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Developing generic skills for tertiary students in an online learning environment

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Developing Generic Skills for Tertiary Students in an Online Learning Environment

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

Abstract

Increasingly, higher education institutions are being asked by industry, government and funding bodies to produce graduates with versatile generic skills as well as subject knowledge and expertise. This is causing a major reappraisal of higher education institutions purpose, learning outcomes and research activities. Many institutions are experiencing problems in implementing effective teaching and learning strategies to promote the development of these skills.

The study sought to investigate ways of developing students' generic skills through the design and implementation of a learning environment that incorporated three key learning principles - authenticity, self-regulation and reflection. These were integrated into a course design methodology that focused on creating appropriate *learning tasks* for the given course objectives. The development of learning resources and supports was considered only after key learning tasks had been established for the given context.

Using this instructional strategy, a learning environment was created using both face-to-face and online delivery, and tested with a class of final year higher education students. Eleven generic skills were identified as being important for these students. These included – time management, learning-to-learn, self-assessment, leadership, collaboration, communication, peer-assessment, research, analysis/synthesis, problem solving and task management.

A range of data was collected and analysed by triangulating various qualitative and quantitative research methodologies that provided a rich representation of how the students engaged with the learning activities. Results showed that the design of the learning environment was effective in promoting the development of these generic skills, and that the authentic activities were instrumental in motivating students. Once motivated, students then actively engaged with self-directed and reflective activities, which helped construct knowledge and promote generic skill development.

The major implication of the study is that generic skill development and deep approaches to learning can be achieved without having to take extra time to specifically teach these skills. Developing generic skills becomes a natural consequence of students actively engaging with learning tasks that are authentic, student-centred and reflective. Using this approach to teaching and learning, course coordinators need to consider which generic skills should be targeted at different year levels to cover the necessary skills.

Declaration

"I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution in higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text."

Signed:

Date: 31/7/2002

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Chapter 1

Introduction

1.1 Overview and Background

Over the past decade there has been a growing concern about the role of higher education institutions and how they are meeting the needs of employers. Increasingly, higher education institutions are being asked by industry, government and higher education funding bodies to produce graduates with versatile workplace skills, as well as subject-specific skills. This is causing a major reappraisal of higher education institutions purpose, learning outcomes and research activities. (Australian National Training Authority, 1998; Bennett, Dunne, & Carre, 1999; Candy, Crebert, & O'Leary, 1994; Dearing, 1997; Mayer, 1992).

As higher education institutions struggle to implement the development of these workplace skills, they must firstly define what these skills represent. There are currently several synonyms for workplace skills including generic, key, core, life, competencies, employment, transferable, personal and others. These terms usually refer to "skills that are common to more than one work site, more than one occupation or more than one field of knowledge" (National Board of Employment Education and Training, 1996, p. 17). The Mayer Committee (1992) and the Finn Review (1991) identified the following as being required by graduates: working in teams, communicating clearly, personal and interpersonal skills, problem solving, understanding technology and using mathematical concepts efficiently. In this study, these skills will be referred to as *generic skills.*

However, varying definitions of what generic skills are and different requirements in different disciplines is complicating progress. Professional courses such as teaching, medicine and social work place a strong emphasis on collaboration and communication skills and are usually designed with practical work-experience components so that students learn "on the job" skills. Other courses have no work experience component or industry contact during their studies but may contain "stand-alone" modules designed to teach these skills. Some courses have no work experience or generic skill development components (Bennett et al., 1999).

Employers are now explicitly demanding both generic skills and discipline knowledge from new graduates (ACNielsen Research Services, 2000). Higher education institutions must adopt new strategies to help promote the development of these skills to satisfy industry demand. Conventional approaches to teaching need to be reviewed in the light of new learning technologies and pedagogical viewpoints to help promote the development of generic skills "where pedagogical aspects need to be strengthened in line with technological changes to achieve a synergistic relationship with learning and technology" (Kearns, 2001, p.3).

This study sought to explore new ways of developing students' generic skills. By investigating the nature of generic skills and contemporary methods of teaching and learning, it planned to gain an enhanced understanding of how higher education institutions can prepare students for the workplace by helping them develop generic skills as well as discipline-specific knowledge. Specifically the study planned to:

- Explore generic skills that are considered important in higher education;
- Review contemporary teaching and learning strategies which promote the enhancement of generic skills as well as deep approaches to learning;
- Investigate the extent to which flexible, on-line delivery environments promote the development of students' generic skills;
- Propose instructional strategies that support generic skill development;
- Design, develop and implement a learning environment focused on developing students' generic skills; and
- Evaluate the success of the learning environment.

1.2 The Problem

Developing generic skills for students in higher education institutions has become a priority issue in Australia, New Zealand, Great Britain, America and many other countries around the world. Higher education institutions are experiencing continual pressure from government, industry, funding bodies and students, to place a greater emphasis on developing generic skills that are currently delivered through the "hidden curriculum".

For example, in Australia, the Department of Education, Science and Training has funded the Australian Council for Educational Research (1999) to develop a Graduate Skills Survey instrument which was piloted in the year 2000 and implemented in 2001 across all universities in Australia (Appendix 1). First year students take a skills test at entry level, and then again in their final year of study at exit level. This then enables universities to compare the change in students' generic skills over the course of study, differences in student profiles between fields of study, and differences between universities. How, and if, universities will be assessed on students' generic skills development is still unknown but the subject of hot political debate: "a policy on the use of the data is still being finalised" (Australian Council for Educational Research, 1999). This testing shows the seriousness by which the government views generic skill development.

Against this external pressure, many higher education institutions are still trying to define generic skills (key skills, competencies, life skills, core skills, transferable skills, broad skills, basic skills, etc) and exactly what skills are needed as part of their overall strategic plan or mission statement. This is further complicated by issues of transferability, that is, there is a strong school of thought that "the pursuit of general transferable core/key skills is a wasteful chimera-hunt and should now be abandoned" (Hyland & Johnson, 1998).

Higher education institutions face additional problems when trying to implement appropriate teaching and learning strategies for the development of these skills in different disciplines. Resistance from lecturers, who are reluctant to remove subject content in order to teach or integrate generic skills, and different perceptions of importance from students about learning these skills, all contribute to making this a difficult task (Bailey, 1993; Leckey & McGuigan, 1997).

This proposal intends to produce a strategy that will help teachers create learning environments that will promote generic skill development, in an attempt to meet the needs of industry, funding authorities, government regulatory bodies and lecturers undertaking teaching generic skills as part of their syllabus. This will be proposed within a framework that does not add extra content to the curriculum, which would not be possible in many courses.

1.3 Significance of the Study

Employers are showing increasing dissatisfaction with new graduates in regards to generic skill development such as critical thinking, problem solving, communication and teamwork (Candy et al., 1994). The need for graduates to have well-developed personal and transferable skills is consistently articulated by most employers across numerous different fields of study. Many courses in higher education institutions have a tendency to increasingly put more technical content at the core of the curriculum by sacrificing the development of generic skills and propose three key components as the "basic building blocks" (p. 59) of any course in higher education institutions as follows:

- Applied skills and knowledge, or technical content which graduates attain within their field of expertise;
- A firm foundation of general education or wide general knowledge which helps fulfil the liberal definition of an "educated person" (p.61); and
- Personal and transferable skills and attitudes such as communication skills, leadership, self-organization, time management, analytical skills, critical thinking, teamwork, etc.

More recently, a report funded under the Evaluations and Investigations Programme of the Department of Education, Science and Training also found deficiencies among new graduates. The greatest deficiencies were perceived to be in the areas of creativity and flair, oral business communications, problem solving, independent and critical thinking, interpersonal skills and a lack of understanding of business practice (ACNielsen Research Services, 2000) which is consistent with earlier research studies and reports.

Clearly, just teaching subject knowledge and skills, as higher education institutions have done for many years is no longer enough. The demand for more "rounded" graduates with useful generic skills can no longer be ignored. How then can higher education institutions meet these demands of business, higher education funding bodies and the general community? For these demands to be met by higher education institutions, lifelong learning and generic skills development must be placed at the centre of curriculum development, rather than as just "bolt-on" extras (Candy et al., 1994).

The traditional model of course delivery having disciplinary content at the core of each course, with generic skill development, contextual studies and lifelong learning at the peripheral is no longer a viable model (Figure 1.1). It is proposed by Candy et al. (1994) that this model be reversed. They advocate that lifelong learning should be the prime or core consideration of *any course*, followed by generic skill development and lastly by disciplinary content. The report recommended that: "That lifelong learning skills should form part of the core of any and every undergraduate degree, and that this emphasis should be spelled out in course aims and objectives" (p.66).

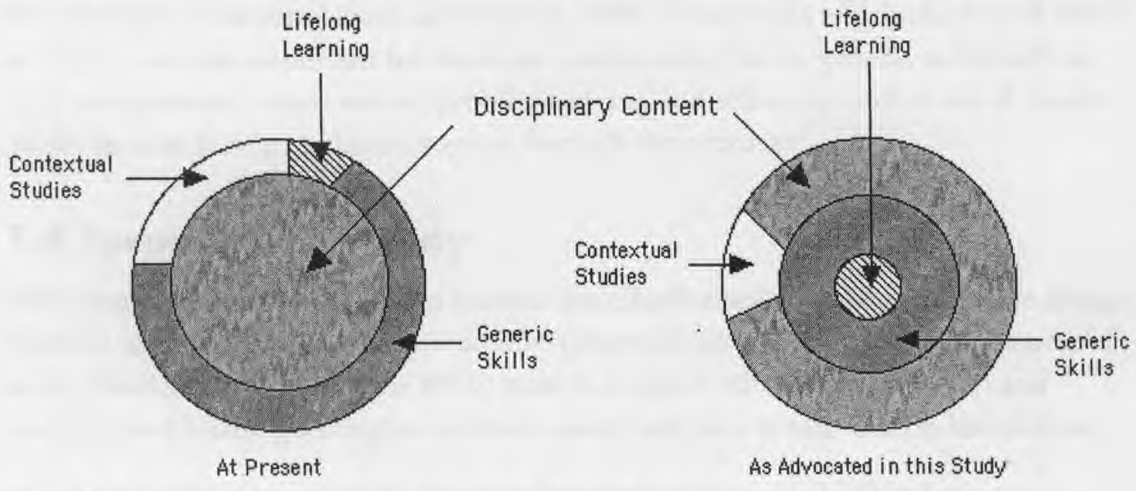


Figure 1.1: Idealised models of undergraduate curriculum (Candy et al., 1994)

In a study conducted by ACNielsen Research Services (2000) to establish the extent of employer satisfaction with skills of new graduates entering the labour market, it was found that skill deficiencies most commonly cited by employers included:

- Communication skills;
- Interpersonal skills;
- Understanding for business practice; and

- Independent and critical thinking skills.

In the United Kingdom, the Committee of Vice Chancellors and Principals, the Confederation of British Industry, the Council for Industry and Higher Education assert that most British people, most educators, and most students now believe that it is one of higher education's purposes to prepare students well for working life. They have agreed on a joint national effort to help develop graduates core transferable skills (Bennett et al., 1999, p.72). The United States, Canada, Europe, New Zealand and other countries are also confronting the requirement for a more flexible education system, which promotes the development of graduate skills.

The need for graduates to have well-developed generic skills is consistently being demanded by employers across different disciplines and different countries. This is supported by a report funded by the Department of Education, Training and Youth Affairs (DETYA) in Australia, which found that generic skills such as personal skills, communication skills and the ability to continue updating and developing industry specific skills continue to be critical factors in determining the recruitment of new graduates (ACNielsen Research Services, 1998).

Besides these external pressures encouraging higher education institutions to upgrade students' generic skills, there is also educational justification for increasing emphasis on student generic skill development. Study skills clearly underpin effective learning and academic progress, as does communication, teamwork and problem-solving skills (Drummond, Alderson, Nixon, & Wiltshire, 1999). These skills which employers value so highly, are also important for students in academia, that is, generic skills such as time management, collaboration, problem-solving and self-organization are all useful attributes which help students progress through their courses.

1.4 Purpose of the study

The intention of this study was to explore the effectiveness of a range of course design features used to try and develop students' generic skills within their regular course of study. Students involved in the study were in a higher education institution and teaching and learning strategies involved using both face-to-face and on-line delivery.

A salient design strategy of the investigation was to integrate the development of students' generic skills through pedagogical principles incorporated within the established course structure. Students were required to interact with the course content in ways that would promote the development of their generic skills without to need to "teach" generic skills and hence avoid any overheads in the syllabus when promoting the development of these skills.

1.5 Structure of Thesis

This thesis has been designed around eight chapters that are illustrated in Figure 1.2. These chapters outline a theoretical framework and design methodology for creating a learning environment to promote the development of students' generic skills.

Chapter 2 begins with a review of the literature and provides an overview of contemporary issues in higher education, specifically: contemporary teaching and learning practices in higher education, strategies for developing generic skills and flexible and on-line delivery systems. A synthesis of the literature in this chapter is used in Chapter 3 to establish guidelines for developing generic skills, as well as defining the research questions. These guidelines form the basis of creating the learning environment in Chapter 4 in conjunction with a design methodology (Oliver & Herrington, 2001) that promotes course design as a combination of learning strategies, learning supports and learning resources.

Chapter 5 outlines the research methodology used and describes the methods used to collect data in order to help provide valid and reliable answers to the research questions outlined in Chapter 3.

Responses to the two research questions are investigated in Chapters 6 and 7. Chapter 6 provides an analysis and discussion of factors that contributed to students practising generic skills within the established learning environment. The analysis was conducted by firstly defining each generic skill, and then considering learning activities needed to develop this skill, as defined by the literature and established design methodology. Course design features that promoted skill development are discussed, followed by descriptors of student activity found to be most prevalent in practising these skills. Attention is given to identifying elements with the learning environment that motivated students to practise these skills. Chapter 7 provides an analysis and discussion about changes that occurred in students' generic skills throughout the course of the semester using quantitative research techniques.

Chapter 8 concludes the thesis by discussing the findings as well as making critical comments about limitations of the study. Conclusions and recommendations for further development and associated research are then provided.

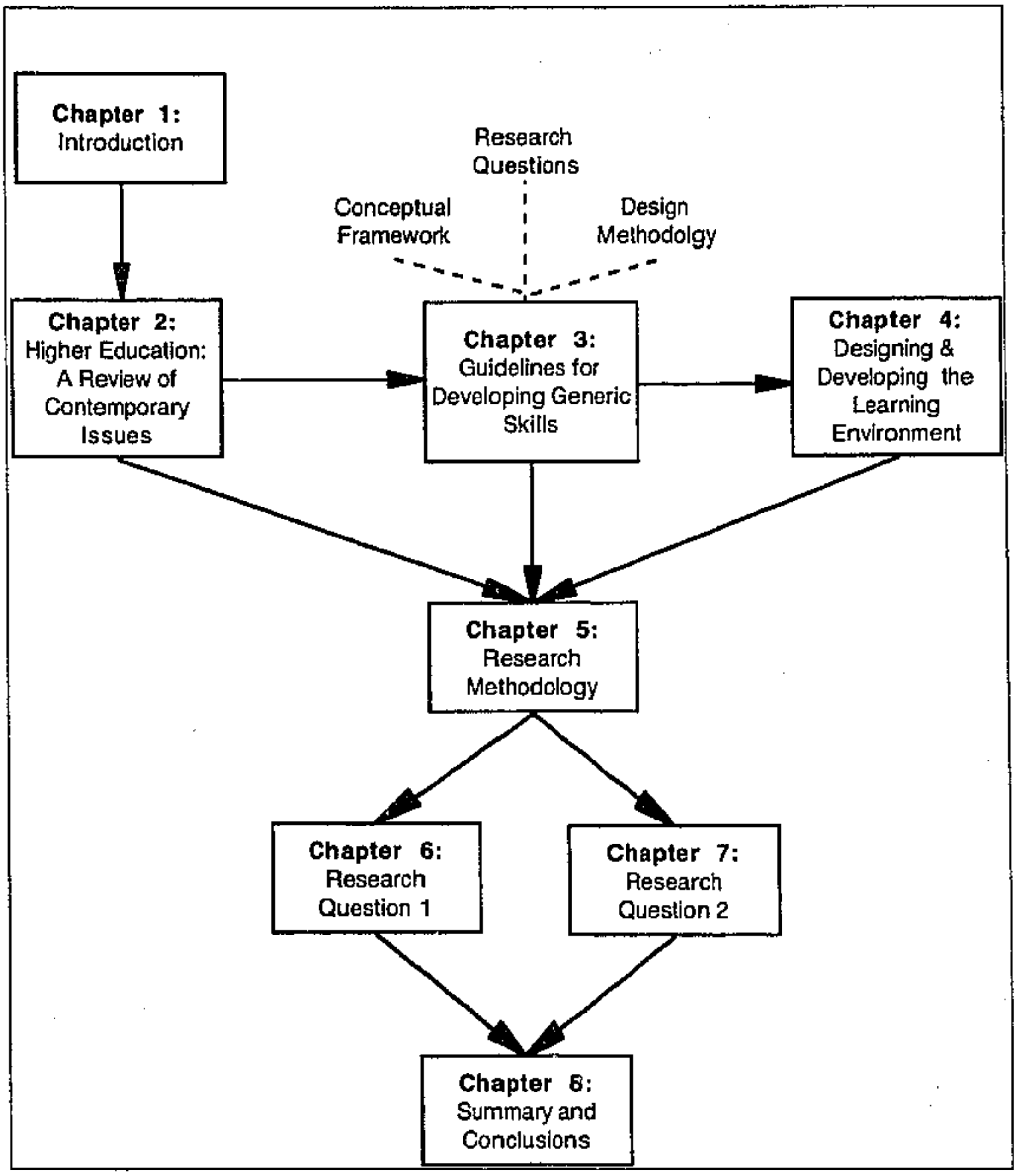


Figure 1.2: Structure of thesis

Chapter 2

Higher Education: A Review of Contemporary Issues

In order to develop a framework to investigate generic skill development, this proposal explored three broad areas (Figure 2.1). Firstly, a review of how generic skills are defined and their perceived importance by employers, higher education institutions and the general community are considered. A review of how on-line delivery systems can be used to enhance the effectiveness of student learning then follows. Finally, contemporary teaching and learning practices in higher education institutions are reviewed in an attempt to determine a pattern of consistent learning strategies recommended for developing generic skills and deep approaches to learning. As shown in Figure 2.1 these three areas of review were not clearly distinguishable as discrete items and in many cases there was evidence of commonality between them.

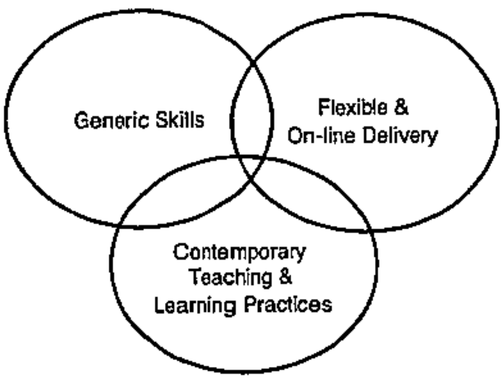


Figure 2.1: Literature review components

A review of the literature was performed with a view of developing common and complementary elements from each area to help propose a conceptual model, which would facilitate the design and development of a learning environment to promote the development of students' generic skills without having to "teach" generic skills within separate modules. The aim is to help teachers include strategies for generic skill development within the unit's learning activities through the use of effective learning principles.

2.1 Generic Skills

This section firstly gives a brief historical overview of generic skill development in Europe, Great Britain, the United States and Australia, making comparisons between how these skills developed in these different countries. This is followed by:

- Definitions given to generic skills, including various lists of desired skills;
- A representative sample of generic skills being promoted by some Australian universities;
- An overview of opinions from business and industry representatives about which skills are necessary; and
- A synthesis of these skills.

Historical Overview

This section considers the issues surrounding the generic skills debate that are current in higher education institutions, giving a brief synopsis of the events that have promoted changes in the "skills agenda" in Australia, the United States and in Europe/Great Britain. Since the late 1980s there have been massive reforms in higher education institutions in these countries led by employer dissatisfaction with graduate skills. Many research reports and reforms have been promoted to try and address this issue, and improve the quality of students' generic skills.

These changes have been fuelled by growing employer demands for generic skills that are running in parallel for improved workplace performance and productivity (ACNielsen Research Services, 2000; Robinson, 2000). To a large degree many employers in Australia now consider generic skills and workplace productivity to be analogous, and report that graduates often lack skills such as decision making, problem solving, creativity, written and oral communication, and interpersonal skills (Allen Group, 2000; Moy, 1999). In the United States a survey of employers showed a wide range of perceived benefits for graduates who had enhanced generic skills. These included an increased quality of work, better team performance, improved capacity to deal with change in the workplace, improved capacity to use new technology, and increased profitability (Conference Board, 1999). Also, in the United Kingdom, a survey of employers also showed that generic skills such as communication, problem solving and technology skills are highly valued by employers (Penn, 1999).

The following section gives an overview of how Australia, the United States and Great Britain have embraced the promotion and development of generic skills during the 1980s and 1990s. Each country was driven by similar concerns with the implications of workplace change and the consequent need to ensure the supply of generic skills needed by employers in a changing environment to help enhance productivity.

Australia

In the mid-1980s Australia experienced high levels of unemployment, inflation and a long-term decline in its terms of trade. This promoted widespread changes to be implemented linking education with national economic growth (Dawkins, 1988). The aim was to increase efficiency and effectiveness of the education system by having fewer and larger institutions, which saw a reduction of 47 Colleges of Advanced Education and 19 universities consolidated into 36 universities (Meek & Wood, 1998). This rapid period of change and expansion was followed by a push for quality assurance in higher education institutions (Higher Education Council, 1992) and ran in parallel with the push for competency-based education.

In 1991 the concept of key competencies was introduced into Australian education policy. The Finn Committee (1991) concluded that all young people needed to learn a range of employment related "Key Competencies" in their preparation for employment, regardless of their educational discipline. These included communication skills, mathematical competencies, scientific and technological understanding, cultural understanding, problem solving, and personal/interpersonal characteristics.

In response to this report, a committee was established, which presented a strategy for meeting Australia's training needs to 2001. This included recommendations for a competency-based Vocational Certificate Training System and flexible delivery strategy based on employment-related key competencies (Carmichael L. (Chair), 1992). This led to the development of a "standards framework" to allow consistent assessment and reporting of young people's achievements in each key competency to help provide clearer linkages between education, training and employment. Much of this was driven by the Federal Labour Government's resolve to improve Australia's economic problems through embracing the rhetoric of the 'clever country' (Australian Vice-Chancellors Committee, 1991). The need to further develop these employment related key competencies was taken up by the Mayer Committee (1992). In its report, it further clarified the required key competencies and provided a consistent approach for assessing and reporting achievement.

In 1992 the Prime Minister announced the agreement by heads of Government to establish a new authority to advise State/Territory and Commonwealth Ministers on appropriate policies and mechanisms to move towards a more national focus for vocational education and training. The Federal Parliament, under the ANTA Act 1992 established the Australian National Training Authority (ANTA). ANTA is overseen by an industry-based board and is charged with developing and implementing a national vocational education and training system with agreed goals and priorities:

- Close interaction between industry and vocational education and training providers;
- An effective training market;

- An efficient and productive network of publicly funded providers;
- Increased opportunities and improved outcomes; and
- Improved cross-sectoral links between schools, higher education and vocational education and training.

These developments caused concern in some higher education institutions. To what extent would universities have to modify their aims to serve the needs of governments bodies such as ANTA? Some academics were of the opinion that "the pursuit of general transferable core/key skills is a wasteful chimera-hunt and should now be abandoned" (Hyland & Johnson, 1998).

However, the demand for generic skills and quality undergraduate education has steadily gained momentum in Australia (ACNielsen Research Services, 2000). There is now a more pronounced emphasis on the higher education-employment nexus, particularly on the skills or competencies that can be transferred from the university setting to the workplace.

The United States

In the 1980s, the American Society for Training and Development, and the Department of Labour became concerned about graduate skill requirements created by changing work practices and new technologies and commissioned two large studies (American Society for Training and Development, 1988) that took three years to complete. On the basis of these studies sixteen key skills were identified under the broad headings of: learning to learn, academic basics, communication, adaptability, personal development, group effectiveness and influencing skills (Carnevale, Gainer, & Meltzer, 1991).

The above studies influenced the approach taken by the Secretary's Commission on Achieving Necessary Skills (SCANS) to help identify essential workplace competencies (Secretary's Commission on Achieving Necessary Skills, 1992). The report promoted that the key competencies outlined were essential for effective participation in the emerging patterns of work and work organization. These included both workplace competencies and foundation skills.

Workplace competencies that effective workers can productively use:

- Resources—they know how to allocate time, money, materials, space and staff;
- Interpersonal skills—they can work in teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds;
- Information—they can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information;
- Systems—they understand social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems; and

- Technology—they can select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.

Foundation skills that competent workers in the high-performance workplace need:

- Basic skills—reading, writing, arithmetic and mathematics, speaking and listening;
- Thinking skills—the ability to learn, to reason, to think creatively, to make decisions and to solve problems;
- Personal qualities—individual responsibility, self-esteem and self-management; and
- Sociability, and integrity.

The approach adopted by the United States included two broad categories of skills: workplace competencies and foundation skills. This has a slightly different focus to the approach adopted in Australia (Mayer, 1992) where the focus is more on performance and outcomes, and aspects such as personal attributes do not have a high priority.

Great Britain and Europe

In Great Britain, the generic skill debate came to prominence in the mid-1980s with employers demanding a better quality of professional skills from graduates. This gained support from the University Grants Commission and National Advisory Body for public sector higher education who also perceived a weakness in these skills (Bradshaw, 1985; Brennan & McGeevor, 1987). A growing body of research and opinion was forming that suggested industry and commerce needed "versatile and adaptable graduates" (Council for Industry and Higher Education, 1987) if it was to remain competitive into the next century. There was a growing trend in which universities had to justify their existence on the grounds of potential contribution to the economic development of the country (Marchello, 1987).

An indication of industry expectations shows that employers are interested in two requirements from graduates: subject-specific knowledge and skills, and transferable knowledge, skills and attitudes (Leckey & McGuigan, 1997). Though results from employer surveys indicate that while most graduates were strong on the provision of relevant multidisciplinary knowledge, they were not so effective with work based competencies needed on the job (Harvey, 1993). There appeared to be a mismatch between what employers wanted and what educational institutions were providing.

The British government under the leadership of Margaret Thatcher made this a priority issue and consistently pursued enterprise culture by launching the Department of Enterprise in Higher Education (EHE) in 1987 with the following objectives:

- Undergraduates will develop key competencies relevant to the concept of enterprise in their particular course of study;

- Higher education institutions will modify their teaching, learning and assessment methods and style to ensure the effective delivery of the key competencies; and
- Employers will have an increased involvement in the learning process and provide resources on a partnership basis.

Under this initiative, higher education institutions received five years of funding to attempt to develop more enterprising graduates by focusing on improving transferable skills and giving them more work experience.

A related concern during the 1990s was how individuals could maintain their employability throughout their working lives in a world of exponential change where skills were changing and becoming rapidly obsolete (Kearns, 2001). This brings into focus key personal attributes and generic skills that are relevant for maintaining employability and defined as, "The possession by an individual of the qualities and competencies required to meet the changing needs of employers and customers and thereby help to realise his or her aspirations and potential in work" (Confederation of British Industry, 1998, p.3).

These employability skills were defined as:

- Values and attitudes compatible with work—including a desire to learn, to apply that learning, to adapt and to take advantage of change;
- Basic skills (literacy and numeracy);
- Key skills (communication, application of number, information technology, improving one's own learning and performance, working with others, problem solving) sufficient for the needs of the work;
- Other generic skills that are becoming increasingly 'key'—such as modern language and customer service skills;
- Up-to-date and relevant knowledge and understanding;
- Up-to-date, job-specific skills; and
- The ability to manage one's own career.

