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ABSTRACT

The policies and practices of higher education are influenced by social, economic, and technological changes currently occurring in postindustrial information societies. Competition in the globalized marketplace of mass tertiary education is transforming traditional curricula and their pedagogies. New communications and information technologies are central to these changes and to the philosophical and pedagogical shifts occurring in university classrooms. Using a case study, this paper investigates the use of online technologies in preservice teacher education. For the purpose of the study, cyber technologies and their associated pedagogical activities are conceptualized not only as tools but also as social practices. This enables a focus on learning and teaching as transformative practices. The instructional design of the course includes the posting of lecture notes on the Web and virtual tutorials through group e-mail discussions. All five criterion-referenced assessment pieces are required to be submitted at the semester's end on a four-member student Web page that is constructed as part of an assignment. The assignments, two of which are a review of Queensland Web sites and an evaluation of two search engines replete with a log of the search journey, illustrate the new forms of cyber- and techno-literacies. (Information Technology Skills Survey is appended.) (Author/SM)

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Global Issues and Local Effects: The Challenge for Educational Research

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Cyber Pedagogy as Critical Social Practice in a Teacher Education Program

Abstract:

The policies and practices of higher education are reeling under the social, economic and technological changes currently taking place in postindustrial, information societies. Competition in the globalised marketplace of mass tertiary education is transforming traditional curricula and their pedagogies. New communications and information technologies are central to these changes and to the philosophical and pedagogical shifts occurring in university classrooms. In a case study, this paper investigates the use made of online technologies in a preservice teacher education context. For the purpose of the study, cyber technologies and their associated pedagogical activities are conceptualised not only as tools but also as social practices. This approach enables a focus on learning and teaching as transformative practices. The instructional design of the course includes the posting of lecture notes on the Web and virtual tutorials through group email discussions. All five criterion-referenced assessment pieces are required to be submitted at semester's end on a 4-member student webpage that is constructed as part of an assignment. The assignments, two of which are a review of Queensland school websites and an evaluation of two search engines replete with a log of the search journey, illustrate the new forms of cyber and technoliteracies.

Higher Education In the Information Age

Teaching and learning in higher education contexts occur differently today from how they did as recently as a decade ago. Widespread technological, economic and social change is transforming the student populations, the curricula and the cultures of university classrooms . Employment and productivity in the present Information Age are based not so much on the ownership of natural resources and the harnessing of energy through electricity and petroleum, but on created resources and the informational "flows" of organisations and institutions in global networks . In the post-industrial knowledge economies of today, the primary forms of productive labour and of maintaining a competitive edge in the market are information processing and the generation of knowledge.

The advent of digitisation and cyber technologies also has played a major role in the transformation of higher education. Technological convergence and globalised media networks offer educators a range of services and products that are well suited to classroom uses ;). Some of these services, and examples of research investigating them, include:

- the World Wide Web (Holt, 1996; Tapper, 1997; Tierney, Kieffer, Whalin, Desai, Moss, Harris & Hopper, 1997);
- email discussion groups (Bender, 1995; Russell & Cohen, 1997);
- video conferencing (Harasim, 1993);
- listservs (Davis, 1997; Lewis, Treves & Shaindlin, 1997; Turnbull, 1996);
- MOOs (McCallum, McGrath & Rusch, 1997); and
- Internet Relay Chat (Duin & Archee, 1996).

Reforms in the policies and pedagogies of higher education are a response to the pursuit of market share in what is now a borderless educational infosphere (Centre for Educational Research and Innovation, 1996; ; ;). Numerous Australian government policy documents reflect and, conversely, affect these social and educational developments . Whilst the agendas of both state and federal governments is to promote the use of the new technologies, research shows that the current status of the industry is one of uncertainty and variability in the quality of programs provided (Tapsall & Ryan, 1999).

The aim of this paper is to illustrate from grounded practice some of the changes in teaching and learning that are occurring at the higher education level around the new telecommunications and information technologies. Both the media and the government

tout the technologies as revolutionising the content and delivery of education and training. The purpose of this research was to investigate their application and impact in a single context of use in order to assess the extent of the change in this case. With the goal of identifying and defining the features that characterise online teaching and learning, the paper presents a small-scale case study of one subject taught in a preservice teacher education program. I begin here with a theoretical framework for the notions of "technology" and "pedagogy" as they are used both in the subject and in the research. Following an outline of the institutional context of the study, I describe its rationale and methodology. The instructional design, that is, the content, delivery and organisation of the subject from which the data was collected is next examined. The discussion then focuses on six pedagogical features that emerged from the data as characterising this learning environment.

Theoretical Framework for Information Technology and Cyber Pedagogy

Writing is language made material, and the various technologies used to symbolise and materialise language have a profound influence on the identities, textualities and cultures of those using them. Technologies alter perceptions of time, place and space, and thereby change what is understood and lived as human embodiment ; . The shift from oracy to literacy some 3,000 years ago, for instance, revolutionised forms of agency and sociality. In a similar way, the current semiotic shift to electronic visuality and virtuality is generating new forms of communication and community.

Information technologies are commonly considered in terms of utopian or dystopian outcomes. Binarist approaches like these tend to overlook the complexities and the contradictions of sociotechnical activity and educational change. As well, much of the research on educational information technologies arises from cognitive and educational psychology models. Theorists who work within sociocultural and sociological paradigms argue, on the other hand, that conceptualising technologies as forms of social practice that occur in particular social, cultural, historical and institutional contexts is more productive . This standpoint asserts that the social effects and outcomes of new media and communications technologies are not direct, evenly distributed and universal. The social consequences of particular technologies are not fixed or determined by that technology. Rather, they are mediated by the social contexts and the uses made of them, as well as by context-specific sociocultural factors such as gender, class, ethnicity and age .

Conceptualising technology as *practice* focuses on the discursive processes involved, or, in the case of this study, on the material and cultural conditions of learning. The approach renders the use made of the technology analysable, describable and, hence, transformable. It opens a space for the interrogation of classroom processes as either productive or prohibitive of informed, critical and creative social members. In clarifying this issue, I have found that it useful to distinguish between the notion of information technology (singular) and information technologies (plural). Throughout this paper, "information technologies" refers to the technical aspects of technology, that is, to the various analogue, digital and networked communications technologies such as television, video, computers, CD ROMs and the Internet. "Information technology" on the other hand pertains to the social, organisational and technological aspects of the social practices associated with the production, distribution, selection, adaptation and use of the information technologies (cf. Commonwealth of Australia, 1997).

