at Mooroolbark Campus due to network inconsistencies and lack of a staff member to facilitate use by students and staff in the MML program. An additional problem is that of creating the tutorial questions required in CML.

12.0 Interactive Multi- Media

12.1 There have been isolated examples to date of individual lecturers preparing interactive learning guides for distribution via Swinburne's Campus Wide Information Service [CWIS]. This work has been inhibited by the perceived difficulties of student access to the material [especially in first year studies], lecturer unfamiliarity with needed

skills to prepare the materials, conservative expectations that students and staff will prepare hard copies of any materials published on the network because they are more comfortable with printed documents and similar factors. Many affective outcomes of first year higher education on-campus experiences are seen to depend on group interactivity in face to face circumstances and this makes lecturers reluctant to prepare and use learning guides, especially in electronic formats.

12.2 It is expected that electronic publication of a range of materials will occur in future years as incoming student skills in computing rise and so do the skills of teachers. The attractions of the CBT flexibility, packaging of multi-media and ready revision will encourage more and more teachers to prepare their materials in this format.

13.0 Student Adoption of MML:

13.1 Student interest in and acceptance of MML has been considered of high importance since the inception of MML. Key indicators of acceptance of MML are that students and student operated services have demonstrated a desire for extended services based on MML and asked for aspects of the learning model. Students in the program have requested extension of MML features such as seeking early access to learning guides for future subjects. Students not in the MML program have sought inclusion for certain aspects. Student services providers have accepted that MML provides new opportunities to provide their services.

14.0 MML Office-Resource Centre:

14.1 The office and project has received limited funding and is in the process of establishing staff positions. The resource centre and co-ordination functions are most obvious in relation to the publishing of learning guides but there are many other aspects supported and assisted. The operations of the office are largely revenue neutral [except for salary costs] and use a minimum of staff. Considerable impact on the operations of Swinburne generally have been detected, viz learning guides used at Hawthorn Campus and OPAX front end the same as on the MML server.

15.0 Publicity/Team Building:

15.1 This aspect of the project is part of the strategy to encourage staff and students to value the MML work they are pioneering at Swinburne so that desirable motivational effects are created. A

professionally designed logo incorporating Swinburne's crest was negotiated with academic staff to emphasize the aspects of the innovation which they saw as most important. A newsletter and other dissemination strategies were employed.

16.0 Off - Campus Teaching:

16.1 Full implementation of MML is predicated on use of off-campus teaching as well as extending the on-campus learning opportunities. Off-campus teaching [tutorials with groups of one or many students] can be conducted linking to and from learning centres or direct to students homes. Audio linking through telephone "student support services" and audio tutorials are relatively easily accomplished technically. Asynchronous email tutorials through modem connections are also technically non-complex and require little staff training. Synchronous tutorials with voice and email links with scattered students or students grouped at learning centres requires somewhat more sophisticated technical support and staff experience. Audio-visual conferencing with email connection is being tested at present. All of these require revision of teaching and learning strategies and techniques for lecturers and students and a high degree of pre-planning.

16.2 MML has trialled audio tutorials with some success and the use of the technique to link meetings of the MML Steering Committee on two campuses has spread understanding of what is involved. As the learning centres have not been fully functioning, small group tutorials have not been implemented. Lecturers and students in MML have developed email communications to a level to which they are comfortable without specific training, especially for asynchronous individual tutorial needs. Trials of synchronous small group tutorials by email are currently in place with Swinburne written software. The principal reason for slow implementation of off-campus teaching has been the lack of readiness of staff to implement technological contacts for students they know are frequently on-campus. The university time-table does not reflect the opportunity to use off-campus techniques for some of the programs. Training of teaching staff in the use of off-campus teaching methods is needed together with an imperative to use such techniques. The major beneficiaries will be students, who gain much more flexible attendance requirements.