After an enquiry lasting three years, the British National Skills Task Force reported in 2000, that there was an increased demand from employers for generic skills as the nature of employment had changed (National Skills Task Force, 2000). Also, the United Nations Secretariat developed a new competency model designed to build the organization's human resources capacity for the future. UN Secretary General Kofi Annan said that the quality of people was the key to success and went on to say that, "Competencies could provide the glue to link human resources systems together in an integrated way. Clearly, the value of a competency model will come from its application and integration into other aspects of HR management." (Adult Resources Service, 2000, p.2).

A new competency model developed for the United Nations adopts a broader approach, similar to the United States framework developed in the SCANS project. This model includes core competencies, core values and managerial competencies (Table 2.1).

Table 2.1: United Nations competency model (Adult Resources Service, 2000)

Core Competencies	Core Values	Managerial Competencies
• Communication	• Integrity	• Leadership
• Teamwork	• Professionalism	• Vision
• Planning and organizing	• Respect for diversity	• Empowering others
• Accountability		• Building trust
• Creativity		• Managing performance
• Client orientation		• Judgment/decision-making
• Commitment to continuous learning		
• Technological awareness		

Across Europe the issue of developing graduates' generic skills is taking a more urgent focus. The growing realisation that graduates require a range of professional skills, and that must accept personal responsibility for maintaining employability has stimulated much interest in the development of generic skills and competence (Kearns, 2001). This realisation has led the Organization for Economic Co-operation and Development (OECD) to embark on a four-year program directed at establishing required competencies and strategies for implementation. The program - Definition and Selection of Competencies (DeSeCe) is being coordinated by the Swiss Federal Statistical Office and will conclude in 2002 when a final report will be released with its recommendations (Organization for Economic Co-operation and Development, 2000).

Comparing Different Countries

A comparison of approaches toward generic skill development taken by these different countries shows some interesting differences. In both Australia and Great Britain a similar approach was adopted during the 1990s towards developing national competency standards. As opposed to the United States, these countries took a broad approach to skill development and largely omitted human factors, cognitive processes and motivational factors needed for the acquisition of these skills (Kearns, 2001). A review of the recommendations made in Australia by the Mayer Committee (1992) shows that the following were precluded: values and attitudes, personal attributes connected to a theory of human development, cultural understanding, a range of foundation skills, and learning to learn skills. Many of these discrepancies have now been recognised in Europe and Australia and recommendations are being made for their implementation (Candy et al., 1994; Kearns, 2001; Organization for Economic Co-operation and Development, 2000).

A model proposed by Kearns (2001) that considers developments in each of these countries illustrates clusters of generic skills needed in the 21st century (Figure 2.2). The model is based on international research that suggests the need for all graduates to develop skills relevant to the new knowledge-based economy. These include a focus on skills in autonomy, self-direction and personal mastery in a world of growing complexity, uncertainty and rapid change in which individuals must become more responsible for their own lifelong learning and maintaining employability. This model is more aligned to the United States SCANS framework that includes values, foundation skills and a commitment to life long learning.

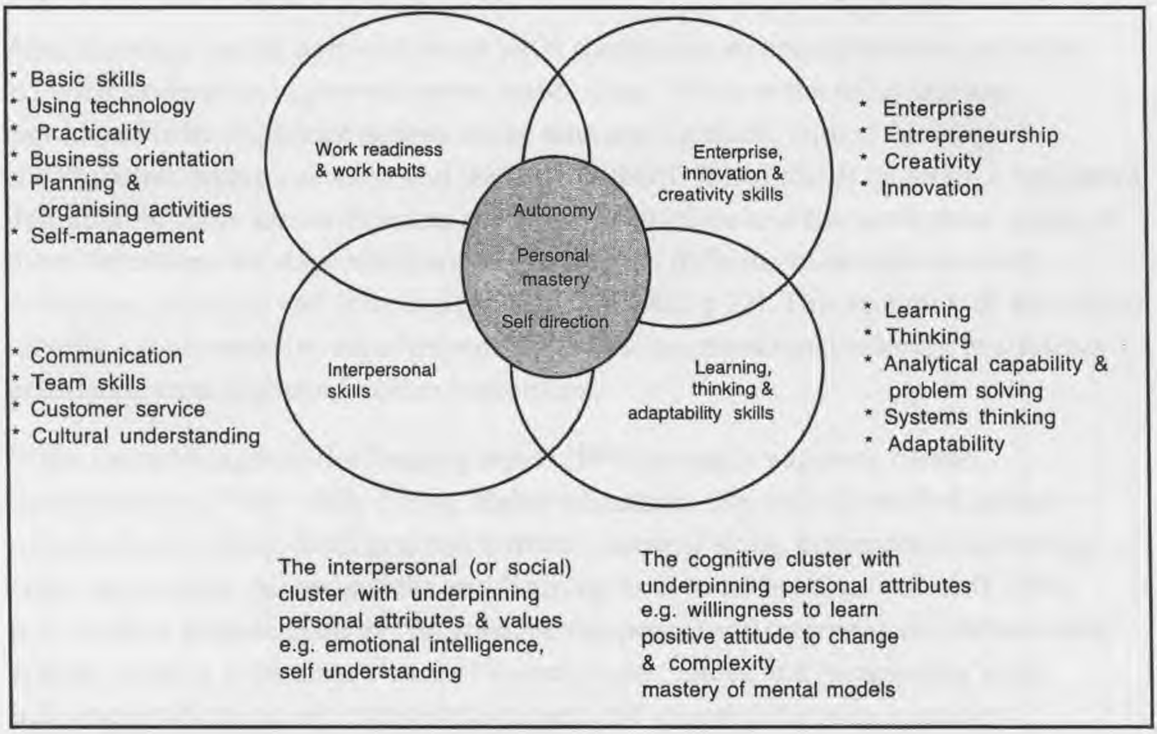


Figure 2.2: Clusters of key generic skills (Kearns, 2001)

The next section considers different definitions given to generic skills, as well as what constitutes an appropriate set of generic skills for students graduating from higher education institutions.

Defining Generic Skills

As higher education institutions struggle to implement strategies and courses to promote the development of generic skills across different courses, they must firstly define what the term *generic skills* actually means. It currently has several synonyms including key skills, core skills, life skills, competencies, work related skills, employment skills, transferable skills, personal skills and others. These terms usually refer to "skills that are common to more than one work site, more than one occupation or more than one field of knowledge" (National Board of Employment Education and Training, 1996, p. 17).

Also, there are varied opinions about what constitutes an appropriate set of generic skills for students in higher education institutions. Which of the following are considered to be important generic skills: time management, critical thinking, collaboration, communication and learning to learn? It is difficult to obtain a consistent definition of these across different academic institutions and the workplace. Many of these definitions are dependent on time and place, differing in accordance with disciplines, purpose and interests (Marginson, 1993, p.22). This section will attempt to identify a representative set of generic skills that are considered relevant to students graduating from higher education institutions.

In the United Kingdom the Dearing report (1997) strongly supports further development of "key" skills during higher education. Key skills identified include - communication skills (both oral and written), numeric skills, information technology skills, team skills, personal skills and learning how to learn. Also, Ashcroft (1994, p.37) defines generic skills as "personal development and interpersonal skills which enable students to become aware of assumptions, values and perspective's that influence students as self motivated learners and cooperative team members."

Two reports commissioned by the Australian government identified a range of key generic skills considered fundamental to performing tasks in a wide range of occupations and needed by graduates from higher education institutions (Finn, 1991; Mayer, 1992). A high correlation was found in what were considered to be essential generic skills needed by higher education graduates (Table 2.2). Being able to work in teams, communicating clearly, personal and interpersonal skills, problem solving, understanding technology and using mathematical concepts efficiently were all rated as important skills by employers as needed for the workplace.

Table 2.2: A Comparison of Required Generic Skills

(Finn, 1991)	(Mayer, 1992)
• Personal and Interpersonal skills which include personal management and planning including career planning, negotiating and team skills, initiative and leadership, adaptability to change, self-esteem and ethics	• Working with others in teams to set common goals, decide on allocation of task, monitor achievement of goals and check quality of the final product • Planning, organising activities and self-management includes the capacity to complete a task with some degree of independence, monitoring one's own performance and ensuring effective communication, reporting and recording of processes and outcomes
• Language and communication, which includes speaking, listening, reading, writing and accessing/using information	• Expressing ideas and information by using a variety of communication forms such as oral, written and graphic, to communicate ideas and information effectively to others
• Problem solving which includes analysis, critical thinking, decision making, creative thinking and transfer to new concepts	• Solving problems by identifying and framing the nature of problems and devising suitable strategies of response
• Scientific and technological understanding of concepts and understanding the impact on society	• Using technology, systems and equipment with the capacity to transfer to new situations
• Mathematics which includes computation, measurement and understanding symbols	• Using mathematical ideas and techniques to complete tasks in a wide range of contexts
• Cultural understanding of Australia's historical, geographical and political context. Also, major global issues such competing environmental, technological and social priorities, as well as understanding the world of work, its importance and requirements	• Collecting, analysing and organising ideas and information for a range of practical purposes

Self and peer assessment skills are also widely promoted as being necessary for graduating students. Higher education should support students to become reflective practitioners who are able to critically reflect on their own performance (Falchikov & Boud, 1989; Kwang & Leung, 1996; Schon, 1983; Wilson & Johnson, 2000). To help develop these skills, students must be able to reflect on their own behaviour and evaluate its effectiveness (Sluijsmans, Dochy, & Moerkerke, 1999). Research shows there is a link between self-assessment, and the adoption of a deep approaches to learning (Boud, 1988; Ramsden, 1992; Whitaker, 1995).

The introduction of self-assessment skills in higher education institutions provides students with opportunities to take increased responsibilities for their own learning. Essentially, self-assessment is a two-part process: the setting and negotiation of criteria and standards by which judgements will be made and the use of those standards in making, justifying and explaining judgements. Students are encouraged to think about what constitutes quality in relation to different content material and contexts. They can then begin to identify 'gaps' in their learning and take steps to 'fill the gaps' which enables them to develop their evaluative and critical skills. This is also supported by Boud (1992), who has expressed the defining characteristics of self-assessment as, "The involvement of students in identifying standards and/or criteria to apply to their work and making judgements about the extent to which they have met these criteria" (p. 5).

Peer assessment is another alternative form of assessment that requires individuals to decide on what value each of their colleagues has contributed to a process or project. Topping (1998) is more specific with his definition, "Peer assessment can be defined as an arrangement in which individuals consider the amount, level, value, worth, quality, or successfulness of the products or outcomes of learning of others of similar status" (p. 249).

This approach is also supported by Falchikov (1995) who defines peer assessment as a process in which individuals rate their peers by agreeing on appropriate assessment criteria and then apply the assessment. Many other research reports have elaborated on the importance of peer assessment and the processes needed to help develop these skills. Ford (1997), Sluijsmans (1999), Topping (2000), and Woolhouse (1999) all support these views and promote the development of related skills such as being able to identify valid assessment criteria and accurately judging the success or failure of their efforts as essential skills needed by all graduates.

Australian Universities

The Department of Education, Training and Youth Affairs (DETYA) has funded the Australian Council for Educational Research (1999) to develop a Graduate Skills Assessment instrument (GSA). All first year students will be required to take a skills test at entry level, and then again in their final year of study at exit level. The format of the GSA is two hours of multiple-choice items and one-hour of writing tasks. In a survey of Australian universities, the ACER found the following to be the skills most valued:

- Communication/Structured Writing
- Problem Solving/Applied Reasoning
- A Body of Knowledge
- Interpersonal Skills/Teamwork
- Critical Thinking
- Ethics/Citizenship/Social Responsibility
- Commitment to and Capacity for Lifelong Learning
- IT familiarity/Use of Technology/Information Literacy/ Information Management

The GSA test will enable universities to compare the variance in students' generic skills over their course of study. How, and if universities will be assessed on students' generic skills development is still unknown but the subject of hot political debate. This testing shows the seriousness by which the government views generic skill development, which in turn has forced Australian universities to also take this issue seriously, as demonstrated by the discussion that follows. A few universities have been selected to illustrate how they have moved forward.

The University of Wollongong (n.d.) suggests that the graduate attributes of a Wollongong graduate are the touchstone against which the University's academic programs are compared and against which, ultimately, the University's effectiveness can be measured. Graduate attributes include:

- A commitment to continued and independent learning, intellectual development, critical analysis and creativity;
- Coherent and extensive knowledge in a discipline, appropriate ethical standards and, where appropriate, defined professional skills;
- Self confidence combined with oral and written skills of a high level;
- A capacity for, and understanding of teamwork;
- An ability to logically analyse issues, consider different options and viewpoints, and implement decisions;
- An appreciation and valuing of cultural and intellectual diversity and ability to function in a multicultural or global environment;
- A basic understanding of information literacy and specific skills in acquiring, organising and presenting information, particularly through computer based activity;
- A desire to continually seek improved solutions and to initiate, and participate in, organization and social change; and
- An acknowledgment and acceptance of individual responsibilities and obligations and of the assertion of the rights of the individual and the community.

Murdoch University (n.d.) has adopted a set of seven graduate attributes for its graduates through the national drive to develop these skills for all graduates, "Murdoch's commitment to these attributes reflects an Australia-wide movement for all universities firstly, to define their graduate attributes and show how they are integrated into teaching and secondly to develop these attributes in students during their undergraduate degree". Attributes considered essential for all graduates include:

- Communication - to demonstrate oral, aural, and writing skills of a high level, including the ability to use electronic media and computers for report writing and presentations;
- Analysis and Problem Solving - ability to think clearly, critically and creatively when solving problems to fuse experience, reason and training into considered judgement;

- Social Justice - an acknowledgment of and respect for equality of opportunity, social justice and social responsibility of the individual and the community, in the light of awareness of one's own values and the values of others and the differences that exist;
- Global Perspectives - ability to understand and respect the social, biological, cultural and economic interdependence of global life;
- Social Interaction - a capacity for and understanding of teamwork, including the demands of tolerance and mutual respect for others, resolving conflict and the negotiation of outcomes;
- In-depth Professional Knowledge - use and maintain knowledge about a discipline, in terms of theoretical, conceptual and methodical elements, striving continually and independently to secure further knowledge and understanding with appropriate ethical standards, and where appropriate, defined professional skills; and
- Interdisciplinary - to be aware of the interconnectedness of human knowledge and acquire knowledge and understanding of fields of study beyond a single discipline.

The University of South Australia (n.d.) has adopted as institutional policy a statement of seven graduate qualities as the outcomes it seeks for its graduates, and has expressed a commitment to develop these through a range of educational programs. The following list of seven qualities was agreed to as being appropriate to the University's distinct mission and profile. Graduates are required to:

- Operate effectively with and upon a body of knowledge of sufficient depth to begin professional practice;
- Be prepared for life-long learning in pursuit of personal development and excellence in professional practice;
- Be effective problem solver, capable of applying logical, critical, and creative thinking to a range of problems;
- Work both autonomously and collaboratively as a professional
- Be committed to ethical action and social responsibility as a professional and citizen;
- Communicate effectively in professional practice and as a member of the community; and
- Demonstrate international perspectives as a professional and as a citizen.

Curtin University Business School (1999) set up a task force to identify and define professional skills needed by graduates. The list included:

- Communication – written and oral;

- Computer literacy;
- Information literacy;
- Team-working – listening, teamwork, participation, networking, negotiating, time management and project management;
- Decision making - problem solving, critical thinking and analytical thinking;
- Numeracy;
- Leadership;
- Cross-cultural and ethical awareness; and
- Independent Learning and Reflective thinking.

Many other diverse lists of graduate attributes exist across different universities in Australia, as can be seen at Griffith University, University of Canberra University of Sydney, University of New England and the University of Queensland.

The practice in Australian universities has been to develop attributes specific to the institution, rather than adopting a common set of skills across all higher education institutions in Australia. The extent to which universities are able to stimulate the development of these attributes in concert with subject knowledge, is rapidly becoming a measure of their success, it is often stated as key mission statement. This is becoming a quality benchmark of Australian universities, and highlights the importance of graduate attributes and the need to integrate them within course units (ACNielsen Research Services, 2000).

Industry Requirements

The three most desired characteristics of university graduates by business and industry in Australia were found to be communication skills, capacity to learn new skills and procedures, and capacity for cooperation and teamwork (Marginson, 1993). This was in consensus with a research study conducted by the Australian Council for Educational Research (1999), which found that the most frequently mentioned and desired generic skills by employers include: communication, problem solving, critical thinking, interpersonal skills, ethics, life long learning and information and technology literacy. This is supported by the Coates study (1995, p.18), which reports that generic skills required by higher education graduates should include the following:

- The ability to read, do mathematics, and write at the level expected of the eleventh or twelfth-grade student of 1950;
- Communications skills which are essential in an information society and involves both listening and speaking;
- The ability to learn;

- Creativity – the ability to think outside of the box;
- Interpersonal skills – teamwork; and
- A positive, healthy and enthusiastic attitude toward work.

A report published by the Higher Education Council (1992) on "Achieving Quality" in higher education was severely criticised by Clanchy and Ballard (1995) for the vague and inconsistent fashion in which the report defined generic skills. The definition included low-level technical competencies such as word-processing, computing skills, problem solving, critical thinking, ethical practice, tolerant behaviour, sympathy to cultural and racial differences. Clanchy and Ballard contend that this represents a "hodge-podge of broad motherhood claims" about ethics, values and culture which universities could not legitimately commit to deliver. They propose the following generic skills as being necessary for all university graduates, and should be developed in context of the specific discipline:

- Thinking, which though generic, takes a specific form for different disciplines eg analytical thinking (concepts), theoretical thinking (laws, models or theories), interpretive thinking (data, facts or events) or combinations of these for problem solving, decision making, etc;
- Research skills, which are varied across disciplines such as library research, experimental work, fieldwork, computer modelling or different qualitative research methods. These must be developed in situ; and
- Communication skills, which are discipline/content based, must include ideas and information relevant to that subject of discourse. Oral skills can be general across disciplines e.g., eye contact, pacing of presentation, voice clarity, reiteration of key themes, etc.

A wider set of required generic skills was identified through the results of a survey of 350 firms undertaken for the Australian Industry Group (Allen Group, 2000). The survey revealed that in addition to the Mayer key competencies, the following generic skills were also identified as being required by industry:

- Basic skills – literacy and numeracy;
- Understanding of system relationships;
- Customer focus; and
- Personal attributes including a capacity to learn, willingness to embrace change, practicality and a business orientation.

An interim report was produced by AC Nielsen Research Services (1998) to the Department of Employment, Education, Training and Youth Affairs concerning the satisfaction of employers with new graduates. Their research showed, that besides wanting academic achievement, employers rated the following skills as being important for new graduates:

- Literacy, numeracy and computer skills;
- Time management;
- Communication – oral and written;
- Inter-personal skills;
- Teamwork skills;
- Problem solving skills; and
- Comprehension of business practice.

Summary

As can be seen from the above review, there is no firm consensus in the literature on the identification of essential generic skills needed by graduates in higher education, which makes it difficult to create a prescriptive set of generic skills for all courses across different universities. Different employers, higher education institutions, departments and lecturers all have different requirements and viewpoints about what generic skills are, which ones are required and how they should be taught. However, based on the above literature review a list of general generic skills is shown in Table 2.3 that many authors considered essential for higher education graduates. These are in no way prescriptive, and are largely dependent on context, as each institution has a range of unique characteristics that affects how they view and define generic skills based on (Fallows & Steven, 2000):

- The nature of the student population i.e. school leavers or mature age students;
- The management and organisational arrangements;
- Diversity of courses offered;
- Financial status of the institution;
- Location of the institution; and
- Particular national priorities.

Table 2.3. A range of generic skills promoted through higher education reports

Skill	Description	Authors
Collaborating	• Showing patience, empathy, honesty and sensitivity to others in a team situation • Adapting to the needs of others and supporting them when necessary • Respecting the views and values of others	• AC Nielsen Research Services (1998) • Coates (1995) • Dearing (1997) • Finn (1991) • Marginson (1993) • Mayer (1992)
Communicating	• Expressing ideas and information in a clear and easy way to understand through oral, written and graphical means • Giving clear instructions and asking the right questions • Listening actively and with purpose	• AC Nielsen Research Services (1998) • Coates (1995) • Clanchy and Ballard(1995) • Dearing (1997) • Finn (1991) • Marginson (1993) • Mayer (1992)
Problem Solving	• Using problem solving techniques to resolve conflicting project needs which satisfy all parties	• AC Nielsen Research Services (1998) • Clanchy and Ballard(1995) • Dearing (1997) • Finn (1991) • Marginson (1993) • Mayer (1992)
Learning to learn	• Using own initiative to determine how best to complete tasks • Deciding on what is needed to be learnt without being prompted by others • Developing learning strategies to learn new material	• Peters (1996) • Marginson (1993) • Coates (1995) • Clanchy and Ballard(1995) • Dearing (1997)
Using research skills	• Using new technologies such as on-line databases and the Web, textbook, readers, library and other sources to locate relevant information in an efficient manner	• Mayer (1992) • Dearing (1997), • Coates (1995)
Analysing and synthesising information	• Analysing and synthesising information in a critical fashion, and then using it appropriately	• Mayer (1992) • Dearing (1997) • Coates (1995)
Self-assessing	• Assessing own progress in completing tasks relevant to self • Assessing own progress in completing tasks relevant to the teams objectives in terms of time, quality and task completion	• Boud (1992) • Falchikov (1989) • Kwang (1996) • Schon (1983) • Sluijsmans (1999) • Whitaker (1995) • Wilson (2000)

Skill	Description	Authors
Peer-assessing	• Assessing other team members contributions in terms of time, quality and task completion	• Falchikov (1995) • Ford (1997) • Sluijsmans (1999) • Topping (1998) • Topping (2000) • Woolhouse (1999)

The discussion above proposes a list of eight generic skills needed for students in higher education. The demand for these has resulted from employer demands, students and pressure from higher education funding authorities. This has caused many universities to develop detailed mission statements promoting a strong focus on generic skill development. For example, "To produce graduates who are noted for their academic qualities and employment-related skills" (Murdoch University, 1998).

The challenge for universities is now to implement appropriate teaching and learning strategies for skill development across all faculties in an integrated fashion. However, the question remains as to how these generic skills should be structured into a learning environment that facilitates their ongoing development through training, education and workplace experience.

The next two sections consider flexible delivery strategies, and contemporary teaching and learning practices focused on promoting generic skill development through flexible and contemporary teaching and learning strategies.

2.2 Flexible Delivery and New Learning Technologies

Higher education institutions are increasingly using new learning technologies and flexible delivery learning strategies to cater for the needs of both internal and external students. On-line delivery is also seen as a means of becoming more competitive and improving the quality of student learning. Many students are now expected to be "Web literate" as part of the course requirements. Accessing course materials on-line and using listserv, bulletin boards and e-mail are becoming almost standard practices across all courses in higher education institutions. As this becomes a more common means of course delivery, strategies for the development of generic skills within this medium must be considered. The role of on-line technologies in building a capacity for developing generic skills and life long learning has been examined in a number of recent reports and is being built into many educational reform strategies around the world (Kearns & Papadopoulos, 2000).

The section considers a range of pedagogical viewpoints on how flexible delivery and new learning technologies can be implemented, as well as equity and access issues.

Pedagogical Viewpoints

Flexible learning, on-line learning, open learning, distance learning and external studies can all be perceived as meaning to learn outside the classroom. However, Biggs (1999) contends that flexible learning does not necessarily just mean off-campus teaching, in that it also provides an important answer for on-campus large class teaching. He proposes that flexible learning is a form of learning that actively includes learners, in a student-centred approach, which may or may not be outside the classroom or off-campus. In the Vocational Education and Training sector, a more strategic approach has been adopted by the government through a five-year framework for national collaboration in flexible and on-line delivery (ANTA Flexible Learning Team, 2001; Edna VET Advisory Group, 2001). Also the Department of Education Training and Youth Affairs (DETYA) is promoting the "Learning for the knowledge society" action plan with a view to develop "leaders and workers with the vision and skills to develop and manage new approaches to learning" (Department of Education Training and Youth Affairs, 2000, p. 4)

Increasingly, contemporary teaching and learning practices now include on-line facilitation for course delivery. Students are now expected to use email, listservs, bulletin boards and also access the World Wide Web for information and course materials. This trend is being encouraged by an increased push toward flexible delivery by higher education institutions and competition for local students from overseas institutions through on-line courses. The requirement to use on-line facilities is increasingly becoming a life skill itself. Candy, Crebert and O'Leary (1994) see technology accelerating and enhancing flexible learning systems, and conclude, "undergraduate programs, at a minimum, should familiarise graduates with such techniques that they are likely to encounter in their continuing learning" (p. 149).

As well as its increase in popularity, the literature abounds with research showing educational advantages in using on-line delivery to enhancing learning (Crook, 1994; Harasim, 1989; Hiltz, 1994; Johnson & Johnson, 1996; McAteer, Tolmie, Duffy, & Corbett, 1997). It allows students flexibility to access materials, communicate with tutors and peers and also to develop skills within a "safe" environment. Students can test different styles of communication, negotiation and conflict resolution strategies in a highly controlled and easily accessible environment, which may be anonymous.

Technology has great potential to improve the quality of student learning, especially in learning environments that support "real-world activity" (Laurillard, 1993, p.29). These can be supported through the use of computer simulations, microworlds and computer conferencing models which promote collaboration, feedback, student-student and student-tutor dialogue. With the greater availability of on-line collaborative tools now available, these activities can be implemented in on-line settings to promote student learning in a fashion which allows learners to revise and reconstruct ideas to make significant changes to the way they interpret the world and develop their understanding. Laurillard (1993) argues that the use of technology not only promotes learning, but also increases productivity and efficiency in higher education institutions, and increases students' information literacy as demanded from employers.

Nine essential characteristics needed for designing learning environments based on the principles of situated cognition and situated learning were identified by Herrington and Oliver (2000). Their study revealed that a technology based learning environment, based on nine critical characteristics informed by situated learning theory, "created an environment where students used higher-order thinking in collaborative groups to learn strategies of assessment in mathematics that they were able to transfer to teaching practice" (p. 329). Findings suggested that situated learning was a successful model for implementing interactive multimedia, and that multimedia materials are best designed and implemented socially and not as independent instruction for individual learners. These findings support the use of on-line collaborative tools to enhance the development of flexible learning environments.

Also, Oliver and Herrington (2000) described a problem based, on-line learning environment which incorporated these nine critical instructional characteristics within an on-line learning environment (Table 2.4). They argue that on-line delivery provides the means by which these elements can be combined into a learning environment that returns enhanced learning outcomes and encourages the development of generic skills such as collaboration, communication and reflection.

Table 2.4: Elements of situated learning supporting on-line activities and affordances (modified from Oliver & Herrington, 2000)

Learning Elements	Description	On-line System Features
Authentic contexts	Reflect the way knowledge and learning outcomes are used in real life settings	• Content presented in ways reflecting intended use • The problems give relevance and meaning to the coursework
Authentic activities	Must have real world relevance and reflect the complex and ill-structured nature of most real world problems	• Real-life problems are presented to learners • Problems require open-ended inquiry • The problems are non-structured learning activities
Expert performances	Learning through interactions with experts to provide modelling (language, experiences, etc.)	• Sample solutions are provided to guide learners in problem solving process • Access to Web sites of experts and experienced others add to the information sources
Multiple perspectives	Knowledge is gained from access to different perspectives (points of view) and representations of material to be learnt	• Access to multiple web sites for information • A variety of media sources eg. print, video • Groupings provide different perspectives • Best solutions present alternative perspectives
Collaboration	Much learning outside institutions takes place through group work	• Group-based activities encourage collaboration • The open-ended questions require group-based decision making
Reflection	Enables students to consider and deliberate on their learning and learning processes	• The open-ended questions require definition and description • Peer assessment necessitates reflective processes
Articulation	Create inherent opportunities for learners to explain their understandings and constructed meanings	• Group-based problem solving requires students to create solutions to open-ended problems • Summarised solutions necessitate articulation and explanation of learning
Coaching and Scaffolding	Providing support for learning	• Students are supported by other group members • Materials are available to model problem-solving process • E-mail access to tutors provides learner support
Authentic assessment	Assessment which enables students as in real life situations to assess their performance	• Assessment strategies assess the process of learning as well as the products • Peer-assessment ensures students become critical reviewers of others work

On-line learning environments can be created which help students develop deep and strategic learning abilities when applied to web-based settings (Gibbs, 1999). Through the use of coMentor, a virtual learning environment, Gibbs describes how Philosophy was taught to a group of students using on-line facilities for debating, discussion, group-work, resource sharing and vicarious learning. From the results of the study, it was evident that the on-line learning environment promoted learning by enabling students to see each other's work, from having to write down their ideas and by sharing their ideas with others. Students also developed learning methods that were beneficial to learning a theoretical subject matter. The coMentor learning environment is based on the following features:

- An individual work area, were students post their own ideas that they choose to share with selected others;
- A group work area, established by the tutor or the students, in which threaded discussions occur;
- A resource area in which documents such as previous years essays, exam answers, lecture summaries, notes to support group work, handouts and links to external sites of interest; and
- An open access bulletin board for any team member to access.