Having argued that social effects or outcomes of technologies are tied to their contexts of use, I now define the particular context of use here, which is that of pedagogy. In a reframing of "critical pedagogy" theory to accommodate diversity and difference in the student population, reconceptualises the notions of "learning" and "pedagogy". In his attempt to avoid the unhelpful binary of learning as either "teaching" and "transmission", or as "learning" and "interpretation", Green articulates a view of learning as

> *a particular relationship between discourse and subjectivity—as a matter of taking up and working with particular subject-positions as these are made available in and through discursive practice and struggle. (Green, 1998, p. 179)*

In a socially-critical curriculum framework for a diverse, media-saturated societies such as Australia, learning is a socio-semiotic practice that entails the subjective transformation of the learner through engagement with teaching, or pedagogy. In this context, pedagogy refers to the "structured relationship [that arises] between teaching and learning." Green conceives productive pedagogy as "teaching for learning", where teaching is understood not as the cause of learning but as the context. Because the context is a social one, pedagogy becomes a discursive practice, a context for, rather than a cause of learning.

This approach takes the emphasis away from the teacher as transmitter of knowledge (akin to Freire's notion of teaching as banking) and places it on the learning environment. The teacher's role is to design and structure the environment for the student as a context for the practice of self- and societal transformation. At pains to avoid either a universalist or an essentialist position, Green (1998, p. 191) emphasises the specificity of classroom practices, arguing that learning is "always a local, grounded achievement, accomplished by the learner, against the background of the teacher's instructions and support but not directly attributable to action on the teacher's part." From this perspective, teaching is directed towards the "positioning and production of learning identities." It accommodates, furthermore, the notion of teaching for difference which caters for the new forms of subjectivity of young people who live immersed in the texts, images and icons of the mass media and popular culture. Within this context of a focus on textuality, knowledge and difference, and also a cultural context of global networks of language, image and capital that drive technocultures and their multiple literacies, deconstruction is the resource for an relevant and inclusive post-critical pedagogy.

In the past, students worked individually to acquire and display discipline-bound knowledge from a limited number of authoritative resources for the purpose of achieving a good grade in assessment (Luke & Kapitzke, 1999). Lanham (1993) claims that electronic text creates not only a new "writing space" but an entirely new "educational space" with reconfigured administrative,

physical and disciplinary structures. Tinkler, Lepani and Mitchell (1996) identify principles of learning that need to characterise education services and products in information societies. Learning should be lifelong, learner-directed, contextualised and customised. Learners need to learn about learning and about problem-solving. Learning that is socially productive needs to be transformative, that is, it needs to challenge and change "belief systems and behavioural patterns to meet new needs and opportunities, and overcome disabilities and disadvantage" (Tinkler, Lepani and Mitchell, 1996, p. 89).

New conceptions of technology-assisted pedagogy are oriented towards self-directed, but collaborative learning that is resource-based and problem-oriented. Industrial models of education with Taylorist forms of organisation are now inadequate. This research describes a specific case where the content (media and technology in education), the theory (technology as practice and design), the delivery (mixed-mode) and the assessment (the analysis and creation of web-based materials and resources) converged. The subject thereby provides an unusually rich site for the critical investigation of new pedagogies and literacies enabled by cyber technologies.

The Case Study

Research Aim and Institutional Context

This paper presents a preliminary report on a larger study. The purpose of the study is to provide grounded examples of organisational, epistemological, cultural and technological changes that are occurring within one subject taught at the University of Queensland, Brisbane, Australia. The research focuses on the notion of cyber pedagogy, or online teaching and learning, as practiced in an undergraduate teacher education program. The main questions that the study addresses are, What forms of learning and teaching occurred around, with and through these particular symbolic texts and digitised resources? and, What issues emerged from this application of electronic information technologies to learning?

The study took place during 1999 within the Graduate School of Education at the University of Queensland. The University of Queensland (UQ) is the state's oldest tertiary institution. In January 1999, the University opened a third "virtual" campus at Ipswich, a regional centre west of Brisbane. The University of Queensland is one of only three Australian members of *Universitas 21*. This is a global alliance of 20 research-intensive universities committed to quality enhancement of research and teaching through benchmarking against international best practice. With the goal of improving the flexibility and marketability of its courses, the UQ Teaching and Learning Enhancement Plan 2000-2002 requires the teaching staff to integrate some technology component into the content and/or delivery of their courses.

Research Methodology and Data Sources

The study was an instrumental case study in which I used one case as a site for investigating the interface of online technologies with teaching and learning . The complexities of online learning necessitated a case-study approach that would elicit key issues and apposite examples from context-specific data. As well, the lack of substantive research on Internet-based pedagogy precluded the use of *a priori* concepts. The rationale for a single analysis of one case was that it would generate the kind of "thick" description needed to illustrate the issues raised by the foregoing research questions. Some simple quantitative analyses of data were also undertaken.

I collected data from the subject, Media and Technologies in Education, for three reasons. First, the subject displayed a high level of application and integration of the new information technologies. Second, it foregrounded the notion of cyber technologies as contexts for sociocultural practices, rather than as neutral instruments for the retrieval and exchange of information. Third, its multi-dimensional approach differentiated the "operational/technical", "cultural" and "critical" aspects of technological use .

As researcher, I observed, participated in and wrote field notes for the summer school vacation program held in January 1999 and the first semester offering. In the latter, I attended lectures, tutorials and Open Access sessions, and conducted informal interviews with twenty students and two teaching and two tutorial staff. Textual data sources included the subject profile and a range of student texts such as webpages, assignments and seventy randomly selected reflective logs. Most of the qualitative data presented here comes from the logs. A questionnaire was administered to a cohort of 246 students in the first week of lectures. Approximately forty-five hours of tutorial and Open Access sessions were videotaped. The email tutorial (e-tutorial) archives were printed and coded. Because of the number of students involved, excerpts are identified according to numbers rather than names. Notwithstanding the range and richness of these data sources, the constraints of the paper limit the amount that can be provided here as evidence of outcomes.

Subject Content and Delivery

The subject, Media and Technologies in Education, is a core component of the Bachelor of Education degree. It is a one-semester subject that has been offered since 1997. Enrolments per intake have varied from 80 to 320 students. Media studies help students understand how the mass media construct social realities, values and identities through the creation of meaning and desire. The curricular focus of media and cultural studies subjects are the texts and images that are relevant to an increasingly diverse and media-saturated student population . The disciplinary methodology of media and cultural studies is semiotic interpretation and critical practice .

Media and Technologies in Education focuses therefore on the social, cultural and educational issues relating to mass media, popular culture and the new information technologies. The aim of the subject is to develop discursive analytic skills, and their practical applications to teaching with and about media and electronic technologies in educational contexts. Media and Technologies in Education provides students the opportunity to acquire hypermedia and technoliteracy skills, while engaging critically with issues of how the technocultural revolution is changing education, society and work. On completion of the subject, students are expected to show an understanding of critical literacy concepts associated with mass media and information technology education, and to have developed skills of media text analysis and hypertext production. Students are also expected to demonstrate critical perspectives on the cultural uses and social contexts of mass media and electronic information technologies.