17.0 Lecture Replacement:

17.1 MML expects that lectures will be largely replaced by more appropriate learning strategies. This aspect is allied to use of "outsourced" learning resources, where lecturers build into their courses [documented in learning guides] alternative materials to use to attain the objectives of the course. At present most teaching is

maintaining lecture and tutorial patterns [in many cases the distinction between these is unclear] and early experimentation with lecture replacement using videodisk "out-sourced" training packages has been relegated to occasional adjunctive use through the library at individual student initiative. Basic course plans and accreditation documentation has not incorporated MML principles and specifically lecture replacement. Curricula do not indicate use of a range of presentation techniques. Content which should be learned with outsourced materials is still being taught in lectures.

17.2 A longer time frame for the development of learning guides which can enshrine alternative learning packages and procedures is necessary with supporting instructional designers to negotiate details of the projected courses. A procedure should be negotiated with teaching Schools which requires academics to justify all sections of each course to be presented by lecture technique and to demonstrate that lecturing is the appropriate method. This will require respectful considerate partnership implementation with academic staff who are experienced teachers and committed to MML concepts.

18.0 Student Equipment:

18.1 Fully implementing MML requires students and staff to have portable computers so that they may operate with a "workstation" carrying powerful learning tools at any location. The portable "workstation" also allows all classrooms to become non-networked computer labs [some rooms may be networked by cable or wireless LAN]. Conceptual development and analytical skill formation may then be aided by state of the art software and real data at any time without recourse to a traditional laboratory. Students may take notes and work on documents in tutorial situations directly at any time. Learning may be examined with "open-book/open-computer" methods identical to real life, work-place situations. Three years of active demonstration and experience of the benefits to staff and students of students having portable computers, in general has resulted in staff and students strongly desiring them. Some teachers in MML with higher network software requirements are less enthusiastic than others and all are critical of network connectivity problems not solved before teaching commences. All are concerned about the problem of computer supply for students and reluctant to accept the inevitability of such provision becoming a student responsibility [given present and likely future government policy].

18.2 The method of provision of portable computers for students is a vexed question. Some people persist in promulgating standardization, bulk buying, or philanthropic solutions. Some staff are concerned that

able students will be disbarred from study or turned towards other institutions or courses which do not require students to purchase the equipment. There is no evidence that this will occur, on the contrary there are indications that many students and parents accept or even cautiously welcome the requirement to purchase a portable computer for study purposes. The University has been tardy and indecisive in matters regarding portable computers since the inception of MML. Active positive marketing of the advantages for students and teaching of students owning portable computers is required. Students and staff are being "strongly recommended to purchase portable computers" for all courses. to be offered at Lilydale Campus. Students of B. App. Sc. [Management Science and Computing] continue to be required to have such a machine and for this course loan machines can continue to be made available from the University for Austudy students.

19.0 Swinburne Network Infrastructure:

19.1 The provision of robust connectivity to a high quality network is required to support teaching and learning in traditional and non-traditional laboratories and off-campus. It is necessary that the infrastructure be provided completely customer focused so that all the requirements of teachers and students can be met. Rapid and somewhat

unpredictable change in the needs of staff and students for MML has placed stress on the physical provision and on personnel involved. This has been exacerbated by the multi-campus situation.. Furthermore, rapid developments in the now relatively affordable portable computer field have resulted in students and staff bringing to Swinburne higher performance equipment which is beyond the Swinburne network capability.

Demand from students and staff for higher performance capability conflicts with present budgeted infrastructure expansion plans for example in the quantity and speed of modem access and PCMCIA connectivity on campuses. Management is faced with the dilemma of continual injections of sophisticated user machines which require a somewhat hidden infrastructure to operate for some learning activities.

The necessary funds for provision of the infrastructure can only be provided by capitalizing on the reduction of need for traditional computer laboratories, replacing them with places where portable computers can connect to the network rather than rooms full of desk-top computers. An alternative solution may be through outsourcing network services to students and staff operating off-campus.