The coMentor on-line learning environment set up by Gibbs (1999) specifically set out to give students control over who they shared their work and ideas with, and also attempted to limit the call on tutor's time. The students overwhelmingly (94%) recommended that coMentor should be used with next year's students and the results seemed clear that, "not only did the students learn philosophy using coMentor, but they probably also learned how to learn philosophy" (p.230).

Using an on-line problem-solving environment, the focus of instruction can be moved from "dealing with content and information in abstract ways to using the information in ways which reflect how learners might use it in real-life" (Oliver & McLoughlin, 1999, p.8). Through the use of on-line problem solving software students engaged with course content by working in teams to solve ill-defined problems. The learning activities undertaken by the students included:

- Information seeking, where the students were required to find information relevant and helpful to the given problem;
- Critical thinking, which is needed to apply collected information to solve the problem;
- Collaboration, which is needed to share the workload with team members and consolidate the results;
- Problem solving, where the students use initiative to consider how best a solution can be expressed; and
- Peer assessment and reflection where students mark other teams solutions. Criteria used here include quality of arguments presented, level of research evident, quality of language and information presented and strength of argument and reasoning.

New on-line technology is creating opportunities for teachers to develop students' generic and subject specific skills, and that in a "circular fashion" the use of technology is becoming itself, an increasingly important generic skill, as discussed in the next section (Oliver & McLoughlin, 1999).

Equity and Access Issues – Technological Literacy

In the twenty first century, students increasingly are being required to become familiar with using technology as a means of collecting information, and also as a means of communicating, collaborating and value-adding to their jobs. Tinkler, Lepani and Mitchell (1996) propose that in a knowledge economy, where data and information are raw material, value adding will require higher order thinking skills not only to convert information to knowledge, but also to convert knowledge into insight, foresight, and ultimately wisdom. This view is supported by Candy, Crebert and O'Leary (1994) who also contend that access to and use of information technology is absolutely vital to lifelong learning and accordingly "no graduate – indeed no person – can be judged educated unless he or she is information literate" (p. xii).

One chief concern about the proliferation of technology has been the increasing "digital divide" between different socio-economic classes. Access to technology has been found to be strongly influenced by race, socio-economic status, location and other demographic aspects such as country areas and low income (National Telecommunications and Information Administration, 1999; Policy Action Team 15, 2000). In Australia, policy statements are now being implemented in an attempt to use technology as a means of providing access and equity to disadvantaged and minority groups. The use of new technologies is being targeted to widen equitable access to education and training opportunities:

Access to new information sources and technological literacy is directly relevant to the employability of individuals in the new knowledge-based economy. Equity strategies, including policies and programs that enable individuals, particularly disadvantaged groups, to access learning and training opportunities are needed to circumvent social problems as technology becomes more prevalent (Kearns & Papadopoulos, 2000).

As the uptake of technology increases, accessibility to the web by disadvantaged groups is becoming more critical. To help promote accessibility, The World Wide Web Consortium (2000) or W3C was created in October 1994 to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability. W3C has more than 500 Member organizations from around the world and has earned international recognition for its contributions to the growth and accessibility of the Web. One of its main goals is to make the Web accessible to all by "promoting technologies that take into account the vast differences in culture, education, ability, material resources, and physical limitations of users on all continents" (The World Wide Web Consortium, 2000).

The requirement to provide access to information and communication technology is well recognised to help balance socio-economic, culture and minority differences and inequities. The need to provide technological literacy to all graduates will become increasingly important as governments and employers continue to promote these skills requirement for employability.

Summary

As new learning technologies and flexible delivery continue to increase in popularity, higher education institutions are being forced to consider technology as an alternative means of enhancing instruction and developing generic skills. Being able to access on-line information and communication tools is increasingly becoming standard practice. Local and remote students are now required to access on-line course materials and be involved with collaborative activities through bulletin boards, emails and listservs with peers and tutors. Not only does on-line delivery provide an enhanced method of providing flexible learning, but it also holds promise to provide an enhanced learning environment which promotes the development of students' generic skills in communicating and accessing information.

In the twenty first century, higher education institutions are faced with many challenges. With increasing budget cuts and greater expectations for quality from both employers and students, universities are faced with becoming more cost effective in an increasingly competitive environment, as well as increasing the quality of courses. These factors are contributing to the uptake of new learning technologies and flexible delivery by higher education institutions all around the world. It holds promise to create learning environments that will satisfy many of these demands, with technological literacy being a required generic skill by graduating students in the information economy (Australian Information Economy Advisory Council, 1999). Based on these requirements, this study necessarily caters to the implementation of technology as part of the learning environment.

2.3 Contemporary Teaching and Learning Practices

With the pressure of employers and funding authorities demanding improvement in students' generic skills, higher education institutions are continually striving to find effective teaching and learning strategies to promote the development of these skills through effective learning environments. How can generic skills be effectively taught and remain in harmony with subject matter content, when often there is pressure within many disciplines to increase rather than decrease the amount of subject content being delivered?

This section considers the views of a number of authors who are leaders in their field, to help provide an understanding of critical elements required in learning environments that enhance the development of generic skills, without comprising the amount of content being delivered. The review will be framed by teaching and learning strategies that encourage skill development as well as deep approaches to learning, in which students take an active role in learning through sharing ideas with others based on process oriented strategies such as teamwork, problem solving and inquiry based learning. An overview of the literature on knowledge construction will be considered, followed by teaching and learning practices that promote deep learning and the development of generic skills.

Knowledge Construction

Constructivism is an educational philosophy that promotes learning as an active process of constructing rather than a process of acquiring knowledge, where teaching and learning practices support the construction of knowledge rather than just the simple communication of facts (Duffy & Cunningham, 1996). The belief is that knowledge is developed within each individual, based on their experience and understandings from and the world around them, rather than being transferred from the instructor to student as in traditional didactic teaching environments (Bruner, 1990; Driscoll, 1994; Jonassen, 1999; Savery & Duffy, 1995).

Another model of learning that views knowledge as continuously constructed is situated cognition (Brown, Collins, & Duguid, 1989). Rather than students trying to acquire knowledge as abstract, individual concepts, the emphasis is on acquiring knowledge through enculturation, that is, understanding how knowledge is used by a group of practitioners or members of a community. Brown, Collins and Duguid (1989) believe that knowledge is similar to a set of tools that is best acquired through use in an appropriate, contextual environment.

In its implementation, a constructivist-learning environment should be based around authentic settings and problems that provide a motivating environment for the students to learn (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990; Savery

& Duffy, 1995; Shank, Berman, & Macpherson, 1999). These problems should be open-ended and allow learners to engage with these authentic problems in which there is not one obvious correct answer. This environment should also allow for social negotiation so that students can compare and test their interpretations against peers and experts (Jonassen, 1999; Lave & Wenger, 1991; Vygotsky, 1978). Also, supports should be built into the environment to help students become successful learners through modelling and scaffolding, as well as providing regular opportunities for reflection (American Psychological Association, 1997; Jonassen, 1999; Schon, 1987).

Deep and Meaningful Approaches to Learning

The approach taken to learning by individual students is based on their intent, or what they want to achieve (Gibbs, 1992). Some will want just to repeat what the lecturer has told them, while others will want to develop their own perspective and synthesis of the subject. These two approaches to learning have been classified as *surface and deep*. Students take a surface approach when they reduce what they need to learn into a series of unconnected facts to be memorised for reproduction in a test or exam with the intent of getting the task out of the way. A deep approach to learning is taken by students who want to make sense of what is being learnt, which involves synthesising ideas and concepts between tasks with a view of understanding the underlying meaning (Biggs, 1999; Marton & Saljo, 1984; Ramsden, 1992).

"Student intent" compared against teaching method and level of engagement is illustrated in Figure 2.3 (Biggs, 1999). Three key factors influencing student learning are promoted:

- The students' level of engagement or intent to learn as a surface or deep learner, which ranges from memorising through to theorising;
- The degree of learning-related activity that a teaching method is likely to stimulate, which ranges from passive (lecture) through to active (problem-based learning); and
- The academic orientation of the students.

Two "types" of student are compared in Figure 2.3 (Susan and Robert) to demonstrate the effects of passive and active teaching (Biggs, 1999). Susan, is academically committed, interested in her studies and what she learns is important to her. Robert, has no ambition to excel, has a less developed background of relevant knowledge and basically wants just enough marks to pass and get a job. When passive approaches to teaching are used (point A), there is a large gap between the performances of the two different types of students. However, when active teaching methods are used (point B) the gap between Robert and Susan is not so wide, that is, Robert is now using some higher-order cognitive activities that Susan was using spontaneously.

It is proposed that there are limits to what certain students can achieve, and these are beyond the teacher's control, however good teaching narrows the gap, that is, "good teaching is getting most students to use higher cognitive level processes that the more academic students use spontaneously" (Biggs, 1999, p.4).

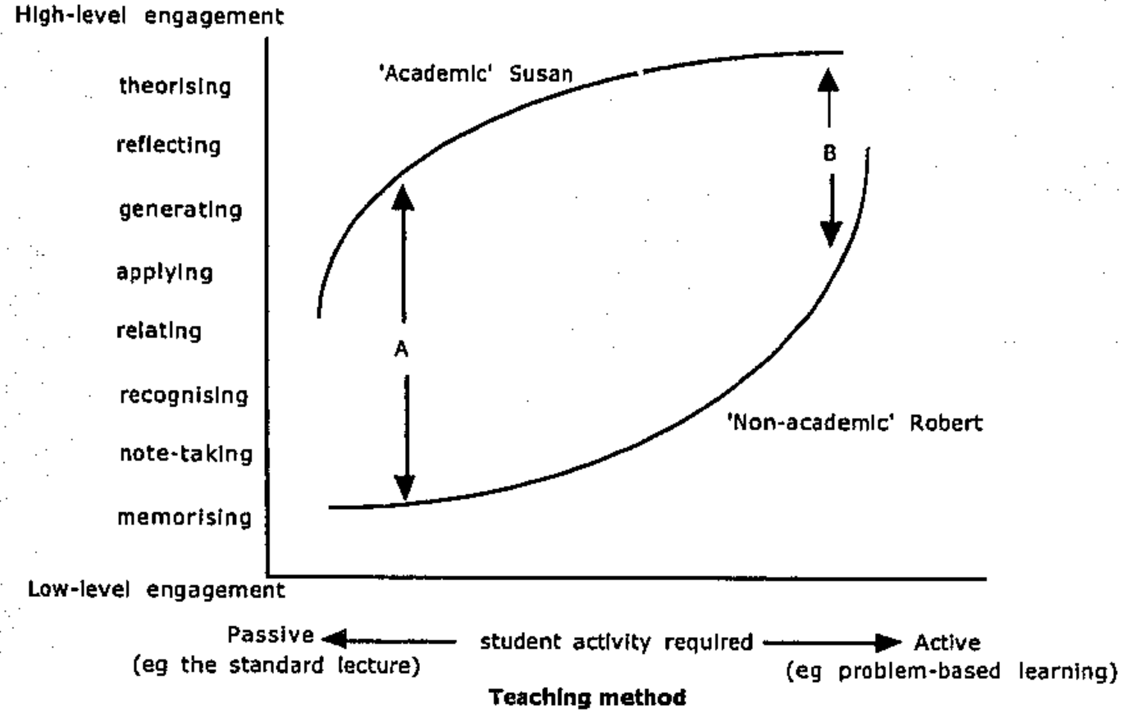


Figure 2.3: Student orientation, teaching method and level of engagement (Biggs, 1999)

Constructivism is an influential learning theory that focuses on the meaning created by the learner and the nature of the learning activities that have encouraged the student to learn (Biggs, 1999). In this context, the desired learning objectives should be expressed as verbs, which encourage students to use a deep approach to learning, that is, to *reflect, apply, hypothesise, relate to principles, explain, argue and comprehend ideas*. Verbs used in learning objectives that encourage surface approaches include *describe, enumerate, paraphrase, comprehend sentence, identify, name and memorise*. As well as the influence of learners' personal characteristics, the following learning strategies are promoted as being important (Biggs, 1999):

- A well structured knowledge base (i.e. sound knowledge and cognitive growth comes from interconnections, which is not just learning new material, but in the restructuring that occurs when new knowledge becomes connected with existing);
- An appropriate motivational context;
- Learner activity (i.e. the greater the student activity, the greater the efficiency of learning); and
- Interaction with others.

A range of issues contributes towards whether deep or surface approaches are adopted to learning, which includes the design of the learning environment, students' personal characteristics, teaching strategies and assessment methods (Dart, 1998). All these elements must "press for student understanding", that is, good teaching methods, assessment methods, openness to students, freedom in learning, vocational relevance and appropriate workload. These in combination with students' personal characteristics (intentions, perceived self-ability, previous experience, etc.) will affect the quality of learning and the development of transferable generic skills such as communication and problem solving.

A project funded by the Council for National Academic Awards (UK) provided support for eight courses to introduce innovations designed to improve the quality of student learning by fostering a deep approach to learning has been summarised by Gibbs (1992). Each innovative course attempted to promote deep approaches to learning, and develop generic skills, by having students make sense of what was being learnt, rather than just reducing what had to be learnt to a set of unconnected facts for memorisation. The following course characteristics were associated with surface approaches:

- A heavy workload;
- Relatively high class contact hours;
- An excessive amount of course material;
- A lack of opportunity to pursue subjects in depth;
- A lack of choice over subjects and a lack of choice over the method of study; and
- A threatening and anxiety provoking assessment system.

A number of teaching strategies are shown in Table 2.5 that foster deep approaches to learning (Gibbs, 1992). Reflection, learning by doing and experiential learning are all elements promoted as fostering a deep approach to learning, and needed for developing such generic skills teamwork, problem solving and personal development.

Table 2.5: Strategies for fostering a deep approach to learning (summarised from Gibbs, 1992)

Teaching Strategies	Learner Activities
Independent learning, to give students greater autonomy and control over the choice of subject matter, learning methods, pace of study and assessment of learning outcomes	• Learning contracts • Self and peer assessment • Project work • Negotiation of goals, learning methods and assessment
Personal development, promoting personal involvement and development (feelings) as well as intellect	• Group work
Problem-Based learning, learning through tackling relevant problems, which may not be solvable.	• Problem-based
Reflection, reflecting on how and what they are learning (process and content) and what the real demands of the course are	• Learning diaries • Reflective journals • Portfolios of work • Discussion of learning strategies
Independent group work, promoting interaction between students	• Group/project work • Peer tutoring • Problem based learning
Learning by doing, experiential learning to emphasise learner activity	• Games, simulations, role plays • Practical work, visits • Work experience
Developing learning skills, developing a sense of purpose, and awareness of task demands and flexibility in adapting to different demands	• Reflection
Project work, to go beyond the reproduction of information, and go to the application of knowledge.	• Project work

Deep and significant learning takes place for both students and teachers when considered reflection and dialogue is incorporated into the design of the learning environment (Whitaker, 1995). The process of experiential learning (Kolb, Rubin, & McIntyre, 1971) promotes a cycle of concrete experience, reflective observation, abstract conceptualisation and active experimentation. This process purports to enable student experiences to be assimilated into their framework of concepts and constructs by thinking about their behaviour and experiences, and then modifying their behaviour in the light of these realisations. The emphasis placed on authentic, reflective learning is commonly advocated in constructivist learning environments and promotes the development of generic skills such as collaboration and self-directed learning (Whitaker, 1995).

To achieve deep approaches to learning, the role of teachers must not be just to transmit knowledge, but also to help students take increased responsibility for their own learning (Boud, 1988). Courses that emphasise student independence and responsibility for decision making are needed to help students decide what they should be learning and how they should be learning it. Teachers should not be guiding every aspect of the learning process. He argues that the notion of autonomy as an approach to learning is that students must take significant responsibility for their own learning over and above teacher led instruction through learning contracts, group and project-centred approaches. Student activities that promote this autonomy are shown in Table 2.6. These learning activities also support the development of generic skills, as students are required to take responsibility for their own learning, and actively practice collaborating, managing tasks and locating appropriate learning resources. These process-oriented tasks, rather than content focused, all contribute in helping to develop students' generic skills.

Table 2.6: Learner activities that promote autonomy (summarised from Boud, 1988)

Learning Strategies	Learner Activities
Goal Setting	• Identifying learning needs • Planning learning activities
Self Regulation	• Finding resources needed for learning • Selecting learning projects • Creating 'problems' to tackle • Choosing where and when they will learn • Deciding when learning is complete • Opting to undertake additional non teacher-directed work, such as learning through independent (structured) learning materials • Determining criteria to apply to their work • Using teachers as guides and counsellors rather than instructors
Collaboration	• Working collaboratively with others
Reflection	• Reflecting on their learning processes • Engaging in self-assessment
Real Environments	• Learning outside the confines of the educational institution, for example in a work setting

Activities that focus on encouraging student understanding and promoting an intrinsic interest of the content should be the main focus of any learning environment trying to encourage deep approaches to learning (Ramsden, 1992). These environments include activities that encourage students to actively find knowledge, interpret results and test hypotheses. Surface approaches encourage students to complete task requirements and reproduce knowledge in order to please lecturers and pass examinations (Table 2.7). This distorts the task and results in knowledge being removed from reality, which results in students forgetting almost everything a few days later. This type of "surface" learning encourages students to focus on memorising unrelated tasks for examination purposes. These experiences are too general and out of context, and do little to encourage students to develop generic skills appropriate to their professional disciplines (Hicks, Reid, & George, 1999).

Table 2.7: Different approaches to learning (Ramsden, 1992, p. 46)

Deep Approach Intention to Understand. Student maintains structure of task	**Surface Approach** Intention only to complete task requirements. Student distorts structure of task
• Focus on 'what is signified' (eg. the author's argument, or the concepts applicable to solving a problem)	• Focus on 'the signs' (eg. the words and sentences of the text, or unthinkingly on the formula needed to solve the problem)
• Relate previous knowledge to new knowledge	• Focus on unrelated parts of the task
• Relate knowledge from different courses	• Memorise information for assessment
• Relate theoretical ideas to everyday experience	• Associate facts and concepts un-reflectively
• Relate and distinguish evidence and argument	• Fail to distinguish principles from examples
• Organise and structure content into a coherent whole	• Treat the task as an external imposition

Process, not content focused activities that are student-centred, collaborative and authentic are needed to help develop generic skills. Six key strategies for effective teaching in higher education as shown in Table 2.8. These strategies promote, "Active engagement, imaginative enquiry, and the finding of a suitable level and style are all much more likely to occur if teaching methods that necessitate student activity, problem solving, and cooperative learning are employed" (Ramsden, 1992, p.101)

As advocated by others, a focus on *process*, rather than *content* material is also the main focus of this delivery strategy.

Table 2.8: Six key principles of effective teaching in higher education (Summarised from Ramsden, 1992)

Teaching Strategies	Description
Interest and Explanation	• Stimulating student interest in the material being taught • Having the lecturer provide quality explanations • Demonstrating the lecturer's personal commitment to the subject
Concern and Respect for Students and Student Learning	• Respect and consideration toward students • Developing a climate of trust and teacher-student relationship
Appropriate Assessment and Feedback	• Giving appropriate assessment which does not focus on rote-learning or reproducing detail, but testing students understanding • Giving frequent and extensive feedback on assignments and other learning tasks
Clear Goals and Intellectual Challenge	• Committing to making it absolutely clear what has to be understood, at what level, and why • Focusing on key concepts, and students misunderstandings of them, rather than on covering the ground • Allocating an appropriate workload
Independence, control, and active engagement (Teaching Strategies)	• Encouraging student independence with a proper balance of structure and freedom • Promoting choice of how to learn the subject matter, and give students control over aspects which may be focused on • Promoting problem solving, cooperative learning and student activity which encourage active engagement
Learning from the students	• Having a desire to learn from students and other sources about the effects of teaching and how it can be improved

2.4 Implications for Generic Skill Development

A study conducted by Moses and Trigwell (1993) at the University of Technology, Sydney considered the quality of teaching in Engineering and Computing Science based on industry and community expectations of university graduates. They found the development of transferable generic skills was related to teaching and learning practice that provided students with a real or meaningful understanding of the subject content.

The study found teaching strategies that were found to be successful in promoting generic skill development through deep approaches to learning had some or all of the following characteristics:

- Committed, enthusiastic, well prepared and knowledgeable teachers;
- Used a variety of teaching strategies;
- Actively involved students in the classroom or the field through case studies, projects, discussions, workshops, presentations, etc;
- Had high expectations of students and challenged students' intellectually;

- Varied the degree of guidance and autonomy depending on the context, the level of preparedness and stage in the degree course;
- Used a variety of assessment methods which demanded of students integration of knowledge, application of higher order skills and initiative; and
- Gave feedback to students.

Two recommendations that evolved from a study conducted by Moses and Trigwell (1993) to promote the development of generic skills through deep approaches to learning included:

- Allowing students time for reflection and discussion about what the subject was about, what skills they learnt and how they learnt them, that is, more consideration given by students about the expected learning outcomes and the process of learning used to achieve the results; and
- Encouraging teaching staff to carefully consider the learning objectives of the course, and how they relate to other subjects in the course, and what teaching strategies and assessment procedures would be most suitable to achieve these.

Surveying opinions of employers Candy, Crebert and O'Leary (1994) found that Australian undergraduate degrees across the board were failing to develop personal transferable skills in graduates. This was also confirmed by graduating students. They showed many practices in higher education institutions that strongly worked against graduates developing generic skills as follows:

- Failing to mention lifelong learning in the mission statement or values;
- Ignoring statements of missions and goals or treating them as irrelevant;
- Overloading the curriculum;
- Imposing too much detail at too advanced level;
- Making excessive use of lectures and other didactic approaches;
- Failing to connect learning with the world of practice;
- Using forms of assessment that encourage 'reproductive' learning;
- Not giving students timely, useful, intelligible feedback on their work;
- Viewing the library as just a storehouse of books; and
- Viewing the university experience as nothing more than vocational training (p. 43).

By asking staff, students and graduates to nominate particular teaching approaches which they felt promoted transferable generic skills development and lifelong learning, Candy, Crebert and O'Leary (1994) found that the teaching approaches shown in Table 2.9 were most likely to result in successful outcomes. These are all based on student-centred learning rather than didactic teacher-centred approaches, "interactive, problem-based, independent approaches and methods that support the students while he/she grapples with the difficult problem of assuming personal responsibility of learning" (p. 127).

Table 2.9: Teaching and learning strategies to promote generic skills and lifelong learning in higher education (summarised from Candy et al., 1994)

Learning Strategies	Learner Activities and Description	Benefits
Self-directed and peer-assisted learning	Self directed learning occurs when learners assumes responsibility for specifying individual learning needs, goals and outcomes, planning and organising the learning task, evaluation its worth and constructing meaning from it, within a highly structured framework. Methods used include: • Learning contracts in which students negotiate contracts with their lecturers specifying what will be learnt and how it will be learnt • Peer mentoring, where advanced students help beginning students, in which both mentors and student participation is voluntary	• Promotes lifelong learning • Confidence gained to repeat process in another context • Development of interpersonal, collaborative and communication skills
Experiential and real-world learning	Providing students with experiences similar to those that they would encounter in the real world. Methods used include: • Role-plays, which enable students to experience real world situations without potentially adverse implications. It enables students to understand the experiences of others when using role reversal • Clinical practice enables students to experience working in the environment for short periods • Field trips to visit and talk with professionals • Work experience, for extended periods of unpaid work • Cooperative education in which students take a semester or full year, through an internship with industry after completing more than half of the academic course. Some credit may be given for the work. Holiday periods are sometimes used to fast track academic requirements for these students.	• Become acculturated to work environment • Become self-critical • Encourages collaboration • Learn how to solve problems "on the spot" • Develops transferable skills
Problem-based learning	Confronts students with real world problems, which provide a stimulus for learning. Students must frame the boundaries of the problem and then evaluate the outcomes of the learning. Students require a sufficient knowledge of the area, and also a grasp of the necessary vocabulary. Methods used include: • Concept mapping as a learning heuristic to help students make sense of readings and clarify relationships between ideas, what the learner already knows, and comparison of student and teacher understanding of a topic • Critical thinking skills to help students think and reason in a critical fashion.	• Develops critical thinking skills • Ability to access required information • Development of interpersonal, collaborative and communication skills

Learning Strategies	Learner Activities and Description	Benefits
Reflective practice and critical self-awareness	Reflecting during and after an experience enhances learning ie the learner notices what is happening and intervenes in various ways to influence the situation. Methods used include: • Reflective learning journals considering how they approached a task, evaluating the effectiveness of the strategies used and what they have discovered about their learning styles • Learners re-constructing the logic of their own or another's thought process in arriving at a solution • Talking through a problem solving sequence • Uncovering assumptions through simulations or exercises	• Promotes lifelong learning skills
Open learning and alternative modes of delivery	Students need to understand how to utilise new technologies which promote learning	• Enables students to choose when, where and how they learn
Assessment practices	Assessment is not only a measure of *how much* or *what* the student learnt, but also *how* the student learnt and what *use* the student will be able to make of it. It is used for diagnosing misunderstandings and putting them right and comparison indicator between course aims and learning outcomes. Students must be able to evaluate the adequacy, completeness or appropriateness of their learning. Methods used include: • Assessing what and not how much learning has occurred through open-book exams which test real-world conditions, critical self-reflection forms which form part of the students graduation documents and oral presentations to a panel • Student input/negotiation into assessment measures as part of contract based learning which must provide 'evidence of learning' • Self and peer assessment which enables students to assess their own and their peers contributions to group process before submitting their assignment • Feedback on assessment tasks by lecturers must provide constructive comments	• Promotes critical self-evaluation and enables students to consider their learning processes, understandings, strengths and weaknesses

By performing research across the education sector, a survey conducted by Tinkler, Lepani and Mitchell (1996) identified defining principles educational institutions would have to meet in order to satisfy markets in the information society and for transferable generic skills development (Table 2.10). These principles are proposed to help improve teaching and learning strategies in the classroom and move toward a new paradigm for education based on the rapid uptake of converging technologies (computers, telecommunications, media) by users throughout the world. The report advocates that to be globally competitive, Australia needs to promote these educational principles as well as imposing information literacy competencies across the education sector.