Content delivery is via a combination of face-to-face and virtual contact. The teaching staff deliver weekly lectures with the aid of PowerPoint presentations. Lecture notes are also published on the subject's website at the beginning of each week. This webpage, hosted on the University of Queensland's webserver, is the "portal" or cyber location for information on and communication within the subject. The homepage comprises ten hypertext links or nodes of information. The hotlinks provide information about and entrée to: the teaching team; the names of the Learning Coordinators and the Open Access personnel; the Course Profile; access to the virtual tutorials; course notices; a list of useful websites; the Lecture Notes for 1998 and 1999; and the University of Queensland's Internet Code of Practice.

Tutorials are conducted in face-to-face and electronic modes. Students meet physically once a week in one of the School's technology studios. The students use this time to participate in the e-tutorial discussion, to work on their assignments and webpages, and to discuss administrative matters or other concerns. Attendance at tutorials is compulsory, but students come and go at will. Each of the tutorial groups is also assigned to an electronic email list that forms a virtual tutorial or online discussion group. E-tutorials continue through the semester, and provide an electronic forum for the discussion of lecture material, the subject readings and assignment topics. Guidelines for communications etiquette in an online environment are provided, and the students are expected to observe these protocols.

The students work in self-selected teams of four within each of the tutorial groups. Each week, one of these 4-member teams prepares discussion questions from the lecture and posts them on the email discussion for the whole group. Students who have computers at home are able to contribute to the discussion at their leisure. Issues of equity in relation to computer and Internet access are paramount in technology-based subjects, so blocks of Open Access hours in a technology studio are booked for the students' use. Each student is also allocated one pre-booked half-hour session in the studio per week. This provision complements existing access to public terminals in the Information Technology Services Centre and the University libraries.

Formative and summative assessment are based solely on a portfolio of completed assignments. Activities undertaken in the preparation of these assignments provides a context for self-directed learning. As the assessment pieces discursively reflect the epistemological design of the subject, and also show the kinds of new literacies it generates, I will describe them briefly. They are a School Webpage Review, a Media Analysis Unit, a Curriculum Resource Unit, a Reflective Log, and the construction of an Individual and a Group Webpage. Students are required to submit the assignments at intervals during the semester, and also to publish them at the end of the semester on the webpage they create.

The School Webpage Review entails the selection and evaluation of any two Queensland school websites. Its aim is to develop the students' critical evaluative skills by familiarising them with the kinds of informational and representational strategies used by schools. The evaluation criteria provided for the students are "informational design" and "functional design". Informational design refers to the structure and logic of the website's organisation. Functional design refers to the ease of navigation, the logic of the hotlinks, and the readability and accessibility of the site's print and iconic text. The Media Analysis Unit requires the semiotic and narrative analysis of one media oriented print advertisement. The expectation is that the assignment and a scanned copy of the image are placed on the student's individual webpage by Week 13. Other outcomes of these assignments are student familiarity with and competence at web searching and scanning.

The Curriculum Resource Unit involves the evaluation and comparison of two search engines and two websites relevant to a particular curriculum area. Students are also required to document the "search journey" in the quest for information in a Search Log. The log should include "false starts", "blind alleys" and "inappropriate sites." The notions of mis-, mal-, and disinformation are considered central to the critical process of establishing the validity, accuracy and authenticity of the information on the sites. Similar to the School Webpage Review assignment, two analytic concepts - functional design and knowledge design - and their criteria are provided to assist the students.

The Email Threads and Reflective Log assignment provides the students an opportunity to reflect on their experience of "cyber education." It entails the selection of one prominent issue taken from the e-tutorial discussions (e.g., "virtual arguments" or students' virtual silence), and the pulling together of 8 to 10 "threads" or student contributions from the archive of e-tutorial messages. They are obliged to include some of their own messages in the discussion of the selected threads, thereby demonstrating their participation in the e-tutorials.

The Webpage assignment requires each group of four students to design and develop an individual and a group webpage. The webpage should include: a curricular theme for the group webpage, hotlinks to the webpage of each group member, at least one image, names and email addresses of each group member, the date of the last webpage update, and a Task Profile indicating each member's contribution to the construction of the site. The minimal elements of the student's individual sites are a site name and map of contents, hypertext links to the other four assignments, a personal profile and a task reflection.

As the transdisciplinary subject matter of these assignments shows, the pedagogical principle underpinning Media and Technologies in Education is that meaningful learning occurs as a result of a process of design (New London Group, 1995). At any one time, the students were learning through and about a range of content areas. The notion of "knowledge as design" rather than "knowledge as information" works on the assumption that knowledge is both the tool adapted and the product constructed in the accomplishment of a purposeful task. In this case, the assignments are, allegedly, the meaningful tasks.

Findings

Participant Profile from Student Questionnaire

In the first week of the course, 246 students completed an Information Technology Skills questionnaire (see Appendix A). The questionnaire consisted of items that were closed questions seeking information about the ownership of and competence with computers and the Internet. The purpose of the questionnaire was to gather data on factors that might affect the students' approaches to and practices of cyber learning. Whilst questionnaires represent a synchronous snapshot of beliefs at only one juncture in the semester, the information was sought nevertheless as a point of reference from which some assessment of learning outcomes could be made at the end of the course.

The respondents consisted of 171 females (62%) and 75 males (38%). Their average age was 22 years. Thirty-seven were non-school-leavers older than 25 years. Note the gender bias with almost twice as many women than men taking the subject, which is typical of the historically feminised school teaching workforce (Brady, 1998). This gender imbalance was nevertheless not reflected across the other items of the questionnaire. Similar ratios of female (87%) and male students (87%) had access to a computer at home. A slightly higher proportion of males (53%) compared to females (43%) had Internet access at home. Women expressed a higher level of regular email usage (55%) than did males (50%).

Nevertheless, consistent with the literature on the masculinised culture of cyberspace , larger disparities occurred in the reported usage of the Internet. Eighty-eight percent of males responded affirmatively to the statement, "I regularly use/am familiar with the Internet," compared to only 44% of women. Only 2% of the women had experience with webpage making compared to 12% of men. Some surprising statistics on Internet searching skills emerged considering that the sample comprised predominantly second-year and third-year students. Confidence using search engines was reported at 44% for females and 59% for males. The use of the Internet as a research tool also showed a low rate with 46% of females and 42% of males indicating prior use for that purpose. Overall, women were more confident in their computer literacy skills than in their online literacy skills. Approximately 60% of female students reported themselves as "average" in the former compared to 29% for online literacy skills. Males also showed decreased confidence in online literacy skills compared to general computer skills. Nineteen percent self-reported as "very good" on computers, but only 11% applied this high rating to their online literacy skills.

The responses to the "General attitude to the new information technologies" item of the survey were able to be divided into 7 categories (see Table 1). These are: Am anxious or worried, Need to learn but excited, Am excited, Don't have much expertise, Have some expertise, Negative about technology, and No response.