20.0 Software for Student Use:

20.1 Software is needed for MML students operating in on-campus [traditional] computer labs and for the students' portable computers whether privately owned or owned by Swinburne. Considerable continuing

difficulties are being experienced with software provision funding or policy. Staff and students are familiar with and generally expect the circumstance whereby Swinburne provides networked software in traditional computer labs at a cost to the institution for licence fees for each user. The two problems with this aspect are the absence of, or late advice by lecturers, to managers of course software requirements⁷ and insufficient funding for licences.

20.2 Swinburne software licence agreements do not allow student privately owned computers [portable or not] to be loaded with Swinburne licenced software⁸. Students required to have certain software on their portable computers in on-campus classes are in a sense emulating traditional computer laboratory situations. But where the software is on a non-Swinburne machine it must be bought at full price for that machine either by Swinburne at the rate of one copy for each such student private machine or by each individual student for their computer. There has been an unsatisfactory mixture of "funded by Swinburne" and "students must purchase" policy on this matter. Staff must consider the consequences of specifying software that is reasonably affordable when acquired through licence arrangements but prohibitive for personal purchasing. [This is in addition to buying a portable computer]. Some rationalization between what software must be used only in laboratories and what students need on their private machines is required.

21.0 Flexible Progression and Examining:

21.1 Individualization of instruction, flexible progression and "exams on demand" are conceptually part of MML but have only been discussed and negotiated for implementation for Swinburne at Lilydale. A judgment was made that the over-all innovation would not be assisted by raising these matters in the pilot stage. These also impinge on the whole university rather than staff and students in the pilot project. Students have expressed interest in these matters since the first learning guides appeared. These procedures are now being introduced in

the separate Division of Swinburne at Lilydale in 1996. It is now appropriate to arrange with academic and administrative staff stages in the implementation of flexible progression.

22.0 Resource Based Learning Materials Research Services:

22.1 Several aspects of MML require students and staff to use learning materials of all media and modes which are not of Swinburne's creation.

In addition to text books and other printed literature a wide range of audio and visual or multi-media resources are required to be bought or

created. Staff need assistance from the library, MML staff and instructional designers to locate materials which could be incorporated into learning guides for courses, if of a suitable quality. Work in this dimension of MML commenced in 1992 but unfortunately there was no systematic follow-up with teaching staff regarding the resources identified. The work lapsed due to pressure of other matters. It has now resumed with the appointment of a 0.6 staff member designated Resource Co-ordinator. Procedures are being put in place to liaise with individual staff as they develop or revise learning guides to ensure that all relevant outsourced materials are considered.

23.0 Conclusion:

23.1 This paper has outlined some of the work in progress at Swinburne University of Technology to introduce a shift from teaching to learning in many degrees offered by the institution. The work is by no means complete but steady progress has been made towards mutually acceptable goals consistent with maintenance of quality instructional circumstances for students.

23.2 The innovations of the MML Project are now being re-examined by the university for endorsement and implementation at Swinburne at Lilydale. The process involves somewhat independent investigations by working parties chaired and comprising academics generally not intimately involved with MML. These working parties have thus far found that many of the MML innovations are worthy of emulation, expansion and continuance in the larger scale operations at the new campus.

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1 This is a report on work in progress because the Multi-Modal Learning is being adapted and adopted into the Swinburne at Lilydale establishment.

2 Now School of Mathematical Sciences.

3 Now School of Computer Science and Software Engineering.

4 Now more commonly referred to as Study Centres.

5 Swinburne staff have individual responsibility for writing learning guides and are expected to provide the documents fully word processed ready for production in quantity. Anticipated funding for DTP assistance and instructional designers did not eventuate.

6 The videos were poorly made recordings of unrehearsed lectures presented in normal theatres at Hawthorn. They were perceived at the time as a method of Swinburne avoiding proper staffing of the new and distant campus, and as such were opposed by the Swinburne Student Union.

7 This could be overcome by earlier preparation of learning guides for subjects.

8 Staff home [or portable?] machines are not so restricted by our licence arrangements with Microsoft.

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