Table 2.10: Defining principles for education services (summarised from Tinkler et al., 1996)

Learning Strategies	Description
Lifelong learning	• No longer front-end school learning but continuous across the life cycle to facilitate flexible career paths and enhance personal development.
Learner-directed learning	• The learner takes increasing control of the learning process with the teacher becoming the facilitator of learning, the therapist and the diagnostician to achieve optimum learning outcomes. Throughout the course of study, the teacher is needed less and less and the student takes on more and more control of the their own learning, so that the student learns more about learning and what works for them ie their individual learning style. • Provides students with opportunity to develop deep conceptual understanding through a variety of learning experiences where they actively engage in the learning process, researching, adapting and problem solving with their peers.
Learning to learn	• Developing the capability in individuals and groups to understand and more effectively plan and realise their own learning.
Contextualised learning	• Contextualised learning enables students to integrate propositional with experiential knowledge – which is essential to translate knowledge (about) into action (capacity to do)
Customised learning	• Products and services are designed to meet different learning preferences or cultural situations and can be appropriately modified by the learner to meet the particular needs of individual and groups.
Transformative learning	• Transformative learning enables learners to challenge and change belief systems and behavioural patterns to meet new needs and opportunities, and overcome disabilities and disadvantage.
Collaborative learning	• Collaborative/cooperative learning enables groups as well as individuals to learn interactively across time and space.
Just-in-time learning	• Learning opportunities are available from the global learning 'supermarket' when and where the learner needs them to meet their learning needs.

Tinkler, Lepani and Mitchell (1996) reported that when respondents responsible for an exemplar of change were questioned about learning theories underpinning their use of information and communication technologies, the consistent answer given was constructivism. This opinion was also reflected through the results of a pilot study focused on evaluating the effectiveness of key competencies implementations (Hager, Moy, & Gonczi, 1997). A strong link was found between the development of key competencies and:

- Adult learning principles;
- Advanced teaching / training technologies;
- Holistic approaches to learning;
- Problem based learning;
- Lifelong learning skills;
- Learning how, why and exploring what if ... not just the facts;

- Learner reflection, evaluation and articulation on learning experiences;
- Active and co-operative learner-centred approaches; and
- The teacher/trainer assuming multiple roles.

The University of Wollongong (n.d.) promotes a range of teaching and learning strategies to help promote the development of student attributes. They suggest that graduate attributes should be integrated into teaching programs, which should be designed so that students:

- Understand the nature of the learning task and become actively engaged in identifying their own learning needs and in the task of learning;
- Participate in the negotiation and planning of their learning and accept responsibility for outcomes;
- Believe that they are capable of success;
- Discuss, apply, reflect on and evaluate their learning;
- Contribute to the development of new knowledge/understandings;
- Develop skills in accessing and using appropriate learning resources;
- Receive adequate guidance, support and feedback on their learning;
- Interact and form positive relationships with peers and teachers;
- Feel secure in their learning environment and are prepared to experiment and take risks in developing creative responses;
- Enjoy the experience of learning and achieving learning goals;
- Experience physical and cultural security; and
- Enjoy sustained participation in campus.

Many of these recommendations concur with contemporary pedagogies that focus on knowledge construction, student-centred learning and reflective practice. Many other universities have taken a similar approach, also recommending that generic skills integrated into the course curriculum of each subject. The University of South Australia (2000) has developed a program design and development process with templates that allows departments to plan how to integrate generic skills into their programs:

- Identify the specific program outcomes;
- Identify the distribution of these outcomes across the year levels of the program;
- Identify the courses that will carry the various outcomes;
- For each course, identify the Graduate Qualities profile;
- Calculate the Graduate Qualities program profile/group of designated courses;

- Decide on the assessment that will indicate whether students have achieved the Graduate Qualities within the course; and
- Develop teaching strategies and student resources to assist students to succeed in the assessment.

Planning grids for graduate attributes and assessment are provided, as well as templates for helping teachers choose from a range of twenty-six different assessment types (Table 2.11)

Table 2.11: Assessing students for Graduate Qualities (University of South Australia, 2000)

Type of assessment	Identifying characteristics	Relevant graduate qualities or indicators							
			1 body of knowledge	2 lifelong learning	3 effective problem solver	4 works autonomously and collabora-tively	5 ethical action and social [illegible]	6 communi-cates effectively	7 international perspectives
1 Essay	• seek information • plan study in appropriate depth • organise information for special purposes • present ideas logically	• body of knowledge • lifelong learning • problem solving • working autonomously • effective communication	✓	✓	✓	✓		✓	
2 Individual and group reports, including laboratory reports	• seek information • plan study in appropriate depth • organise information for special purposes	• body of knowledge • lifelong learning • problem solving • working autonomously and collaboratively • effective communication	✓	✓	✓	✓		✓	
3 Reflective writing, including journals, learning logs and skills development	• demonstrate the development of learning • take responsibility for learning • analyse and synthesise ideas	• body of knowledge • problem solving (logical, critical and creative thinking) • working alone autonomously • effective communication	✓		✓	✓		✓	
4 Creative output projects, including poster presentations, websites, CD-ROMs and PowerPoint presentations	• synthesise ideas • present ideas • use various media • organise information for particular kinds of presentation	• body of knowledge • lifelong learning • problem solving (logical, critical and creative thinking) • working alone autonomously or collaboratively • effective communication	✓	✓	✓	✓		✓	

The Australian Technology Network (ATN), which consists of five Australian universities (RMIT, QUT, UTS, Curtin University, The University of South Australia) produced a report that involved six academic development staff and thirteen course teams across the five ATN universities. The project involved the analysis of case studies from each institution, a review of the existing literature on graduate capabilities, and reflection on the issues highlighted through the integration of the case studies with the literature (Bowden, Hart, King, Trigwell, & Watts, 2000). Six principles were developed for consideration that considered curriculum development, teaching practices, learning experiences and assessment:

- Desirable capabilities are most usefully formulated at both university and course level;
- The development, practice and assessment of capabilities are most effectively achieved within the context of discipline knowledge;
- Exposure to, and reflection on, a variety of teaching approaches and learning experiences fosters a focal awareness of capability development;
- Assessment practices should align with course/subject goals and teaching/learning practice;
- A package for assessing generic capabilities incorporates items designed for a range of purposes; and
- Students' benefit from progressive feedback on the development of capabilities.

Fostering the development of generic skills requires students to be actively engaged with learning strategies in which they take responsibility for their own learning through the use of strategies such as action learning, situated learning and project-based learning (Kearns, 2001).

Traditional university education that focuses on content and didactic delivery is no longer acceptable teaching practice in an environment where the demand for generic skills is increasing. Contemporary thinking supports a constructivist epistemology with learner-centred authentic environments in which students create knowledge and understanding through meaningful self-directed activities that are based on reflective practice.

A course delivery model based on these tenets is attractive, as it not only purports to develop generic skills but also helps promote a deep understanding of the discipline content. In such a framework, a wide range of generic skills can be integrated and developed through the delivery of the course material without using extra resources in an attempt to "teach" generic skills.

2.5 Chapter Summary

This chapter reviewed contemporary issues related to teaching and learning in higher education with a view of synthesising common and complementary elements from three broad areas related to developing students generic skills in higher education. The following gives a brief overview of each of the three sections:

- The demand for improving students' generic skills can no longer be ignored by higher education institutions. As a result, many universities have now included generic skills as a key priority in their mission statements to demonstrate their commitment. However, across different universities and countries there are many varied definitions and perspectives about what generic skills are and how they should be implemented in course structures;
- New technology and flexible delivery continues to increase in popularity, with a growing body of research that indicates if used appropriately can enhance the quality of student learning and promote the development of generic skills. Higher education institutions cannot ignore this new trend and are attempting to find efficient and consistent methods of implementing new technology delivery across their institutions; and
- Teaching and learning trends in higher education institutions are moving away from transmissive, didactic practice towards learner-centred, reflective and authentic environments in an attempt to promote the development of generic skills through deep and meaningful learning approaches. Course delivery models based on these tenets are attractive, but require educators and students to adopt different views of teaching and learning practice.

Based on the above literature review, the next section proposes an instructional framework focused on enhancing students' generic skills through strategies and pedagogies that encourage deep and meaningful approaches to learning.

Chapter 3

Guidelines for Developing Generic Skills

This chapter reports on findings based on the review of the literature from the previous chapter with a view to:

- Synthesise the literature into a set of coherent operational elements;
- Develop a conceptual framework and design methodology for the study; and
- Outline the research questions for the study based on the conceptual framework.

3.1 Synthesis of the Literature

An emphasis on *process* and student-centred activities rather than *subject content* was strongly promoted in the previous chapter as being necessary ingredient in coursework to order to help students' develop their generic skills (Biggs, 1999; Candy et al., 1994; Gibbs, 1992; Ramsden, 1992). The focus on designing and developing learning environments should be on creating meaningful learner activities rather than the creation of "excellent" lecture notes. Learning environments that use a student centred process approache with dialogue, feedback, reflection, and task-oriented activities are required to promote learning, "Students need explicit practice in representation of knowledge in their subject, in language, symbols, graphs, diagrams and in the manipulation and interpretation of those representations" (Laurillard, 1993, p.47).

Learning activities must be situated in a contextual environment as in a "real-world activity" (Laurillard, 1993, p.29). These are supported through the use of authentic learning environments that promote collaboration, feedback, student-student dialogue, student-teacher dialogue and student centred activity. This is defined as a student mathemagenic activity in which the prescribed student activity promotes student learning.

Which learning theories focus on learning process rather than just content? In reviewing the literature relevant to developing deep approaches to learning and generic skills, a constructivist perspective was consistently cited by most authors. Constructivism emphasises the role of the learner in creating their own meaning in different learning situations by actively engaging with the content through accommodation/assimilation (Piaget, 1969) or through social interaction (Vygotsky, 1978). The learners construct knowledge as they attempt to make sense of their experiences in a student centred environment. This approach encourages learners not to be treated as empty vessels waiting to be filled with content, but rather, "Active organisms seeking meaning and constructing knowledge as they attempt to make sense of their experiences" (Driscoll, 1994, p. 360).

Five conditions of learning that are consistent with constructivism and emphasise the *process* of learning, rather than the *products* of learning are summarised as follows (Driscoll, 1994):

- Complex, rich learning environments that incorporate authentic activity;
- Social negotiation as an integral part of learning;
- Multiple juxtapositions of instructional content (i.e examining the same material from multiple perspectives);
- Nurturance of reflexivity; and
- Emphasis on student-centred instruction (p. 45).

Social constructivist theory based on the work of Vygotsky (1978) has become widely accepted in all fields of education. It promotes that learning occurs through social negotiation within authentic settings in which language plays a major role. The development of mental functions must be fostered through collaborative, not isolated or independent activities. This social constructivist philosophy has been adopted by Brown, Collins and Duguid (1989) with the notion of cognitive apprenticeships in which students access expertise through "masters", whose role is to facilitate rather than teach, and the aim of learning is to solve realistic and practical problems in authentic settings.

Based on these tenets of social constructivism, a review of literature was conducted for prominent writers and researchers in the areas of higher education, generic skill development and deep and meaningful approaches to learning. The views of these authors were then compiled (Table 3.1), and used to investigate patterns that were widely accepted, and reflected critical elements needed to promote the development of generic skills as well as deep approaches to learning.

Table 3.1: Summary of contemporary learning strategies capable of supporting generic skill development through deep approaches to learning

Author	Learning Strategies
Biggs (1999)	• a well structured knowledge base • an appropriate motivational context • learner activity • interaction with others • good teaching and assessment practices which incorporate learning objectives based on appropriate "verbs" • personal learner characteristics ie their approach to learning
Candy, Crebert and O'Leary (1994)	• self-directed and peer-assisted learning • experiential and real-world learning • problem based learning • reflective practice and critical self-awareness • self and peer assessment • on-line facilitation
Dart (1998)	• learner activity to promote student control of their own learning • vocational relevance • authentic assessment • good teaching and assessment practices which include openness to students and appropriate workload - "press for student understanding" • personal learner characteristics
Gibbs (1992)	• independent learning • problem based learning • reflection • learning by doing • developing learning skills
Ramsden (1992)	• independence and control • active engagement and student activity • problem solving • cooperative learning • feedback and reflection • good teaching practice. Includes interest, explanation of material, definition of clear goals, intellectual challenge and respect for students
Moses and Trigwell (1993)	• actively involving students through case studies, projects, discussions, workshops, presentations etc. • varying the degree of guidance and autonomy depending on the context • allowing students time for reflection and discussion • good teaching practice - variety of teaching strategies, high expectations, quality feedback and careful consideration of learning objectives
Tinkler, Lepani and Mitchell (1996)	• learner directed learning • learning to learn • contextualised learning • collaborative learning • on-line facilitation

3.2 Conceptual Framework

This section discusses a variety of learning designs focused on promoting the development of students' generic skills through deep and meaningful learning. All of these designs are based on principles of knowledge construction with a view that all learners have knowledge gained from previous experiences, which influences how they construct knowledge gained from new learning environments. Within this setting, teachers' roles are not to dispense information but to provide students with the opportunities and incentives to build it (von Glasersfeld, 1995).

Within this paradigm, it can be seen that the learning strategies presented in Table 3.1 all feature a strong association with self-regulated learning, in which learning activities must promote some degree of intellectual independence so that students are encouraged to engage with learning activities that are self-directed and autonomous (Table 3.2). These strategies all support the use of self-directed learning activities to promote generic skill development through deep and meaningful learning.

Table 3.2: Self-Regulation and autonomy

Description of Learner Activities
• Learners must be encouraged to actively take control of their own learning (Biggs, 1999; Dart, 1998)
• Independent learning, learn by doing, and the development of learning skills should be encouraged (Gibbs, 1992)
• Student independence and control, active engagement and student activity should be promoted (Ramsden, 1992)
• Learning activities should involve students through case studies, projects, discussions, workshops, presentations and other actions that promote autonomy (Moses & Trigwell, 1993)
• Should promote self-directed and peer-assisted learning (Candy et al., 1994)
• Promote learner directed learning and learning to learn (Tinkler et al., 1996)

Self-directed learning can be described as the process whereby students have the ability to activate and sustain cognitions, behaviours, and affects, which are systematically oriented toward attainment of their learning goals and control of learning strategies and process while involved with learning tasks (Corno, 1994; Pressley, 1995; Schunk & Zimmerman, 1994). Self-directed learning activities are designed with a view of encouraging students to actively participate in their own learning. Priority is placed on students setting goals and objectives for their learning, planning the learning, engaging in learning activities, monitoring and regulating how the learning progresses and maintaining motivation to continue learning (Boekaerts, 1997; Jonassen, 1996). Other self-directed learner activities include the use of learner contracts, negotiating learning needs, setting goals and priorities, considering learning methods, peer mentoring, applying performance criteria, finding resources needed for learning, and learners deciding when learning is complete (Biggs & Moore, 1993; Ford & Nichols, 1987; Schunk & Zimmerman, 1994).

As outlined in the review of the literature (Chapter 2), employers and professional groups are increasingly demanding graduates to be adaptable, able to work independently and be willing to continue learning. These are all characteristics that are predicated on the graduate's ability to be a self-directed learner to support continuing professional development, both on and off the job (ACNielsen Research Services, 1998, 2000). Promoting student skills in self-directed learning has value both as an educational learning strategy for promoting deep and meaningful learning, and also as a required graduate attribute to encourage life long learning.

A second clear trend that emerged from the literature was the tendency for settings to encourage learners to reflect. The use of reflection to support knowledge construction is considered an essential learning strategy needed to promote the development of generic skills. Reflection is a deliberate act of thinking about past or future events in which a perceived problem or activity is examined so that a reasoned response may be tested (Loughram, 1996). This enables learners to construct meaning from their experience by critically self-assessing their performance. All authors are supportive of students developing their own perspectives and synthesis of the subject through reflective practice to promote the development of generic skills through deep and meaningful learning (Table 3.3).

Table 3.3: Reflection

Description of Learner Activities
• Deep approaches to learning are achieved by reflecting and theorising (Biggs, 1999)
• Feedback and reflection are essential for deep learning (Gibbs, 1992; Ramsden, 1992)
• Giving students time for reflection and discussion is essential for meaningful learning (Moses & Trigwell, 1993)
• Reflective practice, critical self-awareness and self/peer assessment are essential for developing deep approaches to learning (Candy et al., 1994)

Authentic learning occurs only through reflecting upon personal experiences (Dewey, 1933; Schon, 1990). Reflection is often defined as a process that enables connections between the various elements of an experience, and Dewey refers to reflection on experience as a learning loop that 'runs back and forth' between the experience and the relationships being inferred. The concept of the learning loop has gained popularity through the work of Kolb (1984) and his four stage experiential learning model in which learners move through a series of phases involving experience, reflection, generalising / theorising and planning. Therefore, the ideal experiential learner will be able to:

- Involve themselves in new experiences without bias
- Reflect upon experiences from multiple perspectives
- Integrate their observations into logically sound theories, and
- Use these theories in decision-making and problem solving.

Reflective practice is being promoted by new accreditation processes for graduate engineers in Australia (Jolley, Radcliffe, & McLeod-Palma, 2000) and has the potential to deliver on many of the recommendations about graduate attributes now recommended by Australian Universities (McLoughlin & Luca, 2000). Other related learner activities used to help promote reflection include revision, reconstruction and rethinking of ideas and problem solving sequences, exchanging ideas, commenting on others' work, engaging in critical self-assessment self and peer assessment activities, and using reflective journals (Boud, Keogh, & Walker, 1985; Cox, 1994; Seale & Cann, 2000).

A third key element that emerges from the literature relates to context and purpose of learning. Authentic activities based on constructivist principles are essentially real contexts and situations that provide students with opportunities to develop knowledge and skills needed for specific contexts, jobs and roles. These learning environments should preserve the full context of the situation and allow for the natural complexity of the real world (Barab, Squire, & Dueber, 2000; Brown et al., 1989; Cognition and Technology Group at Vanderbilt, 1993; Resnick, 1987; Winn, 1993). These views of learning are reflected in the following: "Learning occurs naturally as a consequence of the learner recognizing knowledge's practical utility as well as the need to use it in an attempt to interpret, analyse, and solve real-world problems"(Land & Hannafin, 2000, p. 13).

Learning activities based on an authentic context reflect the way in which the information being learnt is actually used in the workplace, and provides students with tasks or problems that have real world relevance. Table 3.4 shows the way in which many writers describe settings that support knowledge construction by including elements in their design that reflect a need for authenticity.

Table 3.4: Authenticity

Description of Learner Activities
• Provide an interactive authentic environment with an appropriate motivational context (Biggs, 1999)
• Promote learning environments with vocational relevance and authentic assessment (Dart, 1998)
• Encourage authentic problem-based learning (Gibbs, 1992; Ramsden, 1992)
• Encourage using conceptualised learning and collaborative learning (Tinkler et al., 1996)
• Promote experiential, real world and problem based learning (Candy et al., 1994)

Immersing students in real world contexts promotes the development of students' workplace readiness skills and helps them gain employment in the industry of their choice. The course students choose at higher education institutions is essentially the vehicle that will enable them to gain employment, so should reflect the real world will employers expectations and necessary professional attributes. Traditional pedagogy generally only provides students with isolated concepts delivered through didactic teaching practices relying on direct delivery methods such as lectures to impart content knowledge, which is generally isolated from reality. Authentic environments aim for developing "real-world" scenarios that students can readily relate to and see relevance in (Brown et al., 1989; Jonassen, 1991; Petraglia, 1998; Resnick, 1987). Other learning activities used to promote authentic context include problem-based learning, real world activities, project work, teamwork, simulation, role-play, work experience, practical work and industry visits.

Stimulating student interest and motivation makes using authentic activities attractive in higher education institutions. They can be a powerful catalyst for encouraging students to engage in the given content if they are deemed to hold relevance, and provide knowledge and skills required in the pursuit of career opportunities.

A synthesis of the related literature suggests that there are three learning principles needed to design instruction to promote the development of students' generic skills. It is the contention of this study that *self-regulation, reflection* and *authentic context* are the central tenets of instructional design capable of creating learning environments that can promote the development of students' generic skills. These three learning principles are shown in Figure 3.1, which illustrates the conceptual framework that will be used in this study.

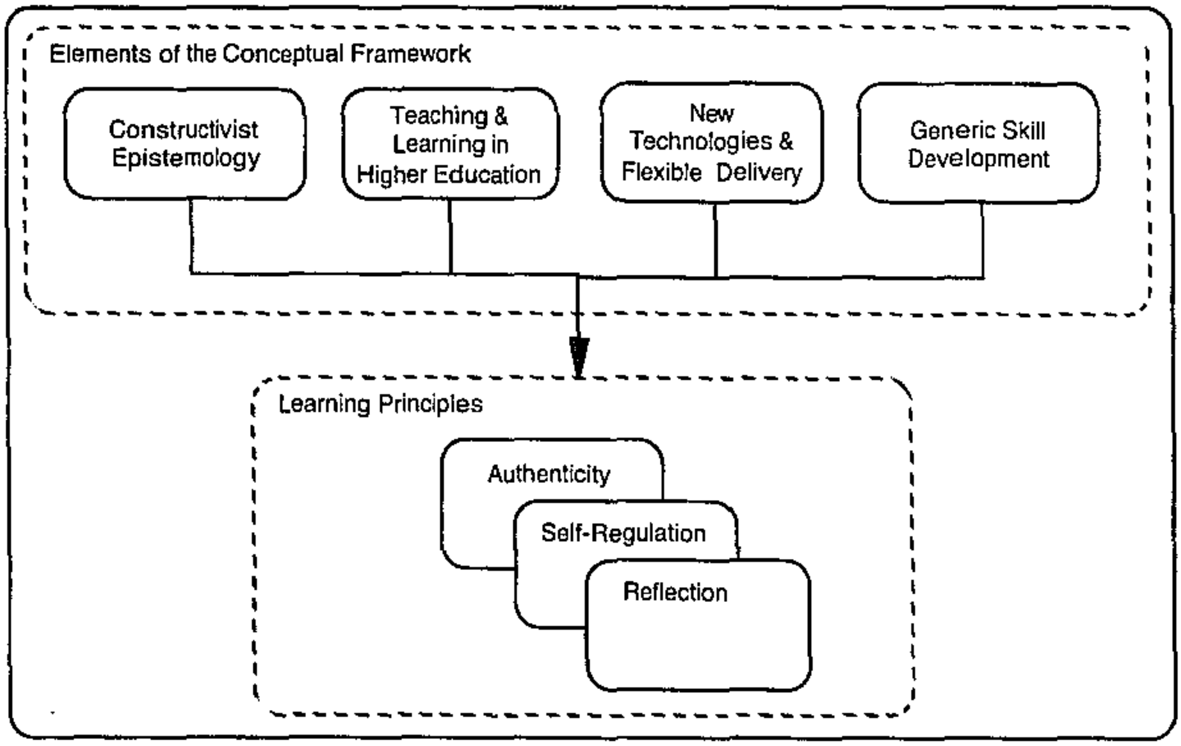


Figure 3.1: Conceptual framework and learning principles

3.3 Guidelines for Implementation

Using these three learning principles as the framework, an implementation strategy was proposed that would support the development of learning environments based on these ideas. An implementation strategy described by Oliver and Herrington (2001) advocates a design methodology centred on developing student-learning activities as the main focus of the course design. These then determine how learners engage with course materials and the forms of knowledge construction that take place through the purposeful selection of tasks, resources and supports (Figure 3.2). These elements are defined as:

- Learning tasks – pivotal elements in the design process used to support knowledge construction and guide the design process. These are chosen based on the intended learning outcomes, resources and learning supports available. Typical learning tasks include problem solving, investigations, inquiries, projects and role play;
- Learning supports or scaffolding - needed to guide learners and provide feedback on their progress. Can include tutor support, library support or on-line facilities, and counselling; and
- Learning resources – these are often the most visible components and include print materials, media and on-line resources. These must support learners' inquiry and problem-solving activities and should allow students to browse a range of alternative resources.

As can be seen in Figure 3.2, overlap exists in each of these three elements with assessment being common. This is in keeping with the views of many authors who promote appropriate assessment and good teaching practice as being critical aspects needed to promote deep and meaningful learning experiences (Biggs, 1999; Dart, 1998; Moses & Trigwell, 1993; Ramsden, 1992).

In this study, this model was adopted to have a strong focus on task oriented, which is supported by an influential group of researchers who have identified students' approaches to learning to be either surface or deep (Biggs, 1999; Candy et al., 1994; Ramsden, 1992). A deep learning approach is consistent with a search for knowledge and understanding, whereas a surface learner is concerned only with passing exams by memorising facts. Applied to teaching and learning approaches in higher education, the implication is that constructivist, task-focused environments where learning activities and curriculum outcomes are aligned can foster cognitive skills and a promote deep approaches to learning. This can be achieved by enabling learners to take an active role in learning by initiating, managing, monitoring, reflecting and evaluating learning tasks.

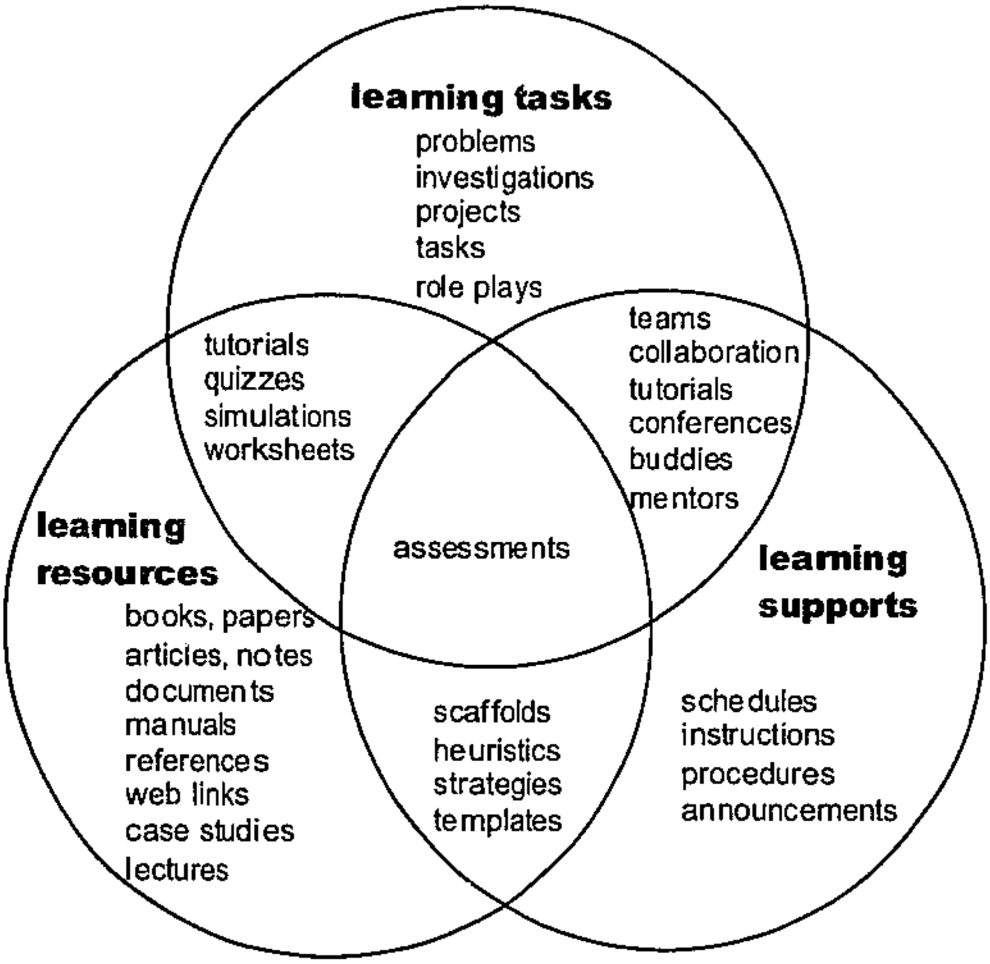


Figure 3.2: Constituent elements for effective learning environments (Oliver & Herrington, 2001)

To promote the development of professional skills, courses must have a focus on process rather than content (Gibbs, 1992). For example, communication and negotiation skills are socially based processes and come into play as learners face new challenges when engaged in authentic problem solving. Developing these skills is encouraged through task based learning strategies that are acquired and refined through social interaction, dialogue and negotiation with others (Candy et al., 1994; Laurillard, 1995). This approach to learning can be regarded as process or task oriented as it focuses on the process of knowledge construction and utilisation, as opposed to simple mastery of content knowledge (Vermunt & Lowyck, 2000).