Table 1. Student Attitudes to New Information Technologies

Response	Frequency	Frequency %	Frequency for students over 25	Frequency %
Anxious or worried	75	31	12	32
Need to learn but excited	61	25	4	10
Excited / enthusiastic	48	20	16	42
Don't have much expertise	19	8	3	8
No response	18	7	0	0
Have some expertise	18	7	3	8
Negative about technology	6	2	0	0
TOTAL	245	100	37	100

Note that the category with most responses (75) was from students declaring their anxiety about working with technology. The timing of the questionnaire during the first week of lectures was a significant factor in the large numbers of students feeling anxious. As the following representative comments illustrate, data from the reflective logs also shows that many of the

students experienced high levels of worry, concern and even "fear" about their lack of technological competence at the beginning of the semester. The logs show nevertheless that the worry subsided as the semester progressed, and was superseded by a strong sense of achievement and enthusiasm for the new skills they had acquired.

> *I freaked out when I read the assessment requirements for this subject. I didn't ever think that I would be able to make my own webpage, but now I can and I feel really excited that I have my own little piece of cyberspace. (Log #70)*

Another large group (61) felt technologically inadequate, claiming that they needed to learn more, but also showing a positive excitement at the prospect. Forty-eight were just "excited", which was taken as a positive response. If these two groups showing some "excitement" at the prospect of doing the subject are combined to make 45% of the cohort, this is by far the biggest response. It indicates that most students are eager to learn about the Internet. Comparable with the nineteen students who responded that they "didn't know much about computers", another eighteen stated that they had "some expertise." In spite of the students' apparent keenness to learn about the technologies, a low proportion (6% of females and 8% of males) had taken advantage of the University's free information technology courses provided by the library and the Information Technology Services Centre. Eighteen students provided no response. Only 2% of the responses were negative statements about computers per se.

The Practice of Pedagogy in and through Technology

At the macro level, there was much about the Media and Technologies classroom that was different from conventional university teaching settings. For example, with the exception of the lectures, the students' work took place not in a classroom but in a computer laboratory, at any one of the libraries' terminals, or at the students' homes. Micro analyses of the social and physical space in which group activities take place help to elucidate the practices and the principles of the learning taking place. The ideological function of spatiality is especially important in contexts of teaching and learning where discursive practices and social relations intersect directly with the axes of knowledge and power. Foucault showed how the institutional and disciplinary domination of the body derives from its position in and relation to specific kinds of spaces. According to Foucault, power is neither a property nor a privilege that is possessed. Rather, it occurs in and through a spatial network of relations that combine with knowledge to dominate the body by subjecting it to "dispositions, manoeuvres, tactics, techniques, functionings" (Foucault, 1977. p. 26).

In traditional classrooms, the distribution of students' bodies in rows, the unobstructed gaze of the teacher, and the authority deployed by the teacher creates knowledge, and in turn provides the means for the exercise of power. Power is exercised through "discipline," which trains and corrects. It is viewed as positive because it constructs knowledgeable and socially useful individuals. In order to analyse the social behaviours of the activities in this classroom, four three-minute blocks at twenty-minute intervals were randomly selected from ten of the 45 video-recorded tutorials and Open Access sessions. A visual analysis of the video frames was made every 30 seconds in each of the 3-minute blocks. This breakdown provided a total of 240 observations, which were analysed according to the following criteria:

- At what are the participants looking: whiteboard, overhead projector transparency, printed material, computer screen, other students, or tutor?
- If students are speaking, are they talking to a tutor or to other students?
- If a tutor is visible, are they standing in front of, beside, or behind the students?
- Is a printed text involved in the social interaction?

The purpose of these questions was to develop criteria for establishing some spatial categories for teacher and student roles, positions and behaviours around the cyber technologies. According to Green's framework, I wanted to establish whether the pedagogical practice here was that of teaching as "transmitting", as "learning", or as a context and a resource for learning.

The analysis of the physical space of the classroom and the bodies involved in the activities will be discussed below within the six pedagogical features that emerged as significant from the coded data (see Table 2). Reference to material in this table will be interwoven with qualitative data to support the findings. The six pedagogical features are: Self-directed Activity, Problem Solving, Collaborative Learning, Change in Student Identities and Self-perceptions, new forms of Technoliteracies, and E-tutorials. For the purpose of clarification and illustration from data, these features are represented here as discrete entities, while, in reality, each interconnects and overlaps with each of the others.

Table 2 Spatial Categories for Teacher / Student Roles

Item	Frequency	Frequency %
Students working in pairs or groups	219	91
Students working alone at computer	21	9
Students looking at computer screen	158	66
Students looking at tutor	41	17
Students at screen but looking at other student	41	17
Students talking to other students	155	64
Students not talking	44	18
Students talking to tutor	41	17
Position of tutor in relation to students:		
Behind students	27	66
In front of students	8	19
Standing beside students	6	15
Interactions where printed text in use	19	8

Self-directed Activity

Media and Technologies in Education was designed and organised so that learning occurred in the context of the preparation of assignments. Data from the questionnaire in Table 1 showing the level of student "excitement" or enthusiasm about the challenge ahead of them, indicates that the students perceived the assignments as interesting, meaningful tasks. Field notes and data from Table 2 shows that the tasks comprised mostly self-directed activity.

Teacher-student relations historically have been mediated by the institutional authority of the teacher or the textbook . Item 1 shows that the students worked mostly with other students (91%). Furthermore, Item 2 shows that the focus of the students' attention was either a computer screen (66%) or another student (17%), compared to a tutor (17%). One student claimed:

> *I found the tutorials interesting and enjoyable, as they were different from the traditional style tutorials where tutors do most of the talking. In our e-tutorials, the students had total control of the discussion topics and everyone had the chance to express their viewpoints. (Log #59)*

The pedagogical centre of this classroom has shifted from a teacher with print materials to computer screens and to other students.

This kind of technologically-enhanced, self-directed activity placed a heavy demand on the tutors. As one stated:

> *(RW: 9.6.99)*
>
> *This subject is not like other courses where the tutors have clear guidelines. This is all new and students come any time wanting help. The nature of the subject means that the students demand a lot of attention and support. In other subjects if they have a problem in understanding a particular concept they can go to the library and read it in a book, but with this one the source is the tutor. It's the mindset... you've got to go to somebody or some place to get that knowledge, but with this one they come to us because the library is no help. It's the nature of the course that is different.*

This tutor spoke at length about the ongoing effects of the industrial model of schooling in which dependent, teacher-oriented students:

> *expect that we will show them everything. Show me this and show me that, if you don't show me then I won't be able to understand it. [They think] "If I don't know then I'll go and see the teacher." We [the tutors] would rather show them the principles and then they can work out the details. If something fails they want to blame the*

teacher, instead of being responsible for their own learning.

Clearly, the expectation here is a high level of student autonomy and self-reliance. According to him, Media and Technologies was trying to generate a new pedagogy through the combination of the curricular content and the technology. Consistent with the constructivist principle of knowledge as student engagement with a meaningful design task, this position on learning was not stated by the teaching staff until the students had been given the opportunity to work the theory out for themselves. The subject's conceptual and theoretical assumptions were explained in the last lecture only. When I told the tutor that some of the students thought that this lecture should have been given at the beginning of the semester, he explained:

(RW: 9.6.99)

We don't put it at the beginning because if we did then it's no longer that [i.e., knowledge acquired in the process of doing], it's still imposed. If we leave it till the end, then the penny drops through their own effort.