The course implementation strategy used in this study used these design concepts integrated with the three key learning principles outlined above and are represented diagrammatically in Figure 3.3. The design process commences by considering the learning objectives and assessment, and then considering an appropriate learning design for the context. The focus then becomes to develop meaningful learning tasks maintained with appropriate learning supports, resources and new technology.

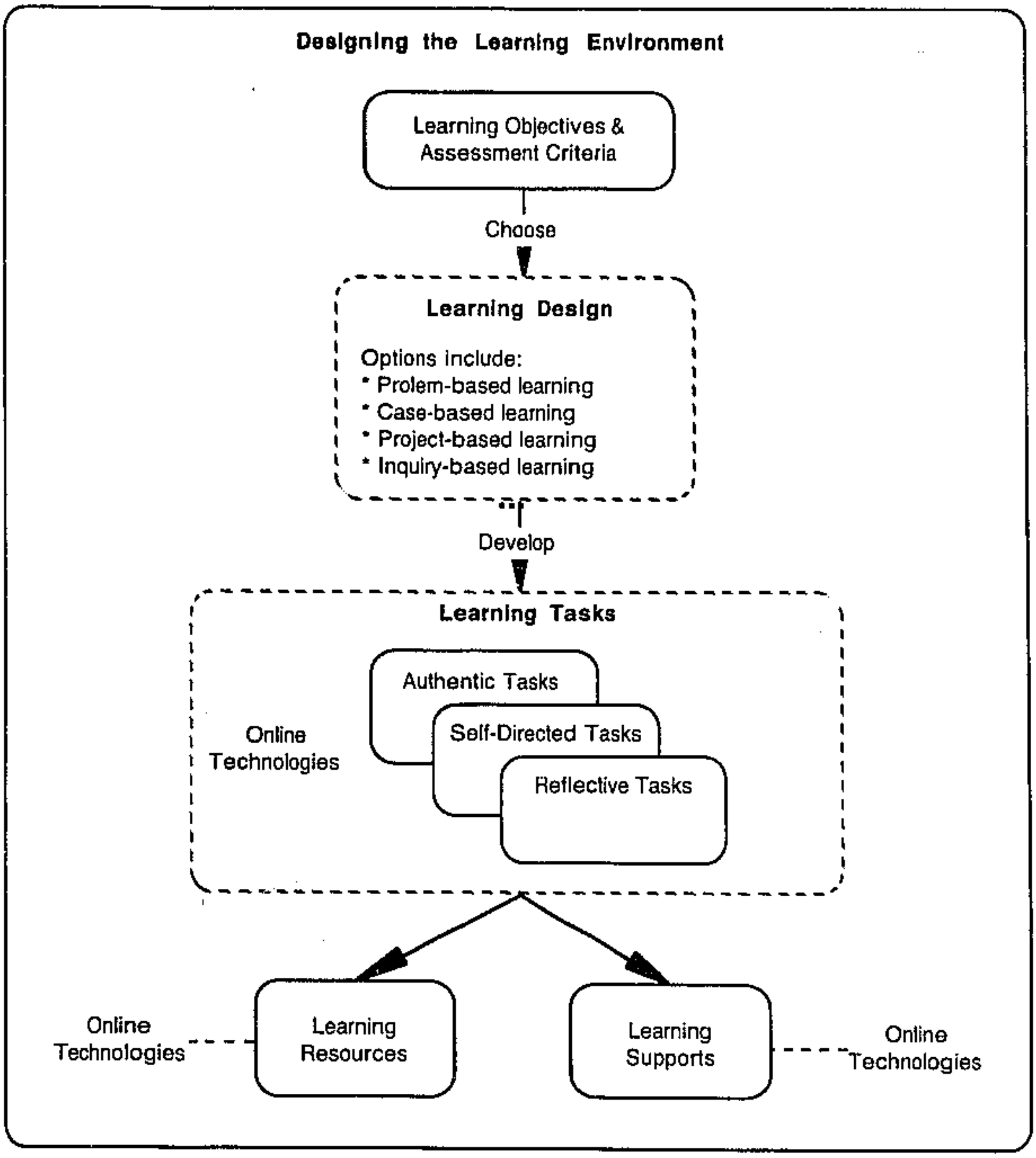


Figure 3.3: Course implementation framework

This design methodology is in direct contrast to traditional didactic methods of teaching in higher education institutions that emphasise subject specific content and the transfer of knowledge from lecturer to student, which often must be memorised for examination purposes.

3.4 Research Questions

In summary, a review of the literature was used to develop a theoretical basis for the design of an online learning environment that could facilitate the development of students' generic skills supported through deep and meaningful learning experiences. Three key pedagogical learning principles were identified that would potentially promote the development of students' generic skills - *authenticity, self-regulation and reflection*. Using these three learning principles, a course design methodology was proposed that had a primary focus on designing learning tasks to engage students.

In order to explore the potential of these learning principles as contributors to generic skill development, the study sought to implement these principles in a learning setting and then investigate student learning in an actual implementation. The next chapter describes the design and development of the online learning environment which was implemented and used in an empirical study to explore the following research questions:

1. What factors contribute to students practising generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection? and
2. To what extent do students develop generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?

Chapter 4

Designing and Developing the Learning Environment

This chapter describes the process by which the three learning principles of authenticity, self-regulation and reflection were designed into an online learning environment. The chapter gives an overview of the context and processes used to design and develop the online application by considering:

- The course context, including the unit outline and required generic skills;
- A course design methodology that supports knowledge construction;
- Designing a web-based course management system based on the established learning principles and course design methodology;
- Application development issues, including project development methodology, interface design issues, programming issues and media development issues; and
- A pilot study implementation and resulting changes.

4.1 Context of Study

To help implement and test the ideas developed in the previous chapter, an appropriate learning context was needed. A course of study was required where an online unit could be developed to test the notion that authenticity, self-regulation and reflection could help develop students' generic skills. While the content was not critical to the aims of the study, a unit was needed where the development of generic skills was an important outcome for all the students.

The Course Context

Researchers and industry surveys consistently report that project managers require effective generic skills for success (Frame, 1999; National Board of Employment Education and Training, 1996; Posner, 1987; Verma, 1996; Zimmerer & Yasin, 1998). Project managers must "juggle" a range of team, business, administrative and production issues, which have a direct affect on profit, delivery time and final product quality. Generic skills needed to coordinate these tasks are increasingly being promoted by employers as being essential, and are actively interviewing potential employees for these skills.

Against this backdrop, the unit *IMM 3228 Multimedia Project Management* was considered as appropriate for this study. It is part of the Bachelor of Communications course (Interactive Multimedia major), or Graduate Diploma course at Edith Cowan University. This is a third year unit (final year), focused on developing project management skills and expertise. The unit is focused on project teams working together to create multimedia products for real clients by working through a project management lifecycle, that is, by conducting a needs analysis, creating legal contracts, developing storyboards, concept maps, rapid prototypes, and conducting formative and summative evaluations. The unit consists of thirteen, three-hour class sessions and runs over a full semester. Each session consists of a one-hour lecture followed by a two-hour team-based activity.

The unit outline was designed to promote the development of both generic and project management skills. There was a strong focus on teamwork and project work, as in the workplace these students would require these skills, as they would all be working in team-based environments using specialised skills to create multimedia products. These intentions are reflected in the aims and objectives of the unit outline (Figure 4.1).

Generic Skills Targeted in this Study

This section identifies the generic skills considered important for students within the unit – a class of final year higher education students studying project management principles for multimedia development. The following are considered:

- The domain specific generic skills considered important for project management;
- Generic skills considered important for higher education graduates; and
- A synthesis of generic skills needed by multimedia project management students studying in a higher education institution.

Domain Specific Generic Skills – Project Management

All multimedia project managers aim to have projects delivered on time, within budget and to the required quality. In the quest, much research has been performed and literature written about management techniques that can assist this process. Increasingly however, the recognition that project managers, and indeed all team members' generic skills play an important role in project success is being promoted, not only by employers but also by academics. This section will attempt to synthesise key generic skills needed for successful project management as identified through the literature.

Unit Outline - Project Management Methodology (IMM 3228/4228)

Edith Cowan University, School of Communications and Multimedia

AIMS and OUTLINE

This unit examines multimedia development methodologies and investigates the different phases of project management cycles such as feasibility, analysis, design, production, implementation and evaluation. Project teams are formed to develop a web-based product in which team members are assigned the role of project manager, designer, programmer or instructional designer/tester and work through all the phases required to develop a multimedia project. Students are given access to online presentation areas, group discussion areas and chat areas to facilitate communication.

Students will also be encouraged to develop a range of generic skills such as time management, learning-to-learn, collaboration, communication, information literacy, problem solving and evaluation skills.

Objectives

On completion of this unit, students should be able to:

1. apply a range of project management and generic skills appropriate to the development of multimedia projects including time management, collaboration, communication, self-assessment, peer-assessment, task management, problem solving, information management and learning to learn skills;
2. make a significant contribution to a team-based multimedia development project;
3. demonstrate an understanding of how project management models, needs analysis, timesheets, categories, planning, scheduling and costing are used to develop metrics and feasibility studies;
4. develop legal contracts that consider all the relevant aspects for multimedia development
5. use planning tools such as storyboarding, concept maps and prototyping to develop design specifications;
6. design and apply quality assurance procedures for testing, formative/summative evaluation strategies, procedures, file naming and templates development; and
7. demonstrate an understanding of the nature of the specialist roles of instructional designers, content experts, computer programmers, graphics designers, project managers, "evaluators", and others when developing a multimedia product.

Figure 4.1: Extract from the unit outline showing aims and objectives

Collaborative teamwork focused on project work is becoming an increasingly popular process by which companies seek to increase efficiency and profits (Thomas & Pinto, 1999). This is placing pressure on a greater number of "modern day project managers" to act as visionaries, technical experts, negotiators, sales people and so forth. These individuals are required to master the various, sometimes-competing demands of their jobs by striking an effective balance between the roles they undertake.

Current research is advocating that successful completion of projects requires project managers and team members to have effective generic skills (Ashcroft & Foreman-Peck, 1994; Bennett et al., 1999; Marginson, 1993; National Board of Employment Education and Training, 1996). This concept is gaining support from industry as well as higher education funding authorities, and many reports from around the world are advocating that vocational and higher education institutions need to focus more on improving students generic skills rather than just providing content knowledge (Australian National Training Authority, 1998; Candy et al., 1994; Dearing, 1997; Mayer, 1992).

In the field of multimedia development, project managers must "juggle" a range of team, business, administrative and production aspects which have a direct affect on profit, delivery time and final product quality (Arts Training Australia, 1995; Commonwealth of Australia, 1994; Department of Industry Science and Technology, 1995). As can be seen in Figure 4.2 project managers are required to coordinate a large range of elements, which requires the use of a number of generic skills including communication, collaborative, interpersonal skills.

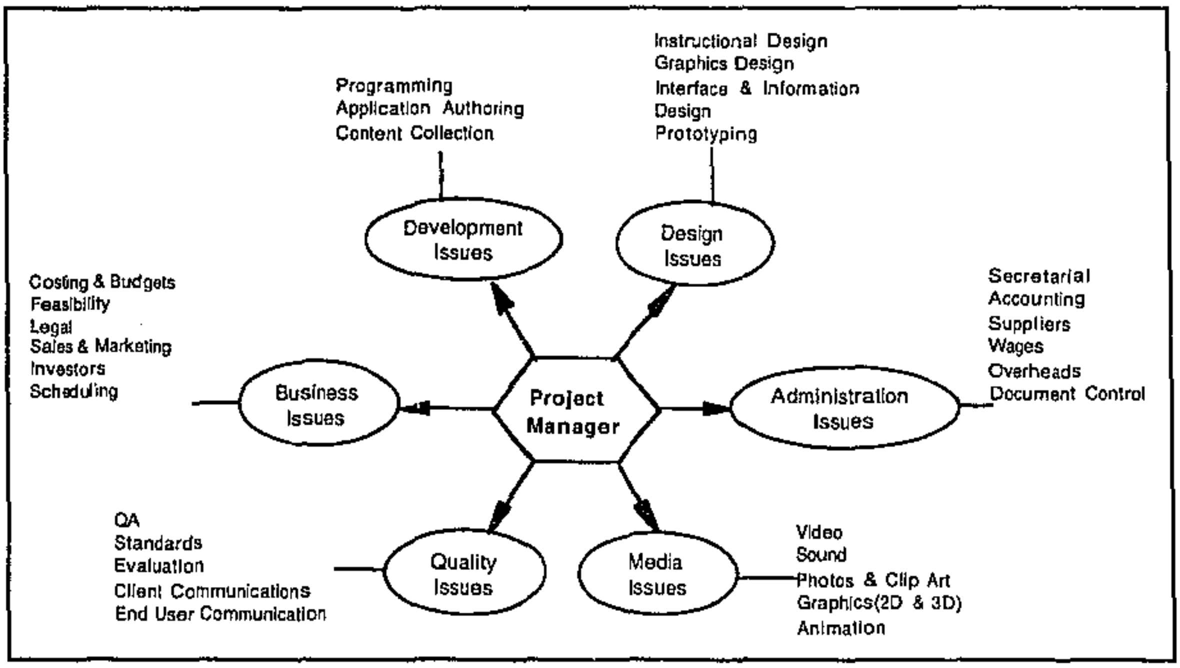


Figure 4.2: Project management responsibilities (Luca, 1997)

Generic skills needed to coordinate these tasks are increasingly being promoted by employers as being essential, and are actively seeking employees with good generic skills such as problem solving skills, collaboration skills and communication skills.

These skills are considered important for both project managers as well as all other team members.

Project team members, especially project managers need skills in three broad areas: managing/administrating, applying technical skills and using generic skills. The management/administrative and technical skills or "Visible Skills" (Wysocki, Beck, & Crane, 1995, p.14) such as scheduling, planning, legal issues and costing are well documented and supported by a myriad of training courses. However, generic skills or "Invisible Skills" needed by project team members have only just recently been recognised as being important by both academics and industry employers. These three skill sets are represented in Figure 4.3 as a continuum, in which technical skills such as computer programming, design or authoring skills are easily proven or observable. Management skills can sometimes be easily demonstrated or monitored, but generic skills are mostly "hidden" or not always clear, that is, how can you predict if a project manager or potential team member has good conflict resolution skills or collaboration skills?

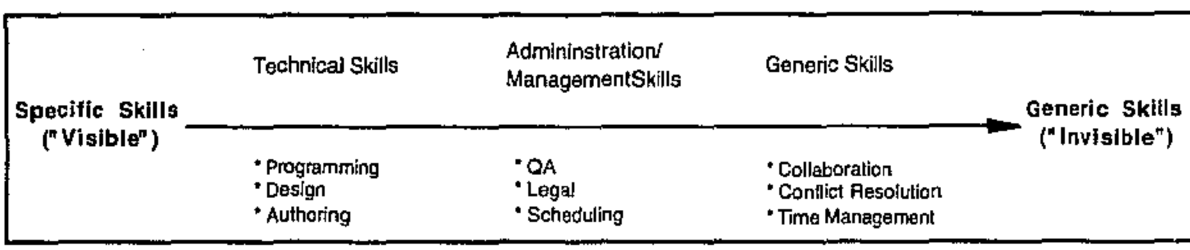


Figure 4.3: Project team skill categories

Project managers need social skills as well as knowledge based competencies. The development of interpersonal skills is described as skills which enable project managers to empathise with others or can be described by the old adage "do unto others as you would have them do unto you", that is, the focus for the project manager must be to show empathy to customers, team and management (Frame, 1999). Intra-personal skills are required for emotional self-control, delaying gratification, stifling impulsiveness and assessing self's strengths and weaknesses accurately. These skills are needed to promote teamwork skills such as knowing how to work with others and understanding their points of view (Goleman, 1998). Project managers also require communication skills, which include being able to articulate requirements, establish realistic expectations, provide accurate written documentation, and have good listening skills to enable social activity that requires many interactions with team members, customers and managers. Project managers who lack social skills, or suffer from dyssemia - a condition in which individuals are unable to read verbal and nonverbal clues directed at them, inevitably experience project problems (Frame, 1999).

Based on a survey of over one hundred senior project managers, Zimmerer and Yasin (1998) concluded that successful project managers couldn't rely on just technical skills and knowledge of the industry. In the increasingly competitive business environment of greater cost effectiveness, timed delivery and client quality assurance requirements, project managers need to combine their technical competency with strong leadership skills. Their survey showed that positive leadership contributed to almost 76% to the success of a project. However, they found that most company executives still firmly believed that technical competence is the most important criteria and are reluctant to spend training dollars in developing leadership skills. The survey showed that strong leadership qualities were reflected by attributes such as team building, communication, focus on achieving results, high self-esteem and demonstration of trust. Effective project management must be considered a combination of operational and behavioural aspects, that is, a people-customer oriented manager with technical competence is what is required for successful project management (Zimmerer & Yasin, 1998).

Training programs are required for project managers that focus on developing behavioural skills. Project managers can no longer rely on just technical skills to ensure successful projects, that is, project managers must be both technically and interpersonally skilled to help ensure the success of a project. Jiang, Klein and Margulis (1998) determined a rank-order of critical behavioural skills needed for project management by targeting one hundred and twenty experienced project managers. Three bands or tiers of skills were identified in the following rank order of importance:

- Interviewing, directing and managing. Where interviewing is being able to ask the right questions to obtain required information. Directing is being able to clearly give instructions and communicate requirements and managing is being able to get the job done on time, within budget and to required specifications;
- Communication skills such as speaking, listening and writing; and
- Interpersonal skills such as cooperation, patience, sensitivity and diplomacy.

The challenge for project managers of the twenty-first century is characterised by high levels of uncertainty, cross-cultural teams, and global competition for human resources (Verma, 1996). Extensive literature and software is available for the planning aspects of project management, but the real challenge and vital element for project management effectiveness lies in behavioural aspects:

> *People determine the success of failure of a project… they meet project goals and objectives by using interpersonal and organisational skills such as communication, delegation, decision making and negotiation. In project environments, people can be viewed as problems and constraints – or as solutions and opportunities.* (p.8)

Verma (1996) argues that effective project managers must acquire six important types of interpersonal skills to produce an open and communicative environment, while also having fun. These include:

1. *Effective communication*: most project problems can be traced back to a breakdown in effective communication. Effective communication consists of: verbal

communication which relies on appropriate choice of words and clarity of expression to transmit the appropriate meaning; nonverbal communication which refers to coding messages with "body language" such as gestures, vocal tones and facial expressions which can have over 50% of the total impact of verbal and nonverbal communication; written communication which must be easily understood and able to be read quickly; and effective and active listening which improves team communication and respect among project participants;

2. *Motivation of team*: crucial for project success, as it is well known that enthusiastic and confident people are more productive. The team takes its attitude from the project leader so it is important that the project manager shows enthusiasm, positive attitude and confidence. Other aspects that affect motivation include: project culture, reward system, work content, work environment, competition, previous experience and personal attitudes;

3. *Conflict resolution*: an important skill needed to obtain a positive result on performance eg diffusing disagreements, clarifying issues and increasing group cohesion. However, when dealt with badly, conflict can lead to highly detrimental effects such increased stress, unproductive work environment, distorted views and loss of status;

4. *Negotiation skills*: needed to bargain and reach agreement with project team members and other stakeholders in regards to resources, information and allocation of tasks. This has to be executed in a manner that is productive and fulfilling to all parties involved;

5. *Stress management*: an important skill for project managers as they generally experience stress through the endless list of demands and problems associated with many jobs. Stress can be caused by role ambiguity, role conflict, project management style, role overload, interpersonal relationships, lack of positive reinforcement and career development concerns; and

6. *Leadership*: the ability to get things done by providing clear, compelling directions and fostering teamwork. Achieved by being a good communicator to obtain favourable responses to given instructions through inspiration rather than rank.

Johns (1995) argues that the basic behaviours needed in effective project management teams can be represented with the acronym COST - *Customer focus, Ownership, System for Planning and Teamwork. Customer focus* is the ability to communicate effectively with customers in order to understand and satisfy their needs. *Ownership* is the ability to allow team members to be involved in establishing the project objectives in order to develop a sense of ownership. *System for Planning* is the ability to lead and control work and *Teamwork* is the ability to promote greater opportunities for the team to interact with each other. This also is supported by Barnes (1993), who suggests that one of the greatest causes of failure in project management is poor communication and teamwork. This study found that many projects and teams are "one-off" implementations, and therefore the volume and importance of communications is huge. Implementing poor standards of communication is the cause of many projects failing.

Through the analysis of a number of narrowly focused research papers, Pettersen (1991) developed a list of predictors needed for project management success. Most of the predictors found were based on generic skills such as problem solving, interpersonal skills, teamwork skills, communication skills, negotiation skills, conflict resolutions skills and other personal qualities such as self-confidence, emotional stability and honesty. Administration skills were also mentioned and included organisational know-how and specialised knowledge.

A survey of 287 project managers was conducted to determine the personal characteristics, traits, or skills that make for above average project managers, as well as specific behaviours, techniques, or strategies that make above average project managers (Posner, 1987). An analysis of the results found that communication skills (including listening and persuading) were considered the most important. Others included team building skills, leadership skills, organisational skills, coping skills and technology skills.

The need for a new training paradigm is needed for project managers, as many organizations still "do not recognise how important project management is to success of their business activity" (Wysocki et al., 1995, p.8). Project managers need two levels of competencies, "At the visible level are skills that can be observed and can be acquired through training. That is the easy part. The more difficult are those traits that lie below the surface, out of the range of the visible" (p. 14).

Project managers must have excellent interpersonal skills, exceptional communication skills, and be adaptive to changes (Bailey & Ergott, 1998). They define communication with client, team and executive management as consisting of speaking, listening, writing and body language. This is also supported by Peters and Homer (1996) who maintain that people skills, teamwork, effective communication, leadership, planning, time management and continual learning are essential for successful projects.

Interpersonal communication is humanity's greatest accomplishment, and when done ineffectively can lead to loneliness, distance from friends, lovers, spouses, children as well as ineffectiveness at work: "Eighty percent of people who fail at work do so for one reason: they do not relate well to other people". (Bolton, 1987, p.7). He stresses that talking does not result in successful communication as many communication barriers can hinder personal and business relationships. Five clusters of communication skills are needed to promote effective human relationships in business and at home - listening skills, assertion/negotiation skills, conflict resolution skills and collaborative problem-solving skills.

Effective project managers require a "skills portfolio" of administrative, technical, inter-personal, business and political skills (Wateridge, 1997). From a summary of the literature, Wateridge deduced that leadership was perceived as the most important skill needed by project managers followed by planning, team building, communication and motivating team members as the major factors in delivering successful projects. This is also supported by research performed by Kliem and Anderson (1996) who advocate that applying project management tools, techniques, and knowledge of project management does not guarantee the success of a project. Key variants to managing projects successfully are the project manager's approach toward teambuilding, how they perceive their environment, how they respond to events, the manner in which they process information and how they interact with others.

Project management is mainly to do with people skills i.e. being able to get people from different organizations to talk to each other and work with each other is a key skill that is essential for promotion (Miller, 1999). In many companies around the world, managing directors and chief executive officers are now starting to realise that promotional attributes should be more closely aligned with people skills rather than technical project management skills. The focus for both researchers and project managers has traditionally been on technical project management techniques and the tools needed to improve the efficiency of projects. This is no longer sufficient; a project's success depends mainly on the right combination of people skills (Ayas, 1996).

When the findings of contemporary research into project management are aggregated, a number of skill groups appear to emerge. Table 4.1 provides such an analysis. It is important to note however that this list of generic skills cannot be considered prescriptive as the literature abounds with varying viewpoints and opinions as to which skills are most important for effective project management. This list of generic skills can be considered the most commonly referred to and cited by most authors as being required.

Table 4.1: Generic skills needed for project management

Skill	Description	Authors
Communicating with others	• Producing written reports which are clear and easy to understand • Speaking in a clear and thoughtful manner • Giving clear instructions and asking the right questions • Listening actively and with purpose • Performing effective presentations • Using the right body language	• Bailey and Ergott (1998) • Bolton (1987) • Frame (1999) • Jiang, Klein and Marguils (1998) • Johns (1995) • Peters and Homer (1996) • Posner (1987) • Verma (1996) • Wateridge (1997) • Zimmerer and Yasin (1998)
Using leadership and negotiation skills	• Motivating others, teambuilding and focusing on results • Satisfying needs and defending rights without dominating • Defending and justifying your views or actions • Giving and receiving constructive criticism • Using effective conflict resolution skills	• Frame (1999) • Kliem and Anderson (1996) • Peters and Homer(1996) • Posner (1987) • Verma (1996) • Wateridge (1997) • Zimmerer (1998)
Using collaboration and interpersonal skills	• Showing patience, empathy, honesty and sensitivity to others • Adapting to the needs of the team • Carrying out agreed tasks to the given deadlines • Respecting the views and values of others • Assisting and supporting others in their learning	• Ayas (1996) • Bailey and Ergott (1998) • Frame (1999) • Jiang, Klein and Marguils (1998) • Johns (1995) • Kliem and Anderson (1996) • Miller (1999) • Pettersen (1991) • Posner (1987) • Verma (1996) • Wateridge (1997) • Wysocki, Beck and Crane (1995) • Zimmerer (1998)
Using problem solving skills	• Using techniques to resolve conflicting project needs which satisfy all parties	• Frame (1999) • Kliem and Anderson (1996) • Pettersen (1991) • Wysocki, Beck and Crane (1995)

Skill	Description	Authors
Setting objectives, priorities, planning and tracking	• Identifying and setting key objectives/priorities • Planning and implementing a course of action • Organising sub-tasks and allocating to appropriate team members • Tracking progress and taking appropriate action if projects deviate	• Johns (1995) • Peters and Homer (1996) • Pettersen (1991) • Posner (1987)
Managing time and setting objectives	• Setting priorities to achieve personal objectives within a given timeframe • Estimating, tracking and scheduling time in order to complete these	• Johns (1995) • Peters and Homer (1996) • Pettersen (1991) • Posner (1987)

Generic Skills for Higher Education Graduates

An analysis of the literature described in the previous chapter suggests that a number of generic skills are essential for graduates from higher education (Table 2.3). These include:

- *Collaborating:* showing patience, empathy, honesty, sensitivity to others, adapting to the needs of others, supporting others, respecting others view and values;
- *Communicating:* expressing ideas and information in a clear and easy way to understand through oral, written and graphical means, giving clear instructions and asking the right questions, listening actively and with purpose;
- *Problem solving:* using problem solving techniques to resolve conflicting project needs which satisfy all parties
- *Learning to learn:* using own initiative to determine how best to complete tasks, deciding on what is needed to be learnt without being prompted by others, developing learning strategies to learn new material;
- *Using research skills:* using new technologies such as online databases and the Web, textbook, readers, library and other sources to locate relevant information in an efficient manner;
- *Analysing and synthesising information:* analysing and synthesising information in a critical fashion, and then using it appropriately;
- *Self-assessing:* assessing own progress in completing tasks relevant to self, assessing own progress in completing tasks relevant to the teams objectives in terms of time, quality and task completion; and
- *Peer-assessing:* assessing other team members contributions in terms of time, quality and task completion.

A Synthesise of Required Generic Skills – Higher Education and Project Management

Bennett, Dunne and Carre (1999) describe a framework that promotes the use of four broad areas to help define generic skills needed by graduates in higher education institutions (Table 4.2). They contend that generic skills can be related to four areas:

- Management of self - generic skills for managing self such as time management, communicating and taking responsibility for own learning;
- Management of others - generic skills for helping to manage others such as collaboration, negotiation and leadership;
- Management of information - generic skills needed to manage information effectively such as being able to access, collect and organise information from a variety of different sources; and
- Management of task - generic skills needed to manage tasks such as being able to effectively plan and implement a course of action, as well as solving problems.

Table 4.2: A framework for generic skill development (Bennett et al., 1999, p.78)

Management of Self	Management of Others
• manage time effectively • set objectives, priorities and standards • take responsibility for own learning • listen actively and with purpose • use a range of academic skills (analysis, synthesis, argument etc.) • develop and adapt learning strategies • show intellectual flexibility • use learning in new or different situations • plan/work towards long-term aims and goals • purposefully reflect on own learning • clarify with criticism constructively • cope with stress	• carry out agreed tasks • respect the views and values of others • work productively in a cooperative context • adapt to the needs of the group • defend/justify views or actions • take initiative and lead others • delegate and stand back • negotiate • offer constructive criticism • take the role of chairperson • learn in a collaborative context • assist/support others in learning
Management of Information	**Management of Task**
• use appropriate sources of information (library, retrieval, systems, people etc) • use appropriate technology, including IT • use appropriate media • handle large amounts of information • use appropriate language different activities • interpret a variety of information forms • present information/ideas competently (orally, in written form, visually) • respond to different purposes and audiences • use information critically • use information in creative ways	• identify key features • conceptualise issues • set and maintain priorities • identify strategic options • plan/implement a course of action • organise sub-tasks • use and develop appropriate strategies • assess outcomes

The skills shown in each of the four categories only serve as examples, rather than a "rigid set of skills to be achieved in each university department" (Bennett et al., 1999, p. 77). There are a number of commonalities within the generic skills described by the various stakeholders under each of the four headings outlined by Bennett, Dunne and Carre (1999).

Many of the skills identified as being important for higher education graduates are complimentary to those identified as being necessary for graduate project managers. These include interpersonal skills, communication skills, collaboration skills and problem solving skills. Table 4.3 provides a summary of eleven generic skills that represent those skills portrayed as essential for all higher education graduates, but tailored to students undertaking studies in project management for multimedia development.

Table 4.3: Generic skills targeted in this study

Category	No	Skill	Description
Management of Self	1	Managing time and setting objectives	• Setting priorities to achieve personal objectives within a given timeframe • Estimating, tracking and scheduling time in order to complete these
	2	Taking responsibility for own learning	• Using own initiative to determine how best to complete tasks • Deciding on what is needed to be learnt without being prompted by others • Developing learning strategies to learn new material
	3	Self-assessment	• Assessing own progress in completing tasks relevant to self • Assessing own progress in completing tasks relevant to the teams objectives in terms of time, quality and task completion
Management of Others	4	Leadership and negotiation skills	• Motivating others, teambuilding and focusing on results • Satisfying needs and defending rights without dominating • Defending and justifying your views or actions • Giving and receiving constructive criticism • Using effective conflict resolution skills
	5	Collaboration and interpersonal skills	• Showing patience, empathy, honesty and sensitivity to others • Adapting to the needs of the team • Carrying out agreed tasks to the given deadlines • Respecting the views and values of others • Assisting and supporting others in their learning

Category	No	Skill	Description
	6	Communicating	• Producing written reports which are clear and easy to understand • Speaking in a clear and thoughtful manner • Giving clear instructions and asking the right questions • Listening actively and with purpose • Performing effective presentations • Using the right body language
	7	Peer-assessment	• Assessing other team members contributions in terms of time, quality and task completion
Management of Information	8	Research skills to locate information	• Using online/Web, textbook, readers, library and other sources to locate relevant information in an efficient manner
	9	Analysing and synthesising information	• Analysing and synthesising information in a critical fashion, and then using it appropriately
Management of Task	10	Using problem solving skills	• Using techniques to resolve conflicting project needs which satisfy all parties
	11	Task management	• Identifying and setting key objectives/priorities • Planning and implementing a course of action • Organising sub-tasks and allocating to appropriate team members • Tracking progress and taking appropriate action if projects deviates • Assessing the overall success of task or project outcomes, when complete, for your team and other teams.

Summary

It is difficult to create a prescriptive set of generic skills needed by graduates for all courses. Different employers, higher education institutions, departments and lecturers all have different requirements and views about what generic skills are, which ones are required and how they should be taught. However, the analysis of contemporary views on generic skills discussed in this chapter suggests that the generic skills outlined in Table 4.3 are those most valued for higher education graduates in the field of multimedia project management.

4.2 Course Design Methodology

Using the design methodology outlined in Chapter 3 (Figure 3.3) learning tasks, learning supports and learning resources became the basis of the design process for this study. The intent was to provide a range of learning activities based on the principles of authenticity, self-regulation and reflection using online technology to support the face-to-face delivery. These activities were carefully chosen to achieve the desired learning outcomes and help learners actively engage with learning materials within an authentic setting that required collaboration, self-direction and reflection, with a view of promoting knowledge construction (Table 4.4). It was intended that learners be required to make their own decisions about which activities they would perform, share ideas and then actively reflect on the results.

Authenticity would be promoted in the materials through project work based on "real" client needs that required a web site to enhance productivity. Student teams would be required to liaise with clients to develop a project proposal, design specification and then develop a web site. As in "real" project scenarios these teams would be required to cost, schedule and track these projects, reporting any discrepancies. It was also intended that students would be required to develop documentation that had direct relevance in the industry for quality assurance and costing web sites to aid in future multimedia development work. The final product and documentation would be hosted on a university server for students to use as an electronic CV to enhance their employment opportunities.

Self-regulation would be promoted by allowing students to make free and open choices about a range of different issues, including project topic, team members, their team roles and responsibilities. This would enable students to make decisions about what skills they wanted to focus on and develop. These would be negotiated at the beginning of the semester through contracts with peers, clients and tutor.

Students would also be encouraged to continually reflect on their progress through a range of different activities. Online reflective journals would monitor self and peer assessment by having all students reflect on their performance. This would be performed at two levels: within their own team (intra-team), and for other teams' work (inter-team). These assessments would then require students to allocate marks and justify their viewpoints with constructive feedback. Discussion and reflection would also be encouraged through online bulletin boards that would allow students to review ideas and criticisms with a wider audience.

Table 4.4: Designing the online learning environment

	Learning Tasks	Learning Supports	Learning Resources
Authentic	Tasks that are contextual, meaningful, ill-defined, involving collaborative effort and are perceived as having real world relevance outside the academic setting eg: • Developing a multimedia product based on solving the needs of a "real" client. Final product hosted on university server as a CV item	Support for students to build expertise and knowledge through authentic activities eg: • Variety of project briefs, presentations and information helping to describe client needs • Online summary of student profiles, skills and interests to assist in team formation • Tutor advice on time needed for each task and responsibilities	A variety of authentic resources to provide a range of perspectives eg: • Online samples of past student projects • Multiple employer perspective's presented through streaming video • Metrics used in industry for estimating time • Online quality assurance procedures and templates • Server space for hosting projects and storing documentation
Self-directed	Tasks that allow students to make their own decisions for range of different tasks eg: • Negotiating contracts for project topic, team members, role, duties and time	Academic support, library support, counselling and online support to help task delivery eg • Online application summarises student skills and interests for team matching	A variety of self-directed learning resources to help students develop skills eg • Weekly online "Briefs" outlining items to complete. Students free to choose most relevant for their needs
	• Creating solutions to variety of tasks - posted to an online area for assessment and feedback	• Online tutorials with a variety of graded exercises. Students decided which they needed to complete • Modelling by tutors in first 3 weeks show how to post solutions and assess others work	• Online resources covering each weekly topic – includes slides, templates, videos and URL's • Book and readers • A range of job selection criteria and online job advertisement for multimedia developers
Reflective	Tasks that encourage reflection and provide feedback eg • Weekly journal entries for self and peer assessment (Intra) • Weekly assessment of three other teams' solutions (Inter) • Reflective reports	Feedback support mechanisms that are responsive and sensitive to student needs eg: • Tutor led peer assessment sessions • Online communication, feedback and discussion with tutor and peers through bulletin boards	Resources that help students monitor their own and peers' efforts eg online applications for: • Assessing self and peers • Comparing actual against estimated time • Comparing actual against promised deliverable's

These learning activities were to be promoted through a combination of project activities, task-based learning strategies and face-to-face lectures in an attempt to support knowledge construction. The learning environment would attempt to promote "scaffolded inquiry", rather than unconstrained discovery through a combination of active exploration and listening to a lecture (Cognition and Technology Group at Vanderbilt, 1992, 1996, 1997; Schwartz & Bransford, 1998).

As shown in Figure 4.4, and reflected in the unit syllabus (Appendix 2), the overall learning design of the learning environment was based on these principles.

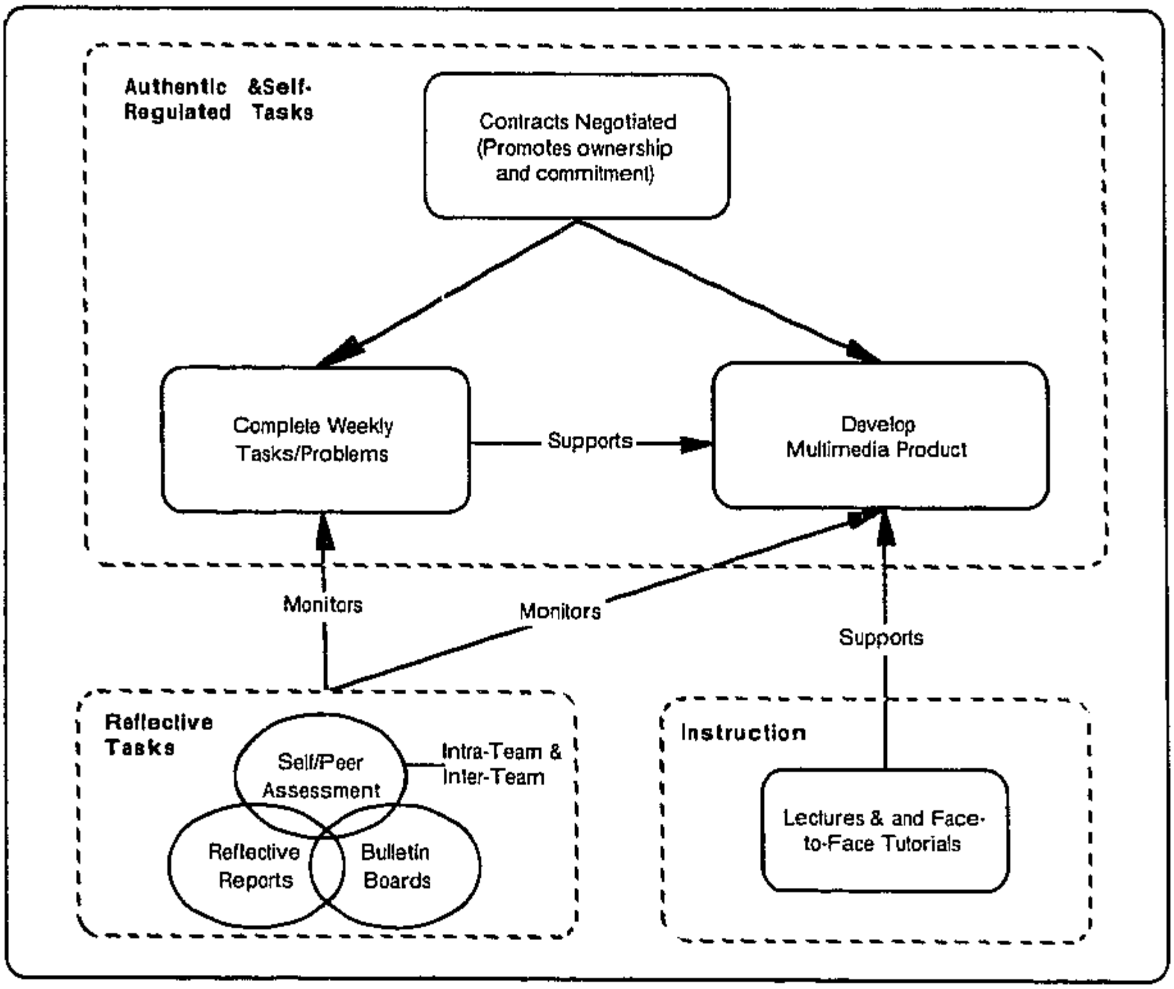


Figure 4.4: Overall learning design

4.3 Web-Based Course Management System

Based on the design methodology, a web-based course management system was designed and developed (JoePM). The main interface metaphor was based on an office that supported all the required learning tasks, resources and supports (Figure 4.5).

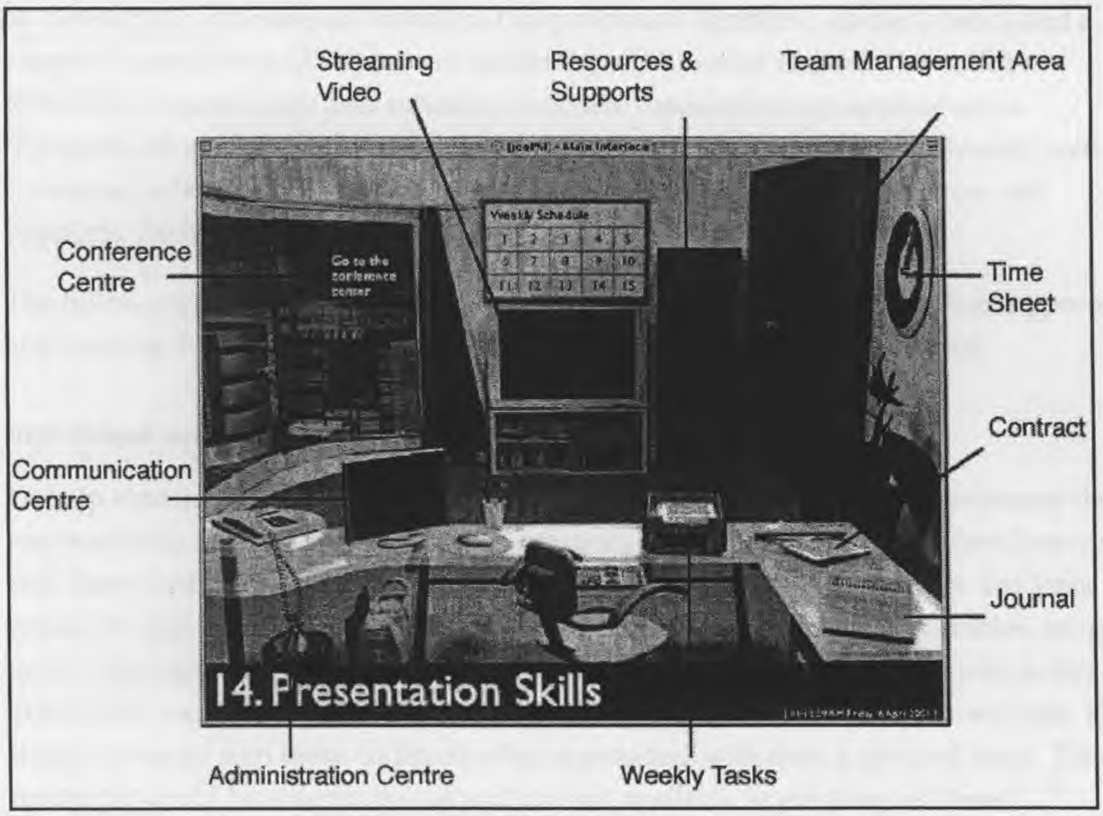


Figure 4.5 Main user interface (JoePM)

The online application was designed using an office metaphor as the main graphical interface. The icons were designed to try and draw on the users' existing knowledge to help reduce cognitive load when using the interface, as advocated by Apple's User Interface Guidelines "Use concrete metaphors and make them plain, so that users have a set of expectations to apply to computer environments" (Apple Computer Inc., 1987, p. 21).

The notion of using metaphors to help users construct mental models has been advocated by many researchers (Norman, 1983; Preece et al., 1994). Interface design principles represent beliefs that should be used to guide design. Three interface principles advocated by Mandel (1997) include:

- Placing users in control of the interface. Strategies include displaying descriptive messages, allowing users to quickly change their focus and providing meaningful paths and exits;

- Reducing users' memory load. Strategies include relying on recognition and not recall, providing visual cues and using real-world metaphors; and
- Making the interface consistent. Strategies include maintaining consistency across the product, providing aesthetic appeal, integrity and encouraging exploration.

In designing the office metaphor for this application these principles were adhered to by developing an online environment that promoted flexibility, learner control and a range of interactive tasks that were authentic, self-directed and reflective. These included contracts, self/peer reflective journals, timesheet entry application, a communication centre with bulletin boards and prototype viewing area, weekly tasks, streaming video showing industry employers, and a wide range of resources and supports. Each of these is considered below.

The following section demonstrates how each of the learning tasks, learning supports and learning resources were implemented as part of the online environment.

Individual and Team Contracts

To help students take ownership of the learning process and clearly communicate their responsibilities, it was decided to have students complete *Individual Student Contracts* and *Team Contracts* at the beginning of the semester. Using these contracts, students would be able to negotiate their team roles, major responsibilities, deliverables, project topic, client and also estimate the amount of time they would commit as well as the grade they were aiming for. As proof of their commitment to perform these duties, all students would sign these contracts after negotiating with their peers and tutor. These contracts would be entered online and always available as evidence of stated commitments with the following details:

- Project topic, client name and team member names?
- Your team role, estimated time and major deliverables? (Table 4.5)
- Are you prepared to put in extra time (more than 120 hours – unit requirements) to get a good product that can be used as part of your CV?
- What grade will you be aiming for C, CR, H, HD?
- List specific procedures you will implement in order to effectively collaborate and contribute as a valued team member

Table 4.5: Individual team contract - estimated time and major deliverables

Assessment	Estimated time over semester	Major Deliverables
Weekly Tasks/Problems		
Project Proposal		
Design Specifications		
Production		
PM Procedures		
Final Report		

When each student had completed their individual contract, team members and the tutor would negotiate tasks, times and objectives nominated by individuals to ensure that they were fair and reasonable for each member in the team. After these negotiations, the team contract would then be signed (Figure 4.6)

Team Contract

Team Name:____________________________________

We the undersigned agree that the roles, tasks and times allocated in all the individual team members' contracts are acceptable, that is, the team has:

- allocated suitable tasks for individual roles within the team;
- correct time allocation for tasks; and
- have created a collaborative team environment in which the team will be able to successfully complete the objectives of this unit.

Team Member 1: Name____________________: Signature:________________

Team Member 2: Name____________________: Signature:________________

Team Member 3: Name____________________: Signature:________________

Team Member 4: Name____________________: Signature:________________

Tutor Name____________________: Signature:________________

Figure 4.6: Team contract

The online application would be designed to reflect these features (Figure 4.7). However, once the students entered their information, they would be unable to then makes changes – as expected from a "real" contract.

Team Member Contracts Close

Student Contract: Mr Bloggs

Project Title: On-line CV
Project Concept: To design a web site that demonstrates what NewMediaCowboys can provide, the skills and qualifications of its team members, company profile and mission statement.

Commitment, Project Topic & Team Role

It is important that you select a team that is prepared to commit the same amount of effort as you. To help you choose team members, answer the following questions:

(1) Are you prepared to put in extra time (more than 120 hours- unit requirements) to get a good product which can be used as part of your CV?

whatever is needed to gain success

(2) What grade will you be aiming for C,CR,H,HD? (***HD***)

(3) Student Role: ***Project Manager***

(4) Student Responsibilities: *Research resources Scheduling to maintain time management and completion of project milestones Co-ordinate team members to deliver required tasks on time Maintaining quality Communication with team and client*

Managing Time & Scheduling

Estimate how many hours your will put into completing the tasks shown in this table. (You are required to put in a minimum of 120 hours - compare these to your team member's totals). Also, include the deliverable's you will produce for each activity.

		Estimate total time commitment (over 15 weeks)	Major Deliverable's (up to 3 points)
Ass 1	Weekly Activities	26	read and contribute to the weekly tasks and submissions
Ass 2	Project Proposal	32	Executive summary, major objectives, scope, content overview
	Design Specifications	10	To oversee the specifications to ensure everything has been addressed
	PM Procedures	16	Reflect on how I have met the commitments that I proposed in the beginning and how it turned out
Ass 3	Production	10	Again to oversee that quality issues have been met and overall requirements have been addressed
	Final Report	32	All information to be collated and put into presentation format ready for submission. Ensure all areas have been addressed.
	PM Procedures	16	A final reflection of how I performed within the group, and how I thought this unit went, what I could have done differently and how we worked as a team.
	Total:	142	

Group-Work

List specific procedures you will implement in order to effectively collaborate and contribute as a valued team member.

Resource information, communicate with the team to pass information. Make sure everyone is happy with their roles and understands exactly what they are expected to do.

Figure 4.7: Online student contract

Another online support designed to help students make decisions about the suitability of their team members, was the "Personal/Team Profile" area supported by the online application (Figure 4.8). This feature sought to enable students to enter their interests, experience, background and hobbies to enable other students to get a profile of others to help in select their team members.

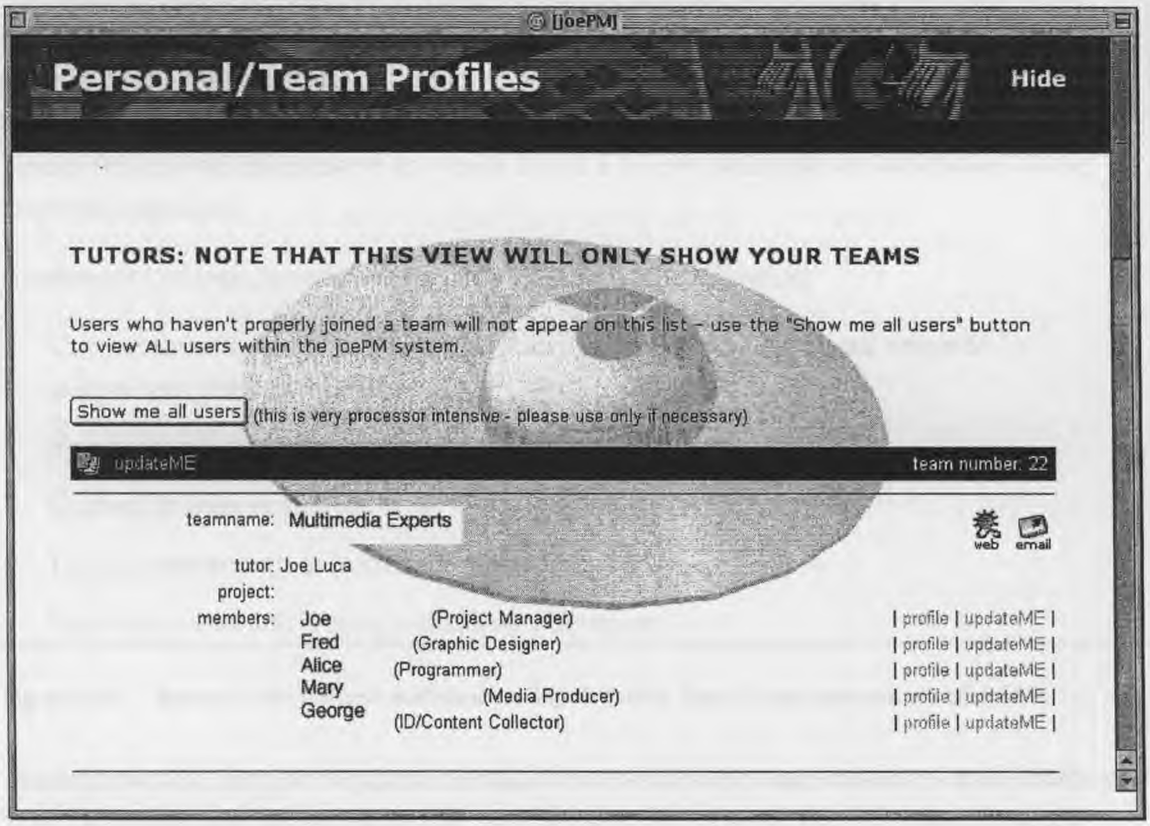


Figure 4.8: Personal and team profiles

Weekly Tasks/Problems

The site was designed to encourage students to engage and interact with the unit content through a range of weekly tasks. These were designed to reflect authentic situations, as they would also occur in the industry (Figure 4.9). These tasks would represent thirty percent of the overall marks and consist of ten assessment items.

Weekly Tasks

Commencing in week 3, students will be required to undertake research and inquiry on a given task with their team. The tasks appear in the "In-Tray" of JoePM and are central to the focus of this unit. Students must collaborate with their team and use the relevant resources in order to develop solutions to these tasks. Decisions need to be made about what resources to use and also which team members will complete various aspects of the task, and what "angle" is taken in solving the problem. Completed tasks are then posted to the "Conference Centre" and assessed by other teams and tutors. Tutors will model the process in weeks 2 and 3 to give students an indication of the required standard.

Assessment criteria for answers will be based on the following:

- Correct focus in answering the question, with relevant facts and research supporting your perspective;
- Synthesis of ideas into a cohesive solution;
- Correct grammar and spelling;
- Proper referencing of information sources; and
- Must be under 400 words, excluding references.

Figure 4.9: Extract from the unit outline showing "Weekly Tasks" and assessment criteria

Students would then be required to collaborate with their team members and decide on how best to collect information and synthesise it into a solution. The weekly tasks would be designed to reflect the weekly topic being covered in the lectures, and would be closely aligned to industry situations (Table 4.6). In the first three weeks it was planned that tutors would model the process by:

- Brainstorming the scope and approach needed for the solution;
- Considering a variety of information sources such as books, readers, industry representatives, experts, Web and other online resources;
- Synthesising a solution into less than 400 words; and
- Referencing correctly; and
- Assessing the solutions of three other teams - grade and comment.

Table 4.6: Extract from the unit outline showing the weekly tasks

No	Title	Task Description
1	Introduction	Students are required to become familiar with JoePM
2	Team Issues and Basic QA	What strategies would you recommend your team adopt to ensure deadlines are met and all tasks are performed satisfactorily by all team members and to the required standard? (400 words or less). **NOTE: Students are NOT required to do this task. It will be done/demonstrated by the tutors, to help students understand the process of using the "Conference Centre" ie posting solutions and assessing others.
3	Financial Management	All project managers struggle to keep within budget over the life cycle of a project. Discuss/prioritise three procedures that you consider essential for your team to follow in order to help with budgeting. How can Excel be used to help with this? (400 words or less)
4	Project Proposal	In order of priority, describe what you consider to be the most important aspects of a project proposal (give reasons). Remember that the producer and client both need to sign this document (less than 400 words)
5	Scheduling and PM Models	In order of priority, outline what you consider to be the essential procedures needed to effectively track the progress of a project
6	Design Specs	Developing a design specification that is clear, and satisfies the needs of both client and producer can be difficult to produce. Outline your strategy for developing a design specification that you believe will be effective and help the whole project progress smoothly with no surprises for the client or end-users (400 words or less).
7	Evaluation	How will you integrate evaluation in your overall PM methodology? What do you consider are key criteria in the process that will really make a difference to the final quality of your product? (400 words or less).
8&9		Student Free Weeks
10	Production	When you are in the production phase, how will you ensure that you keep to budget, time and agreed quality? (400 words or less)
11	QA	Almost all teams experience difficulties in handling documentation and production standards eg working with old versions of documents, coping with clients who change their minds etc. Outline the key QA elements that you will implement in your project methodology to ensure "quality" documentation and standards (400 words or less).
12	Legal Issues	Legal contracts are important for any multimedia production. Using key headings, develop a Client/Developer "legal template" that covers essential legal areas needed in any multimedia production
13	Hand-over	What issues need to be considered (in order of priority) in the final phase of the project's life cycle? (400 words or less).
14	Presentation Skills	Outline in order of priority what you consider are essential aspects of performing a presentation that would impress clients in a large audience
15	Presentations	Student teams present their web sites and metrics

The process shown in Figure 4.10 illustrates the design methodology that would be used to develop the "Conference Centre" learning activities. The design promoted each of the three learning principles – authenticity, self-regulation and reflection to help encourage the development of students' generic skills, through deep and meaningful learning approaches to learning.