The tutors resisted "spoon-feeding" the students because they wanted to empower them by developing a sense of individual and group interdependence, accountability and achievement. The strategy was to inculcate a sense of personal responsibility for failure and success in learning, and thereby to reduce the sense of reliance on and subjection to teacher authority. The tutor claimed that though the students were resistant and sometimes hostile to the approach at the beginning of the semester, their attitude changed as the semester progressed.

Some students claimed nevertheless that the unfamiliarity of the tasks and its technical language caused them unreasonably high levels of anxiety. The following excerpt presents this perspective:

(JSP: 20.4.99)

I thought the idea of creating a webpage seemed like a fun way to learn how to use the Internet but I found that at times it was too hard. Being practically computer illiterate, I needed more guidance from my tutor and group members in order to complete the assignment.

Whilst the issue of whether the realisation of their own empowerment occurs remains a moot point, students demonstrated nevertheless an awareness of the change in approach that this epistemological standpoint required of them as teachers. One e-tutorial message reflected:

[The tutor] suggested that it might be better to allow a student to make a mistake a number of times, [and] then develop strategies for identifying the nature of their mistake in order to take new paths to finally succeed in whatever activity it is that they are trying to master. I'm a champion jumper-inner. I guess too much ego and "I am the knower and I will show you," is going to be detrimental to students. That will be hard to dilute. (E-tut #69)

This student is pondering the implications of decentring in the teaching process for herself. Awareness of the challenge the change presents to her is verbalised in the statement that the old style of "I am the knower and I will show you" will be "hard to dilute." The tension here between the student's customary approach and her engagement with the subject's conceptual and theoretical uptake is evidence of a transformative pedagogical practice.

Though self-directed, the tasks were not self-paced. Many students found themselves under pressure to complete the assignments by their due dates. Tension occurs here from incongruities between inquiry- or discovery-based learning and traditional university timetabling and assessment schedules. One student lamented that:

Due to the lack of experience of the other members of the group, I found myself taking charge and making sure that we kept on task.... In a way this was good, allowing me to test my facilitating skills... Unfortunately, due to time constraints I had to resort to mostly telling them what to do rather than letting them find their own way. (Log #32)

This issue is particularly problematical with technology-mediated subjects. Unexpected problems such as viruses and damaged disks sometimes containing weeks of work on a group webpage made meeting assignment deadlines difficult for some of the students.

Problem Solving

The self-directed nature of the tutorial activities and the students' lack of technological competence meant that the students were frequently challenged with organisational, informational and technical problems to solve. Problem-based or "anchored" instruction is a student-centred approach to learning. The following excerpt from the talk of one group is typical of the consultative and collaborative approach needed to trouble-shoot the many problems that arose for the students, particularly with making and publishing their webpages.

(16.5.99)

45 P: we could delete that and try to send it over [to the server] again

46 L: yeah... or did we reload it

47 S: maybe give that a try... I'm not sure

48 P: Hang on, how many letters did you say to have for the filename...

49 S: eight... why?

50 P: maybe that's the problem...

This negotiation around a problem - an image failed to appear on a published webpage even though it had been transferred to the webserver - requires the students to define and to articulate the glitch for the others to think about and resolve. This collective risk-taking, free from tutor interference and evaluation, minimises student performance anxiety associated with individual public responses in the Question-Response-Evaluation sequences of traditional classroom pedagogies. As noted in the comments below, because of the large number of students for each tutor, the group members relied heavily on each other.

> *We encountered problems at every turn.... Our problems ranged from the background pictures being too small to not being able to change the position of our names on the main page. When we came to a problem if no one knew how to fix it, one of us would look it up in "Help" or in our webpage notes from the lectures. If this failed, I asked others in another group. If this failed, we asked [the tutor] or the computer technician. (Log #61)*

> *From working collaboratively, I learnt how to insert pictures, edit, and save as an html file. This was beneficial for my personal webpage and meant I was learning by trial and error, experientially rather than calling on or waiting for the tutor. It was only when no one in the group knew how to do something that we needed the tutor. (Log #45)*

The Task Reflections also reflected a high level of problem solving. One student used the terms "we found" or "I found" eleven times in his reconstruction of the task. Three of these phrases related to searching the Internet and locating particular images or sites, but the other seven referred to discovering, realising, or understanding a technical detail through an action taken. The following example illustrates the Action / Problem / Attempt / Problem / Resolution sequence and structure of this kind of self-directed group activity:

> *Once Luke (my fellow class companion) explained to me how to download the file, I found it easy to insert the text into the webpage. Luke was quite patient in showing me how to download these objects. The only problem I came across was that in Word the text was not animated. At first this was a worry but once I checked our site on the net I found that the text was fine, it was just that Word did not animate the files. (Log #1)*

Sometimes students failed altogether to understand the technical reasons for their problems. This occurred because of the large number of students, the pressure of meeting assignment deadlines, and the intricacies of web publishing. As the following comment shows, this was not viewed as problematic, as long as it did not prevent them publishing their webpages:

> *I never did work out exactly what the problem was, but I simply deleted these images and found others from image pages and put these in. I think one of the problems was that I was forgetting to rename my personal page as "index.html" and this was the reason that it was not updating properly. (Log #61)*

Many similar comments confirm the amount of lateral and creative thinking done by the students in order for them to achieve their goals of, for example, publishing their webpage.

The data shows that the most challenging and frustrating component of the subject was the procedure of finally publishing the created webpages on the Internet using the File Transfer Protocol software. Different groups solved the problem in different ways.

> *To solve this problem, one of my group members got a handout outlining the procedure from the Technology centre. By working through this handout and with a little help from the tutors and some other friends, as a group, we were able to overcome this problem. (Log #49)*

The students' reflections show how the cultural conditions for and practice of task-based problem solving taught them more than the technological skills they acquired in the process.

> *There were times when I became very frustrated, or believed a particular problem couldn't be fixed, but the difficulties we faced usually turned out to be minor, if "fiddly." So another important skill I have learnt is not to panic! (Log #17)*

> *Perhaps most importantly, I have learnt how to teach myself further skills. I have learnt that this can be done, and what it involves. I can hardly believe that I now feel confident teaching myself more about computers, and I actually enjoy doing this! (Log #17)*

Learning in this class began with an interesting but complex technology-mediated task fraught with difficulties to be overcome rather than with content to be mastered. As each complication arose, students identified and solved it within the context of the

literate or technical activity. The opportunity to verbalise difficulties (e.g., how to wrap text around an image) and to reflect upon the progress of their understanding of the issue provided students the opportunity to develop reasoned and coherent insight to the problem space. Authentic and engaged learning activities such as these facilitate independent, divergent and agentive attitudes and approaches that are requisite to the lifelong learning needed in rapidly changing information societies.

Collaborative Learning

The subject coordinator stated that the promotion of collaborative learning was an important consideration in the design and organisation of Media and Technologies in Education. The data shows that much of the course work did, in fact, entail a multi-party, cooperative approach. Item 1 of Table 2 shows that the students spent a far greater proportion of their tutorial time working in small groups (91%) than in individual work (9%). Item 3 shows, furthermore, that most student interactions took place with other students (64%) rather than with the tutor (17%). The focus is therefore on the co-construction of tasks rather than on the tutor or another student presenting information in seminar-style format. The analysis in Item 4 semiotically demonstrates the facilitative role of tutors, who stood behind watching (66%), rather than in front of (19%) or beside (15%) the students. The loci of disciplinary power in this learning space operates in and through the resource of computer terminals and cyberspace .

The students began to construct their group webpages at the start of the semester. This established a pattern of cooperative planning and shared allocation of tasks from the outset. As one student conceded, "The group webpage forced us to consult with each other." The reflective logs of the students' whose groups worked well communicate a sense of tangible gratitude to the other members for their "patience" and "assistance". One student declared, "My fellow members were a great support to me, particularly on the technical side of things, and I appreciated that never once was I made to feel a burden on the group." Another claimed that:

> *The fact that our group got on so well together and were all prepared to work hard to make this website meant that no task was a chore or something we didn't want to do. If one particular member didn't wish to do a task, then another just did it for them. We were all prepared to help each other, and that is a big contributor to the fact that*
>
> *this website is such a success (well I think it is anyway). (Log #64)*

The claim that "no task was a chore or something we didn't want to do" shows the amount of team-work undertaken and the social skills developed by the students. The comments also convey a sense of pride in the learning outcome, which was a website that is, in the eyes of this designer and author, "such a success."

The foregoing and the following statements also illustrate the quantity of talking, listening, consulting, assessing, disputing, reviewing and reconsidering that went on at each phase of organisation and delegation of the various tasks. Each step toward the final goal required oral communication, reading, writing, keyboarding and online information literacy skills.

> *We worked well as a group and discussed our ideas before arriving at any final decisions whether they involved text, layout, images, style, theme, background or hotlinks. (Log #14)*

The experience of self-directed group work was, nevertheless, a new and personally challenging experience to some. Many were aware of their individual learning styles and openly self-critical of their roles and their contribution- or lack of it- to the task.

> *As a group, I do not feel that we worked well together, and I can take the blame for that as well. As none of us were familiar with the software the tutorials were time for individual work and rapid questions to the tutor. I myself concentrated on my own webpage rather than worrying about the group's homepage. This was not the right thing to do, however, circumstances and time limitations really made it hard for our group to work together. (Log #50)*

Opportunity for reflection and meta-analyses of their own practice assisted the students to understand and to confront differences between their own and their team's attitudes, approaches and learning styles. As one student put it: "Within our group, we are quiet [sic] different, but we always agreed with each other and have taken each other's work and life into account."

A key technological and logistical issue with working collaboratively to construct webpages is that the files are saved and stored on disk, and group members coordinate times to meet and work together. The difficulty was to balance the limited and inflexible hours of the Open Access sessions with university timetables and other responsibilities such as the work and family commitments of four people with different lifestyles and doing different courses. Data from Table 1 and the following statements show that the issue of accessibility to computers, to the Internet and to tutorial support was problematic for many.

> *The only drawback I experienced in this course was the availability of the open access hours. Since I don't have a computer at home, I had to rely entirely on the computers at university.... I had to alter my timetable to fit in with those hours. I would say that I spent more hours in the computer labs this semester than I ever did in my five years at high school. (Log #59)*

This statement raises the issue of different levels of technological competence. Almost without exception, the students were

accepting of this. Many viewed their differential abilities as a positive factor in the learning culture that developed within the group.

> *I think the fact that we all had limited knowledge about webpage construction helped us to work well together, as we learnt by trial and error along the way with great success! (Log #34)*

> *That we have different levels of experience and expertise in this area was not a handicap. Instead I found it was a good experience in personal tutoring, and in understanding that we all bring different gifts and talents to the project. It helped me to learn patience, and to compromise (my perfectionist and organiser tendencies had to be controlled). (Log #19)*

These comments show that the organisational principle of this classroom was cooperation, not competition. Notwithstanding this culture of an apprenticeship model of peer support, some groups did not function well. The groups used a range of strategies to manage the issue of the refusal of some to "pull their weight." The most common was the sending of email messages to each other and to the tutors complaining about the recalcitrant student. The tutors advised the students to email the guilty party, and to attach an open copy to the tutor. This provided the student opportunity to change their attitude and behaviour, and also informed them that the tutor was aware of the issue. The students also engaged in off-campus, behind-the-scenes communication and work, meeting outside of the Open Access hours in colleges and flats. The tutors and the students verified this practice in interviews, but data for it was not quantified.

Another aspect to the issue of access with computer-mediated group work was the logistical challenge of having four people working at a single workstation.

> *With four of us working on one computer, the positioning of the monitors and chairs meant that access was limited. Only one member could operate the mouse or keyboard and [this] meant they had more direct contact editing and navigating the sites. At times the group broke up over two computers and while this created easier access, it meant that two different tasks were being performed. This then led to exclusion of two of the members from direct navigation and editing even if there was collaborative discussion between the groups. (Log #45)*

Though difficult and often frustrating, the work was also hands-on, applied and authentic. The nature of the assignments provided latitude for a high level of student ownership and choice in what were personally meaningful and satisfying tasks.

Change in Students' Identities and Self-perceptions

Many students describe a gradual transformation that occurred in their skills, attitudes and identities as users of online technologies. Initial feelings of being "completely overwhelmed", "incredibly daunted", "intimidated" and "overawed" at the challenges that lay ahead of them progressively gave way to a sense of enormous satisfaction and pride in their achievements. The following are a representative sample of these comments.

> *I am amazed at how much I have learnt and achieved in this subject. I now feel confident using computers, and know how to teach myself more. (Log #17)*

> *Overall the creation of this webpage was a total eye-opener. I found getting started on this page extremely difficult ... Once I had begun though I found the task a great learning experience that has inspired me to want to learn more. (Log #54)*

> *I have found much of this subject quite difficult, and very challenging. I began the semester with very little background knowledge about computers and would have to describe my relationship with them as a "love/hate" relationship. I was probably verging on being "computer-phobic"..... I have come so far since those days! (Log #17)*

The subject's assignment work presented the students with substantive intellectual and social challenges. The anxiety, the stress and the tensions that they generated were often visible in the students' bodily significations. A slamming of the desk denoting frustration, a loud "Yes!" accompanied by a clenched fist proclaiming success, a celebratory group "gimme-five", or even, as one student confided, tears of disappointment at some technical failure were the palpable bodily identifiers of the emotional cost of this institutional training and remaking of these engaged learners.