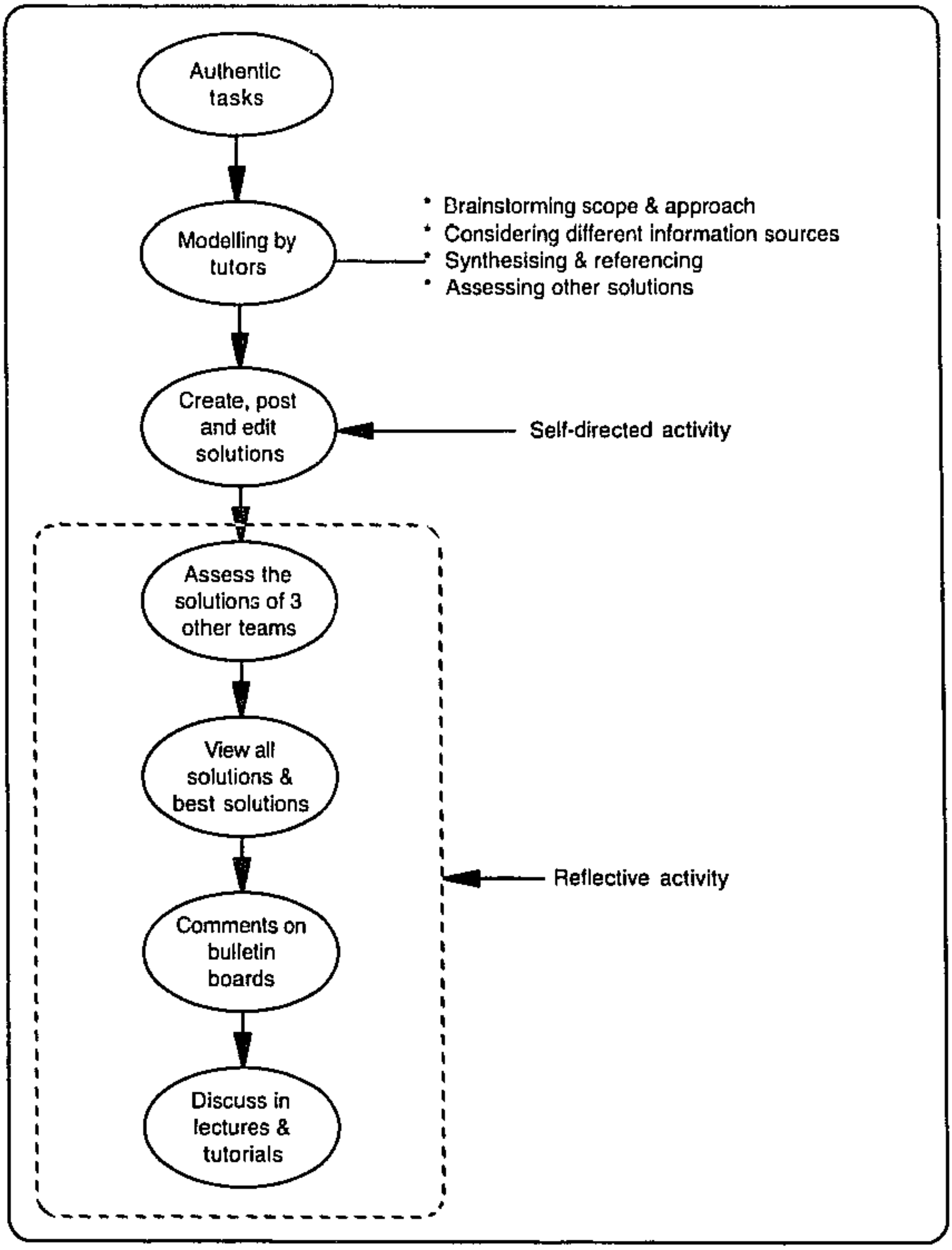


Figure 4.10: Design process used to develop "Conference Centre" activities

The "Conference Centre" was intended to allow students to post solutions, edit solutions, assess other teams' solutions, view all solutions, and view the best three solutions graded by mark (Figure 4.11). Each of these features are discussed in the section below.

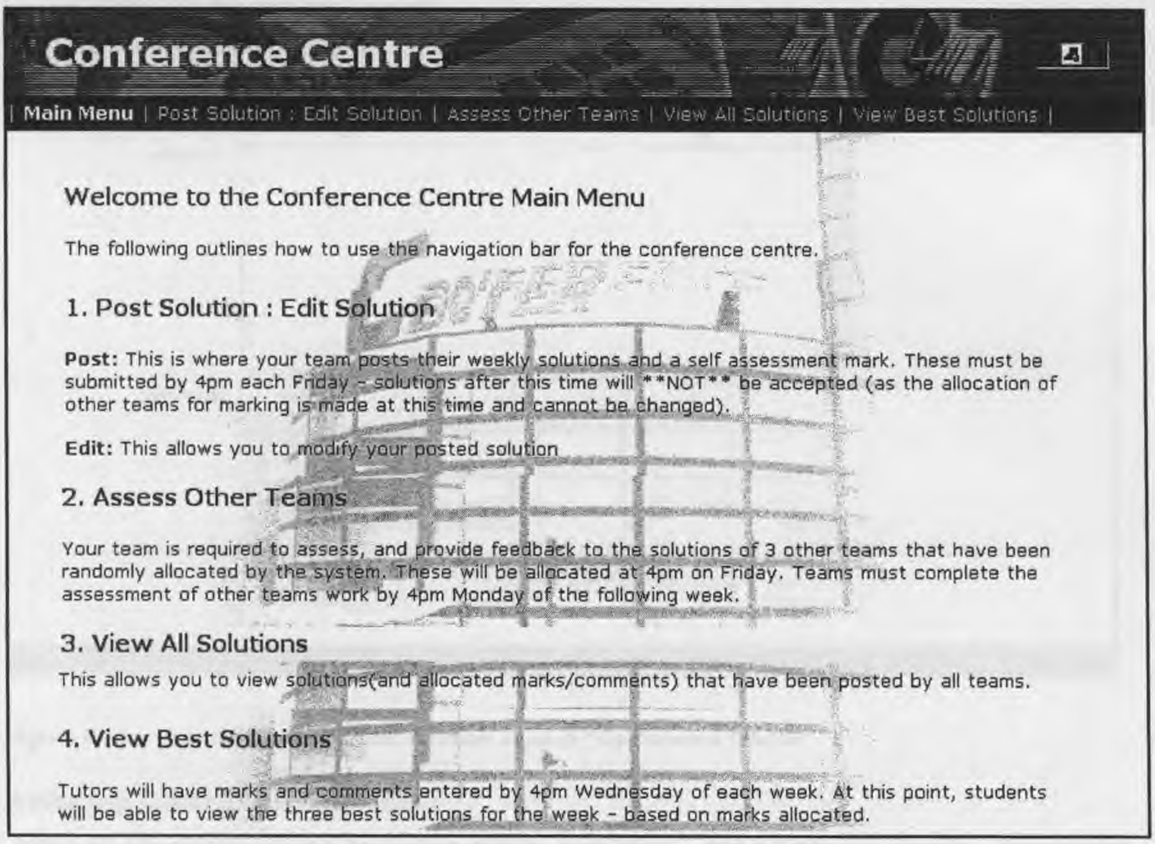


Figure 4.11: Main "Conference Centre" screen

Post Solution, Edit Solution

Each week students would be required to submit solutions to the weekly problems using the online *Conference Centre* (Figure 4.12). The online system would then terminate the *Post* option for that week. Solutions would be required to be fewer than four hundred words in length, and could be formatted using HTML tags. At this stage students would give themselves a self-assessment mark based on the following scale:

1 = no or weak effort

2 = poor or below average

3 = ok or average

4 = good or above average

5 = excellent or high standard

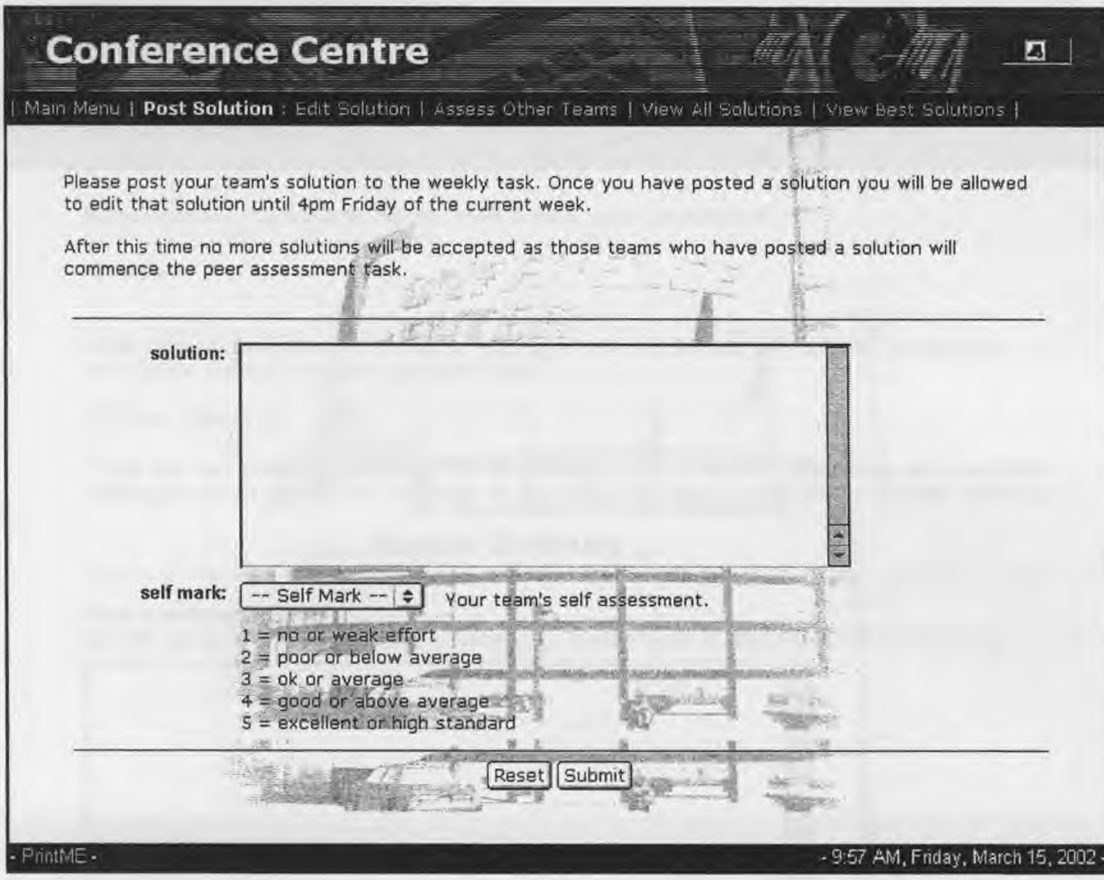


Figure 4.12: Post solution and edit solution area in "Conference Centre"

Assessing Other Teams' Solutions

After all the submissions had been made, the "Post" option would deactivate and the online system would randomly allocate three teams for marking (Figure 4.13). These would be made anonymously so teams would be unaware of the identities of other teams to avoid any possible bias or favouritism when assessing the solutions.

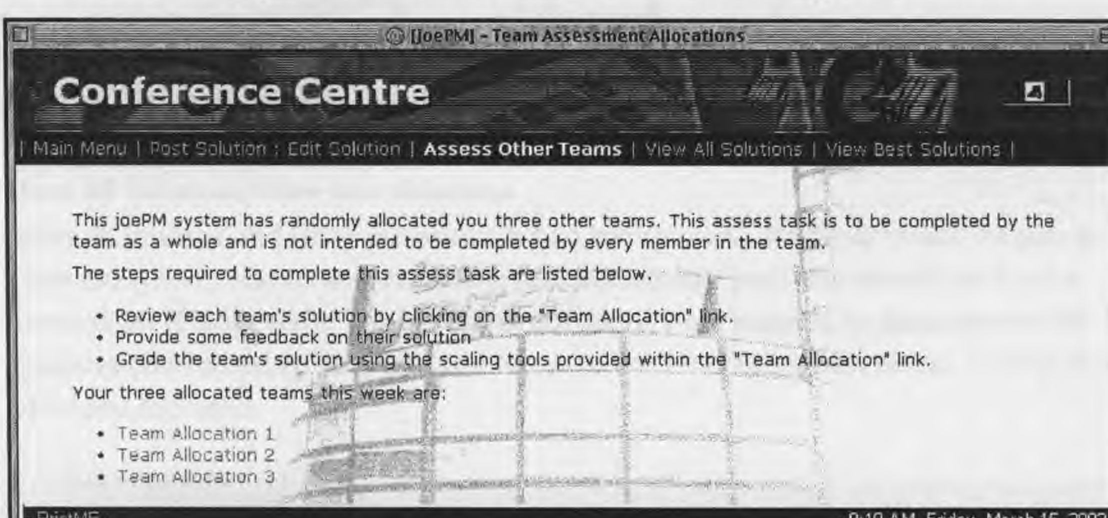


Figure 4.13: Assessing three other solutions

Students would then be required to read the solution, give feedback and allocate an assessment mark (Figure 4.14)

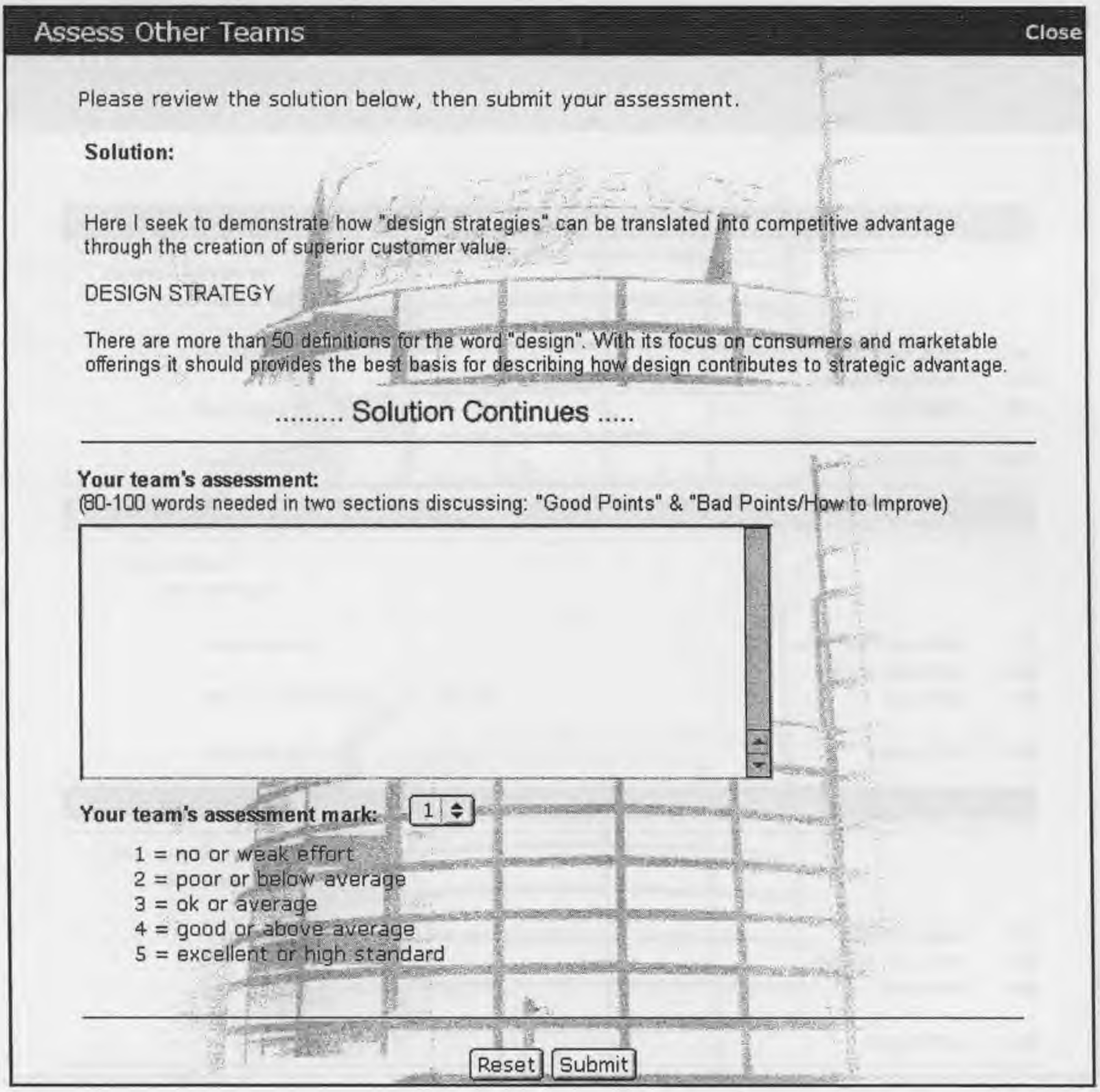


Figure 4.14: Assessing other students' solutions

View All Solutions/View Best Solutions

After all student and tutor assessments had been posted, students would be able to view everybody's solutions, including self-assessment, peer assessments and tutor assessment (Figure 4.15). The best three solutions were isolated to demonstrate the qualities considered by students and tutors to warrant the highest marks. Information provided included:

- The solution;
- The team's self mark;
- Peer marks and comments from three other teams;

- The tutor's mark and comments; and
- A scaled total mark out of 3%.

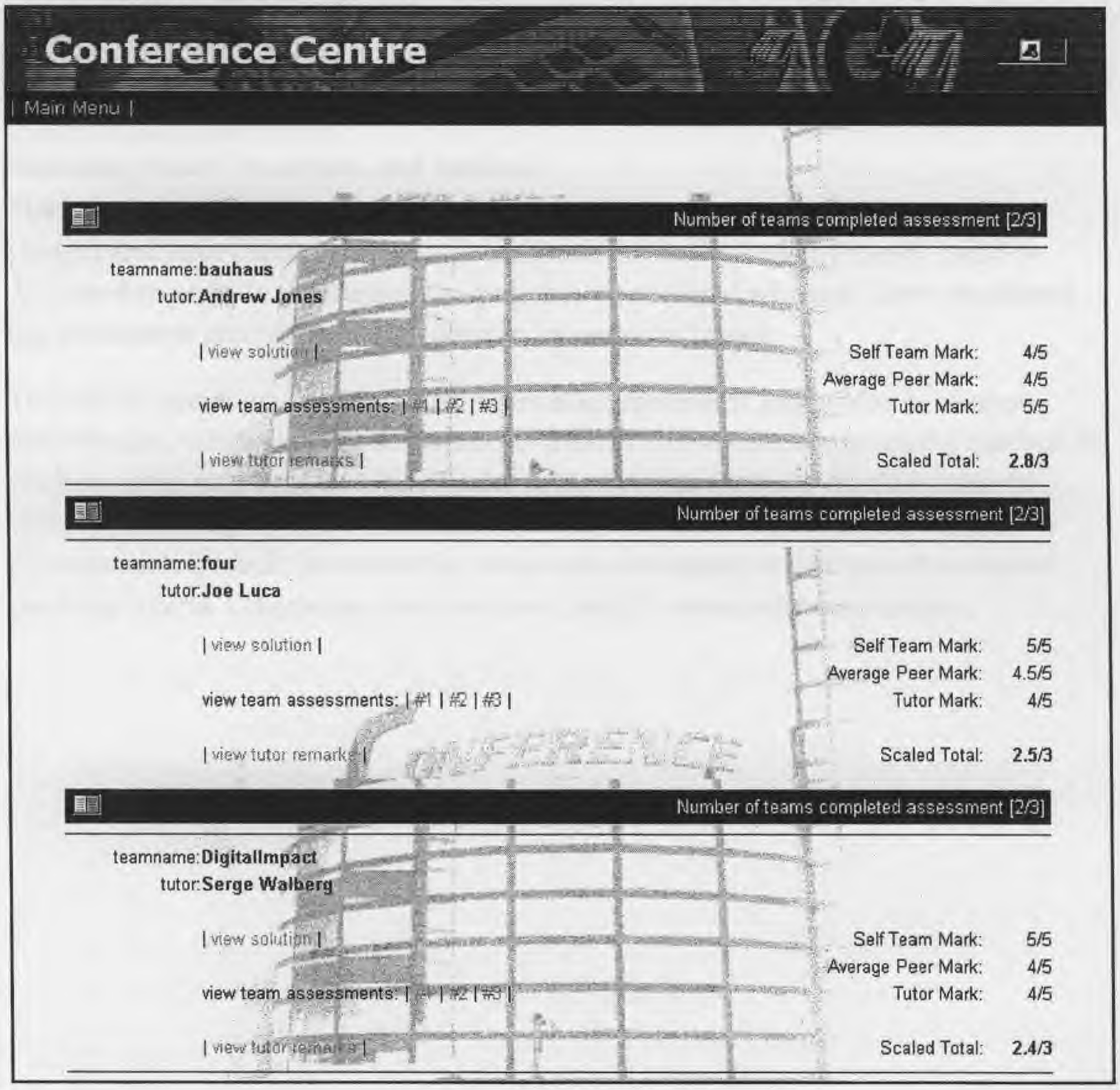


Figure 4.15: Viewing the best solutions

Discussing Results on the Bulletin Boards

The bulletin board was intended to allow students to freely make comments about the rigour and consistency of the given assessments. Comments could be made anonymously when addressing delicate issues, though the tutors would be aware of student identities to help avoid any misconduct (Figure 4.24).

Discussing Results in Lectures and Tutorials

The best three solutions could be discussed in lectures with consideration given to student and tutor comments. Also, comments made in the bulletin boards could be discussed to provide alternative viewpoints from students who may have considered the assessment given by other students to be unfair or biased.

The online system was designed to present tutor comments and grades in an open environment, which would allow students from different tutorial groups the freedom to see how other tutors graded their students. As a result, students would be able to quickly and easily compare marking standards between different classes. In this environment, it would be critical for tutors to be consistent in their use of consistent marking criteria. Otherwise, much criticism could be attracted from students.

Project Support

The planned learning resources, supports and tasks were focused on supporting multimedia development skills through the effective use of project management principles. The design of the learning environment promoted the development of skills by having students develop a multimedia product for a client. It was planned to make the project component worth 45% of the overall unit assessment and consist of a range of assessment items similar to tasks performed in industry that would include:

- Project proposal (Figure 4.16) and design specification;
- Multimedia product development;
- Evaluation study;
- Planning, scheduling and costing;
- "Post Mortem"; and
- Presenting results to a large audience.

Project Proposal (Team - 15%)

Each of the following are to be written in a professional manner, worthy of industry standard as for a "real" client in a paid job!

- Executive Summary - includes client objectives, team members and roles, why you are the best for the job and an overview of the proposal;
- Needs analysis, purpose/rationale and major objectives;
- Feasibility issues - **Implementation and maintenance issues**, perceived problems, risk analysis matrix, company support, client resources (SME's, end users), technical difficulty given the available resources available, and overall feasibility of the job;
- Scope of the project;
- Content overview - collection issues, concept map, perceived problems in collecting, sources, cost in collecting, legal issues, time needed to collect and tracking of collected sources;
- Schedule and milestones (GANTT, PM Model and categories);
- Budget - estimated cost and resources needed; and
- Legal and contract issues, such as copyright of content, IP of code and graphics, educational software issues, rights to have name in credits, scope creep, acceptance criteria and other relevant criteria peculiar to your project.

Figure 4.16: Sample assessment item - project proposal

All these assessment items would be combined into an electronic portfolio, entered through the online application (Figure 4.17), which would then reside on a university server to promote their skills to industry.

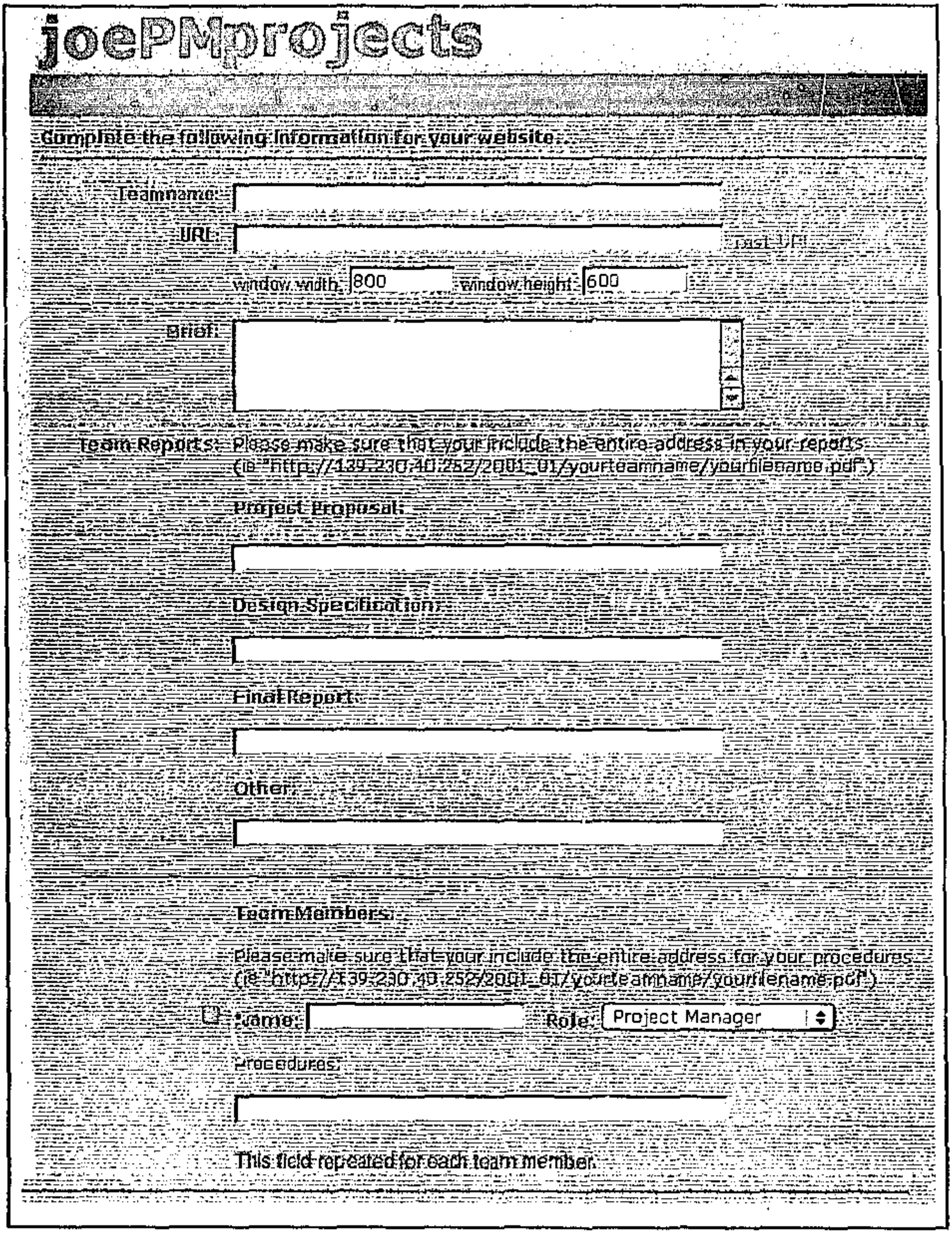


Figure 4.17: Database entry for electronic portfolio

Self/Peer Assessment

Self and peer assessment was to be implemented through the use of online weekly journals. These would be designed to assist students and tutors distribute marks if team members didn't contribute to team responsibilities in a satisfactory manner. It was intended that the design of the learning environment would encourage students to proactively reflect on their own and their peers' contributions. In another setting, some students may not contribute equitably to team activities, but still share the same mark!

No direct assessment was to be given to students completing these journals. However, it was intended that if effort were to be balanced fairly against marks, then these journals would have to be completed each week. They would be designed to allow quick entry and be confidential to the tutor. Students who did not to complete these journals might find it difficult to defend the re-allocation of marks, or request mark re-allocation.

Self and peer assessment strategies were designed at both team level and between teams (Figure 4.18). These would be based on agreements negotiated between students in the contracts. The primary activities were the weekly tasks, and the development of a team web site. These are each discussed below.