This data indicates that the technology-based, online instructional setting of Media and Technologies was a social context and a resource for a marked change in the students' perceptions of themselves as users of technology, and as learners and knowers. A shift is evident here in the identities of the students from being technologically unskilled and anxious, to being competent and sufficiently confident to transfer newly acquired knowledge to different contexts of use (e.g., "in classroom situations"). The public, global reach of the medium was another factor contributing to the student's changing sense of themselves as achievers. One of the students, for example, spoke positively about webpage creation because, to his astonishment and delight, another student from England emailed him, "asking if he could reference my part of the group web page in his assignment." The possibility exists here for students to be part of and contribute to authentic, global learning communities. It is apparent that, in spite of initial low levels of student technological competence, if learning objectives are made clear, and newly acquired skills are used often enough in practical work, then teachers can expect a high retention rate of critical, literate and technological skill development.

Technoliteracies

Another distinctive feature of this classroom is its lack of print materials. Data from Item 5 in Table 2 shows that writing materials and books appeared in only 8% of the observations made. The cybertexts of the World Wide Web appear then to suffice as information and communication resources for the students' research and learning needs. The materiality and fixity of bookspace has been superseded here by the immateriality and plasticity of the screen and virtual space ; .

Students spoke at length about their control of and connection to the texts they were producing. The fluidity of hypermedia text endows a high level of both "creator-control" and "reader-control" (Lanham, 1993, p. 6). The following comment by a student illustrates the diversity and complexity of reading and writing in an online context.

> *I can hardly believe the extent to which my computer skills and knowledge have increased as a result of creating this webpage. Some of the things I now feel confident doing are:*
>
> *scanning photos; editing photos; understanding the language; finding, downloading, inserting and positioning graphics and animations; creating borders; inserting hyperlinks, including hotlinks to other Internet sites; bookmarking within a page; editing in Netscape; saving all sorts of things; naming and renaming files; organising files on my disc; making a directory at the Information Technology Services centre; publishing a webpage; transferring files back and forth; dealing with problems as they arise; searching the Internet. (Log #17)*

Note that the third item is, "understanding the language." This resonates with another student's comment, "Using the internet means learning a whole new language." Webpage creation entails an amalgam of alphanumeric codes, graphical interfaces and technical knowledges that arise out of the interface of digital technologies with everyday language, communication and culture. Becoming a writer in this medium requires learning new ways of non-linear thought and expression. claims this switch from textual centres and ends to links and nodes is a shift that is ushering in "a new cosmology of the mind."

Inserting backgrounds, importing graphics, downloading files, copying images, browsing for hyperlink destination addresses, positioning visual and text elements, navigating nested directories, and dragging and dropping text are new forms of textual work undertaken for publication on the World Wide Web. Much of this is iconographic and multimodal. Some of the student's webpages, for example, are enhanced by multimedia such as background music or, in one case, the singing of whales. This paper shows that activities using these multiliteracies encourage cognitive and social interactivity, creativity, collaborative authorship and problem-based learning. I have shown how the work is socially interactive and grounded in whole, culturally relevant tasks. It is cognitively interactive because it is a process of "click and think." The critical and sociocultural theoretical component of the lectures gives the students an understanding of the ideological and political functioning of language, image and text. This conceptual background enables them to make decisions about colour, font, texture, format and semiotic effect at each stage of the text's design and production. These knowledges and skills once were the province of editors and copyreaders.

The students acquire other technoliterate procedures that are fundamental to Web publishing. Some of these include using Telnet for the preparation of an Internet Access account on the University's webserver, the transfer of the webpages to the Internet Access account storage area, and the provision of public access for readers to view the webpages. Students of Media and Technologies in Education learned to use the mandatory Word Webpage Wizard and the File Transfer Protocol software. Of their own volition, some learned Netscape Composer and HTML. The technical complexity of the task and the apparent "enjoyment" it generated, motivated some students to extend themselves beyond the minimal subject requirements and expected learning outcomes. This investment in terms of time and effort is evidence of authentic and engaged learning.

E-tutorials

The purpose of virtual tutorials is to improve communication and participation for students by increasing flexibility and access. To gain a measure of productivity and to assess the educative value of this type of pedagogy, the discussion archive was printed and categorised into message types. The archive comprised a total of 180 messages for a cohort of 80 students.

Table 4 Categories of Email Messages

Message Type	Frequency	Frequency %
Testing and Introduction	24	13
Obligatory Discussion of Subject Content	21	12
Replies to Discussion of Subject Content	61	34
Requests for Assistance	7	4
Replies to Requests for Assistance	5	3
Unsolicited Sharing of Helpful Information	3	2
Administrative Matters	7	4
Unsolicited Discussion	17	9
Replies to Unsolicited Discussion	35	19

Table 4 provides a breakdown of the archive messages into semantic categories, which are explained here with examples. Testing and Introduction are important messages through which students acknowledge their presence in the group discussion. These took the form of: "*Hi Guys. I'm just testing to see if our discussion group is up. Hope everyone's pages are going alright* " (ED205-01:2). Obligatory Discussion of Subject Content refers to the lecture summaries and discussion questions that the groups were to post each week to stimulate discussion. The following is an example:

> *Hi again. Just a couple of Q's on the reading on "technocentrism". Considering Easton's statement that "a true literacy is an encounter between thought and reality, desire and possibility." Does being capable of manipulating a computer through an operating system (windows '98) qualify this statement or is "true literacy" reserved for those who can program (ie speak computer talk). (ED205-05:32)*

Replies to Discussion of Subject Content are responses addressing the questions raised. Requests for Assistance are messages seeking information about some aspect of the subject content: "*Hi everyone, how is everything. What are mis-, mal-, and dis-information? Is it to do with false information published in the internet* " (ED205-04:28). An example of a reply to the previous request for assistance is: "*Hi. mal- is bad information. dis- is purposefully wrong. mis- is wrong by mistake. Have fun with your assignment* ." (ED205-04:35). Unsolicited Sharing of Helpful Information are messages that voluntarily offer hints, suggestions or collegial support like the following:

> *I am just writing to share some wonderful news... After god knows how many attempts we've got the pictures up on our homepage... and also got our individual homepages linked to our index page. Just sticking with the problem will eventually give you some kind of happy ending. (ED205-02:13)*

Unsolicited Discussion refers to messages that voluntarily raise and discuss relevant issues such as the following.

> *G'day. Since I started sending emails, I've been thinking about how accentuation, not punctuation, gets totally left out, because our big and O so clever computers cannot digest the many little accents and symbols... In French, Spanish, Portuguese and many other languages, a simple little accent can change the meaning. Trust me, they are not superfluous. (ED205-01:53)*

Replies to Unsolicited Discussion are responses to the former: "*Hi everyone. M... raised a lot of interesting comments, I just thought I'd spend a bit of time replying to a few of them with what I believe" (ED205-02:28)* .

All of the students were asked to introduce themselves online to their group. The low compliance rate of just 13% prefigures the inadequate level of overall student participation in the subsequent discussions. Indeed, the per capita contribution was just 2.5 messages per student for the semester. This is a poor result by any standards. If the participation level was poor, was the intellectual content of the messages any better? Messages containing Obligatory Discussion of Subject Content comprised only 12% of the total. Again, this is a poor rate of per capita student participation. The majority of messages did, however, relate to the content. Obligatory Discussion (12%) and Replies to Discussion of Subject Content (34%) comprise 46% of the archive. If Unsolicited Sharing of Helpful information (2%), Unsolicited Discussion (9%) and Replies to Unsolicited Discussion (19%) are added to the Obligatory Discussion and their Replies (46%), this makes a total of 76% of the archive. The significant issue here is not that the electronic forum was used for what it was designed, but rather what should have been in the archive that was absent. In his assessment of the quality of the e-tutorial discussion, one student claimed: *I would estimate that the amount of debate which took place online (over the semester), would be about equal to the amount of debate that might occur in two or three*

weeks of traditional tutorials. It was in effect 'debating in slow motion'. (Log #2)

Some students, particularly those with computers and access to university email accounts at home, found the online discussions freed them from the physical constraints of time and space.

> *Our group relied on the use of e-mail to communicate ideas and to send information across to other members. It was also convenient as we could each leave messages and receive messages when we had the time to do so. (Log #49)*

Conversely, for others the disadvantages of virtual tutorials outweighed their advantages.

> *(14/4/99)*
>
> *Flexibility can also be a drawback. Sometimes, questions were not posted until a week or more after the lecture. In some cases, I had moved onto a new topic, and I then found it difficult to refocus on the old topic.*

The following table (Table 5) provides a list of features of the e-tutorials as reported by the students in their task reflections and logs. For each purported communicative or social benefit, another student reported its negative equivalent.

Table 5 Student Reports of Features of Virtual Tutorials

Advantage	Disadvantage
quick communication	email fast, brief
more communication	trivial messages
time to ponder responses	time between responses too long
able to access from home	access limited unless own a computer
promotes sense of community	online interactions don't build relationships
promotes self-discipline	many students uncommitted to the process
encourages self-motivation	forced to participate
less fear to express different opinions	loss in meaning and nonverbal expression
requires discipline in responses	open to abuse (loss of visual sensibilities)
can overcome shyness/lack of confidence	core groups can dominate
able to ignore questions	easy to avoid responding
access to other people's computer skills	possibility of viruses
forced to learn to use email	emailing took up too much tutorial time

Sociocultural and technological factors clearly are significant issues in how individual students perceive and respond to technology-enhanced learning approaches.

Conclusion

The purpose of this paper was to examine the forms of teaching and learning that occurred around and with online technologies. The data has shown that cyber-based pedagogies are hybrid social practices undertaken in complex learning spaces. They combine old methods (e.g., face-to-face lecturing) with new theory (constructivism and post-critical pedagogy), new content (e.g., media studies) and new information technologies (e.g., the Internet). The teaching staff imparted information and knowledge to students via conventional didactic means, but data indicate that most generative learning occurred in the tutorials and Open Access sessions. Cyber technologies enable a diminution of teacher-student contact and an increase in student independence and autonomy. Many more hours of productive learning occurred through self-directed assignment work than from listening and note-taking in lectures. Indeed, the persistent drop in lecture attendance as the semester progresses, and as the students grasp what the subject entails in terms of learning outcomes, is an issue of concern that the subject coordinators will

address for 2000.

Teachers are responsible for creating the conditions in which understanding is possible, and students are obligated to capitalise on those conditions (Laurillard, 1993, p. 1). The combination of subject content, instructional design and online pedagogy in Media and Technology provided the enabling conditions, and the sociocognitive demands of the context - whether that was solving a problem in relation to email, or posing discussion questions to the e-tutorial group - helped the students to acquire new techniques, skills, knowledges and attitudes. As one of the students wryly noted: "*What you get out of this subject is directly related to the number of hours you can afford to spend sitting at your computer .*"

Online pedagogies operate within and through new socialities and new spatialities of communication and learning. The primary sociality in this classroom was its student-centredness. No authoritative figure dominated the social behaviours and activities in which the students engaged. The emphasis here was on non-hierarchical student-to-student interaction and learning. Some students claimed that unless a problem arose and all other avenues of assistance proved unhelpful, the tutor was "irrelevant." These coequal student-to-student and tutor-to-student interactions embody a new spatiality of social and pedagogical relations. Media and Technologies was not about "sitting, listening to a tutor, and getting the 'right' answer." Rather, it was about the cooperative critique and the collaborative construction of social, cultural and technological languages, knowledges and identities.

Classrooms nevertheless are sites for complex interactions of power in which competing and conflicting relations of privilege and disciplinary authority are played out. The teaching staff here were trying to develop a more equitable, transformative pedagogy around technology, and undoubtedly they achieved a fundamental shift *from* knowledge transmission through instruction *to* knowledge production through construction. The deployment of institutional power in these classes may be diminished and dispersed, but it exists nevertheless. University mechanisms of hierarchical observation and student classification continue to operate through the normative regimes of assessment and certification. As they have historically, these procedures penetrate and define the shifting convergences of power and knowledge between and among the students and the tutors in Media and Technologies.

Teaching and learning in higher education are changing. The current period is a transitional one as student and staff inadequacies and resistances, curricular dysjunctures and inconsistent outcomes overlap emerging technological and pedagogical developments (Privateer, 1999). The practicalities of the classroom, the unpredictable contingencies of technological media, and the messy realities of learners' diverse backgrounds mean that outcomes are neither constant nor predictable. As the e-tutorials show, results can be sporadic and unevenly distributed. Cyber pedagogies in and of themselves are not the means to more critically informed students and socially aware, cyber literate citizens (Kershaw & Safford). Like all instructional "methods," they consist of site-specific social practices, the outcomes of which are dependent upon the local conditions of their application. The study demonstrated nevertheless that Media and Technologies in Education generated interdisciplinary competencies such as communication and negotiation skills, team work, problem solving, critical capacities, information literacy skills and new forms of technoliteracies.

References

Appendix A

Information Technology Skills Survey

ED 205 IT Skills Survey

	Yes	No
1. I have a computer at home		
• My computer has an internet connection		
• I regularly use/am familiar with the internet		
• I know how to make a webpage		
• I regularly use an email program		
• I know how to use search engines		
• I have used the Internet to research topics for uni subjects		
• I have taken short non-credit IT courses at UQ (Library, ITS Centre)		

	Very good	Average	Poor	Zero
9. I would rate my computer literacy skills as				
10. I would rate my 'online' IT literacy skills as				

11. My computer at home is a: _____

(e.g., MAC, PC, Pentium I or II, 286, 486, Laptop, etc.)

12. **Sex: Male Female**

13. **Age:** _____

14. **I am enrolled in the following Degree(s):** _____

15. What is your **general attitude** toward the new information technologies?

(e.g., think it's great; don't know too much about it; a bit anxious about lack of skills; over-rated or too much hype, etc.)

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