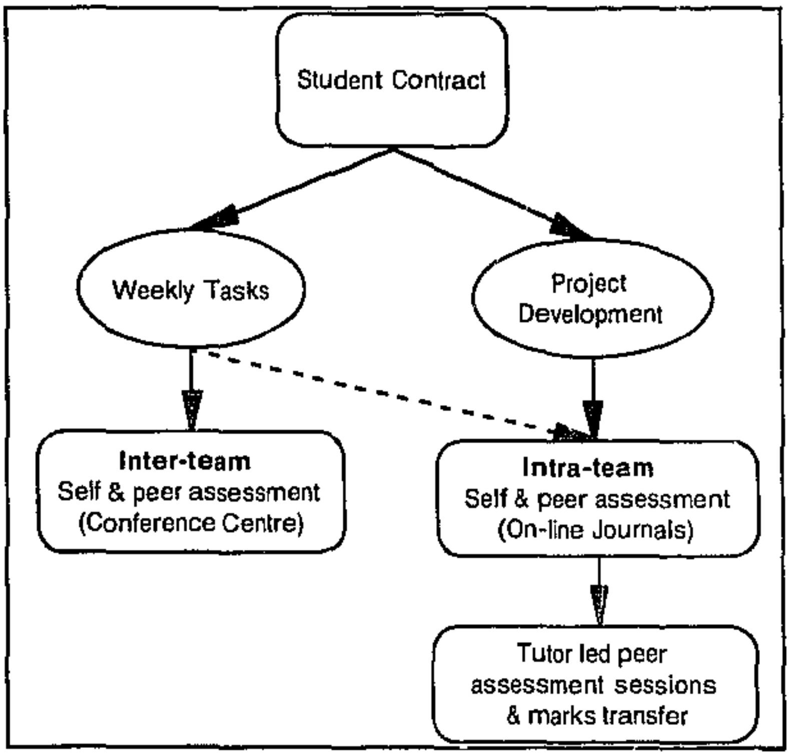


Figure 4.18: Self and peer assessment strategies

Intra-Team Self/Peer Assessment

All students would be required to fill out weekly online journals and comment on their own and team members' progress. As shown in Figure 4.19, the main screen in the online application included:

- View progress - provided a summary of time entries for the week, and a comparison to the original estimates and promised deliverables;
- Self assessment - required students to assess your their performance during the week by giving consideration to the amount of time committed, the quality of the outcome and the success in completing the deliverable's;
- Peer assessment – required students to assess the performance of team members in achieving the expected deliverable's in terms of time and quality.

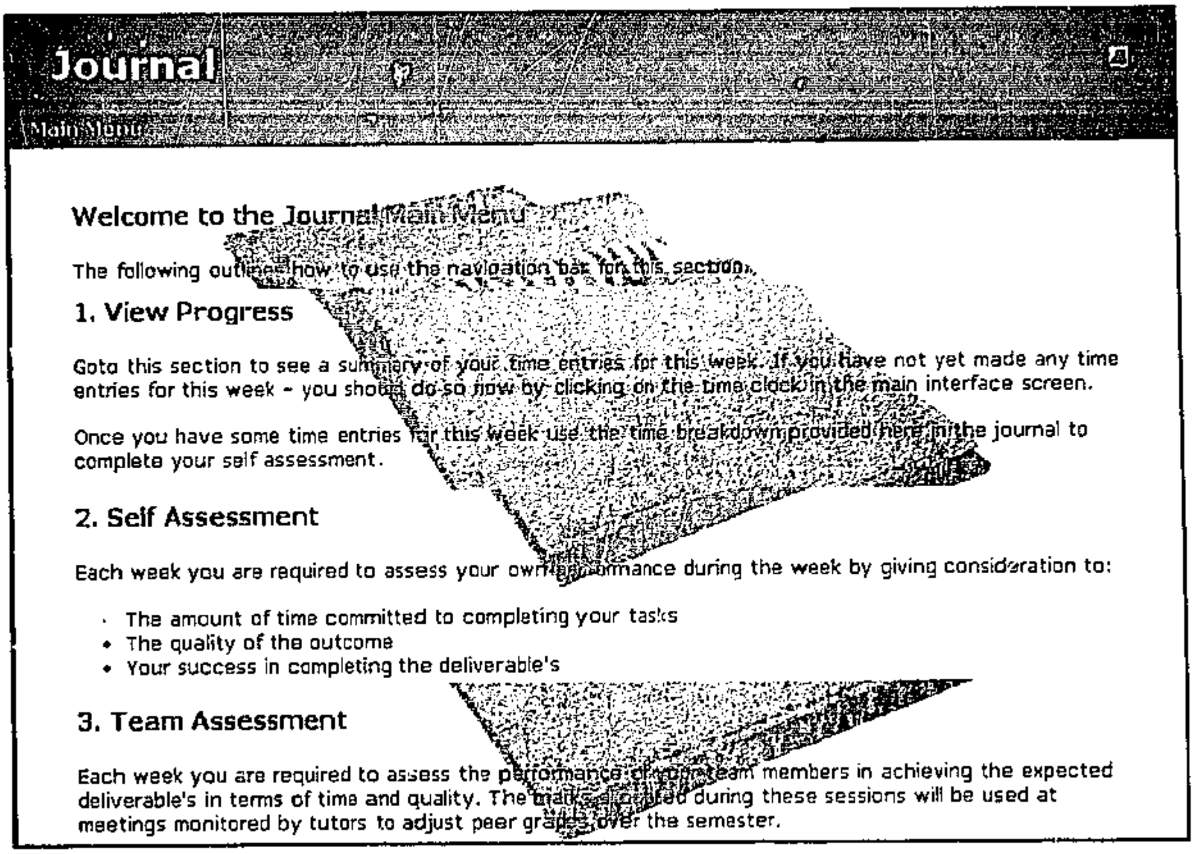


Figure 4.19: Self and peer assessment strategies

To help students consider how successful they had been in achieving their commitments, a "View Progress" option would be provided to allow the comparison of original estimates of planned hours for promised deliverables against the actual hours and deliverables. Once completed, students would be able to complete self and peer assessment components. Students could view their comments through a summary report by selecting the appropriate week (Figure 4.20).

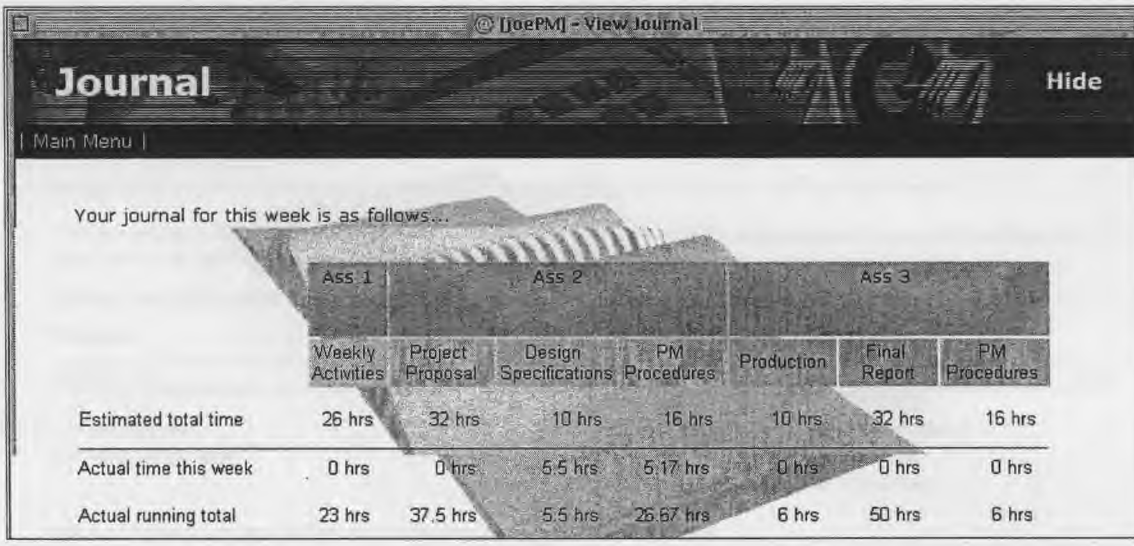


Figure 4.20: Supporting self-assessment: "View Progress" option

Using the above information to consider how effective they had been in completing their tasks, students would then use the self-assessment instrument (Figure 4.21). Students would rate their success in completing allocated tasks according to three scales:

- Success;
- Quality; and
- Time.

This would be complemented with a comment discussing their performance or giving any reasons for non-performance. Finally, students would be required to enter tasks they needed to complete for the following week.

The application was to be designed to allow other team members to see this self-assessment, that is, both tutor and peers would be privy to self-assessment information. Students would be required to complete this assessment before being permitted to perform peer assessment. In this way, peers would have more information from which they could draw conclusions about peer performance.

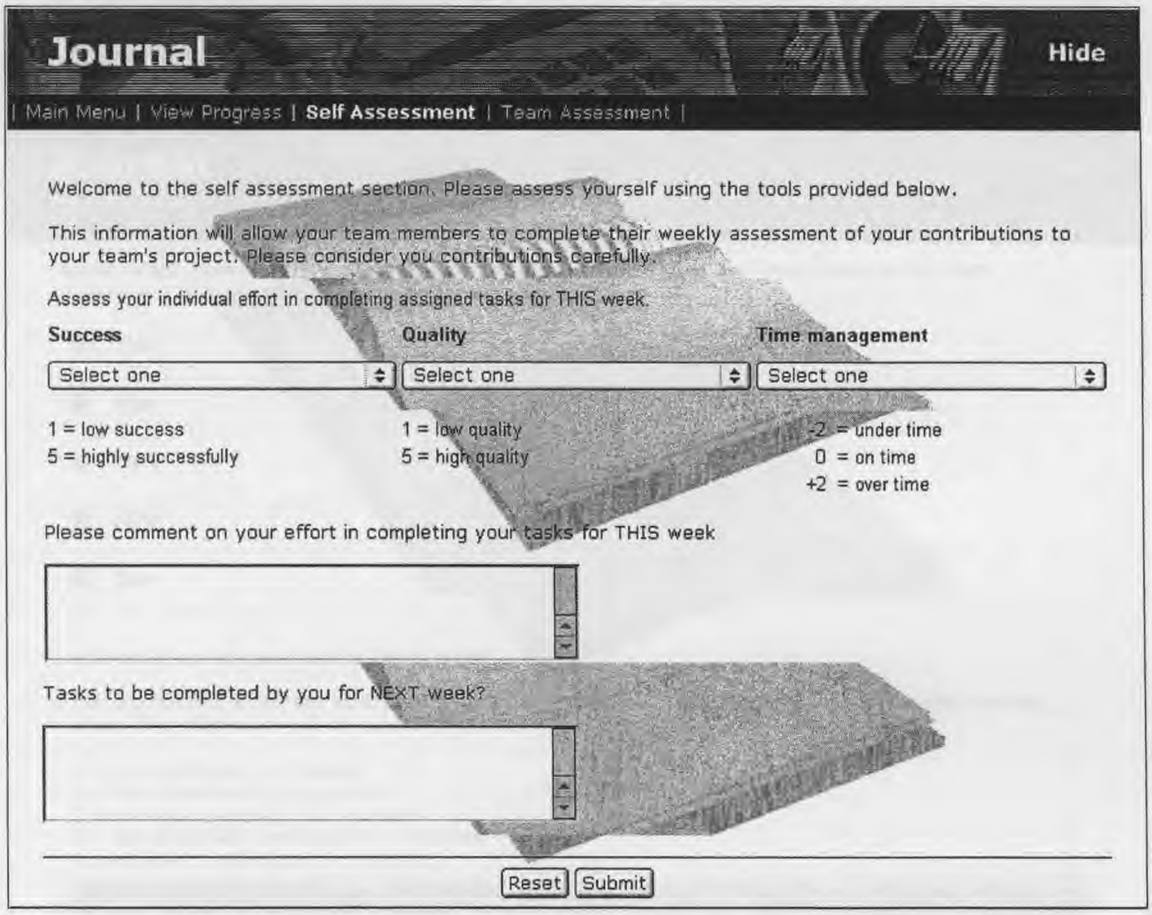


Figure 4.21: Self-assessment (Intra-team)

After students had considered their own progress, they would then be able to assess the performance of their peers (Figure 4.22). This was confidential to the tutors, so students would then be able to discuss the progress of their peers in an honest and open fashion without fear of being compromised or embarrassed.

They could firstly select individual team members and read their self-assessment report, before performing the peer assessment. Peer assessment was based on the following four criteria:

- Was he/she regularly at group meetings and punctual?
- Did he/she contribute ideas, suggestions, volunteer services, cooperate and generally motivate team spirit?
- Did he/she complete the assigned tasks for the past week to the best of their ability?
- To what quality did he/she carry out the tasks assigned for the last week?

After grading each of their peers, students could give comments and reasons as to why they allocated the assessment. This was an important part of the peer assessment strategy, as tutors would need to have good reasons for negative assessments that would be considered in tutor led peer assessment sessions.

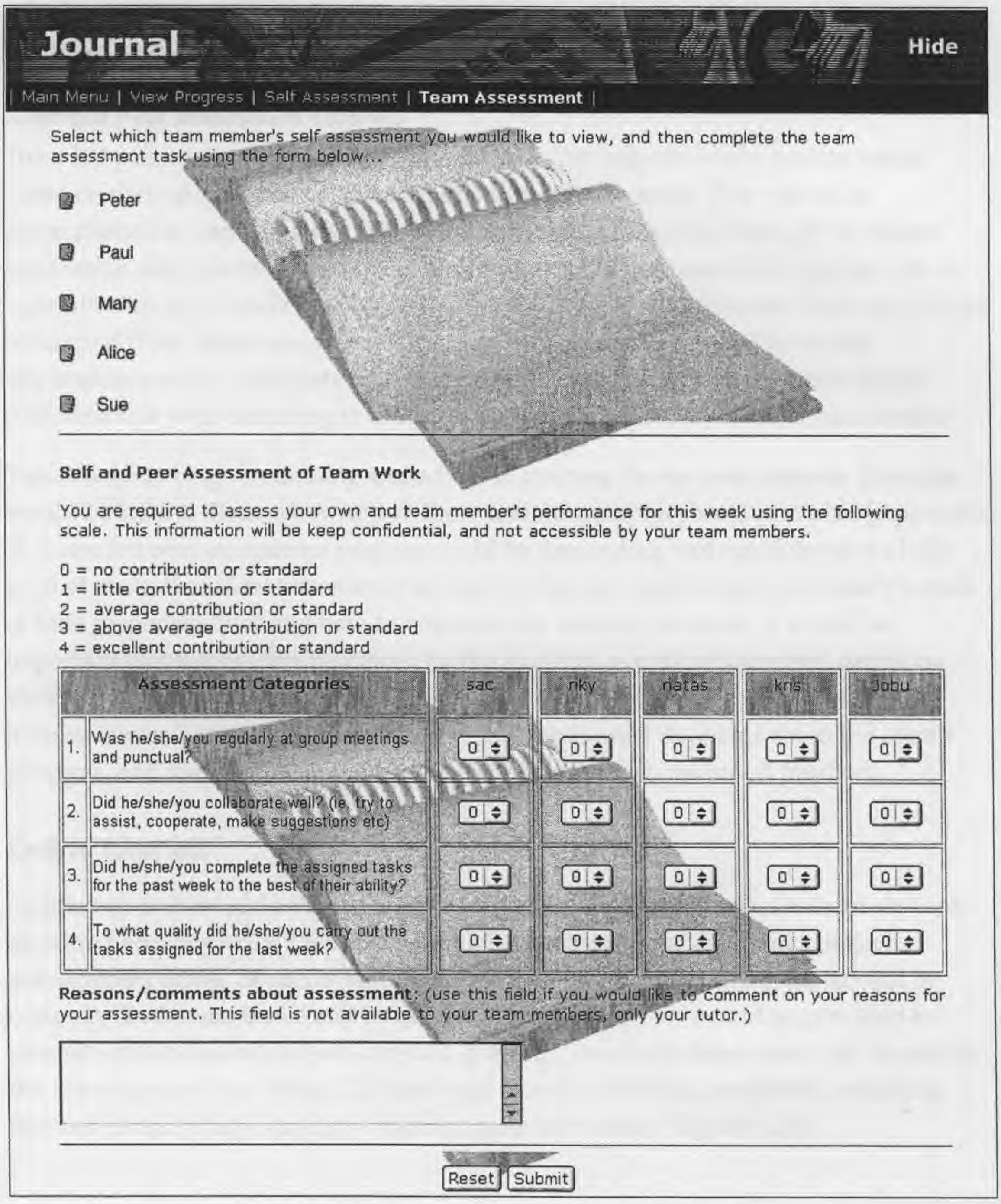


Figure 4.22: Peer-assessment (Intra-team)

Inter-Team Self/Peer Assessment

Reflective self and peer assessment between teams was to be promoted through the "Conference Centre" as discussed earlier. Student teams would be required to assess their own solution, as well as three other teams.

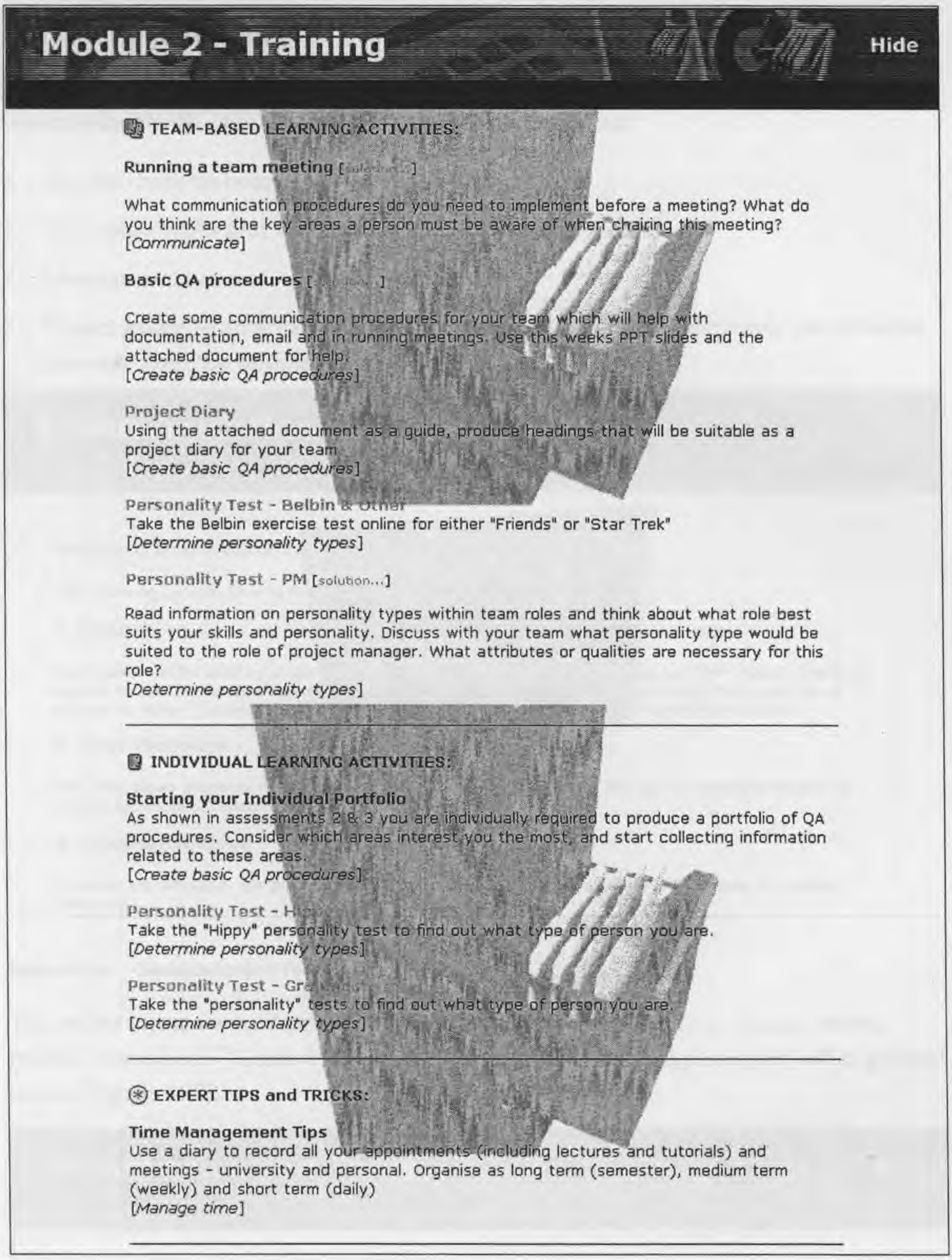
Tutor Led Peer Assessment Sessions

Tutor led peer assessment sessions were designed to help moderate student marks based on their quality of work and overall effort for the team. This was to be accomplished by capturing self and peer assessment information through the online application and collated over several weeks in *Tutor led peer assessment sessions* with a view of balancing student marks according to individual performance. These were to be conducted three times over the semester, or on an as needed basis. The online application would consolidate student comments and ratings to help tutors gauge problems that were occurring in the team, and whether peer assessment was needed.

Tutors were to be given training and advice in running the support sessions. Meetings would be held to discuss how to run these and information sheets provided (Appendix 3). Tutor led peer assessment sessions could be demanding and could involve a high level of stress if student teams were in conflict. Tutors would need to be clearly aware of their responsibilities and how to negotiate the transfer of marks. It would be important that tutors were perceived by the students as making informed decisions about how marks should be transferred, that is, the tutor would need to use information collected from the journals to make informed decisions about the team's progress, and then negotiate the transfer of marks from an informed position.

Online Tutorials

Online tutorials would be structured to provide scaffolded activities to help students develop necessary skills needed to complete weekly tasks and perform project management duties. Students would be able to perform these during the tutorial or remotely. Both team based and individual training exercises would be provided to promote collaborative and self-directed learning. These activities were to be located in the last drawer of the "Filing Cabinet" and contain questions, templates, solutions, tips and tricks to help students construct their knowledge (Figure 4.23).



Module 2 - Training

Hide

TEAM-BASED LEARNING ACTIVITIES:

Running a team meeting [solution...]

What communication procedures do you need to implement before a meeting? What do you think are the key areas a person must be aware of when chairing this meeting?
[*Communicate*]

Basic QA procedures [solution...]

Create some communication procedures for your team which will help with documentation, email and in running meetings. Use this weeks PPT slides and the attached document for help.
[*Create basic QA procedures*]

Project Diary
Using the attached document as a guide, produce headings that will be suitable as a project diary for your team.
[*Create basic QA procedures*]

Personality Test - Belbin & Other
Take the Belbin exercise test online for either "Friends" or "Star Trek"
[*Determine personality types*]

Personality Test - PM [solution...]

Read information on personality types within team roles and think about what role best suits your skills and personality. Discuss with your team what personality type would be suited to the role of project manager. What attributes or qualities are necessary for this role?
[*Determine personality types*]

INDIVIDUAL LEARNING ACTIVITIES:

Starting your Individual Portfolio
As shown in assessments 2 & 3 you are individually required to produce a portfolio of QA procedures. Consider which areas interest you the most, and start collecting information related to these areas.
[*Create basic QA procedures*]

Personality Test - H
Take the "Hippy" personality test to find out what type of person you are.
[*Determine personality types*]

Personality Test - Gr
Take the "personality" tests to find out what type of person you are.
[*Determine personality types*]

EXPERT TIPS and TRICKS:

Time Management Tips
Use a diary to record all your appointments (including lectures and tutorials) and meetings - university and personal. Organise as long term (semester), medium term (weekly) and short term (daily)
[*Manage time*]

Figure 4.23: Training exercises

Communications Centre

The communication centre provided a range of tools that would allow students to communicate with each other (Figure 4.24). These included:

- Forums/bulletin boards;
- View prototypes and websites developed by other teams;
- Message archive; and
- Project gallery – an area that allows students to create their electronic portfolio for this unit (see "Developing a Multimedia Product").

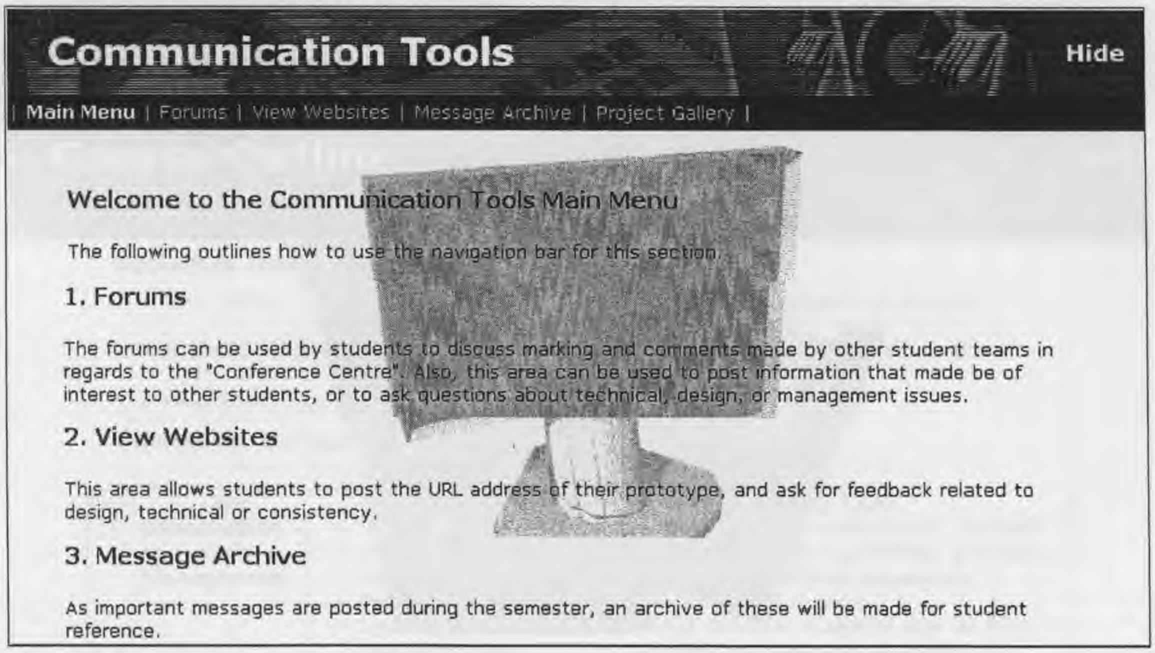


Figure 4.24: Communication Tools

The online forums would provide students with the opportunity to discuss issues related assessment ("Conference Centre"), feedback on prototypes or any other general issues (Figure 4.25).

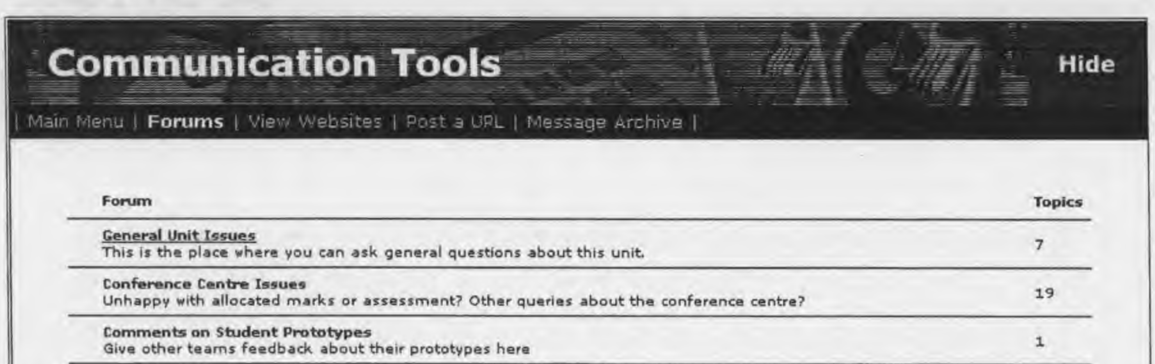


Figure 4.25: Online forums

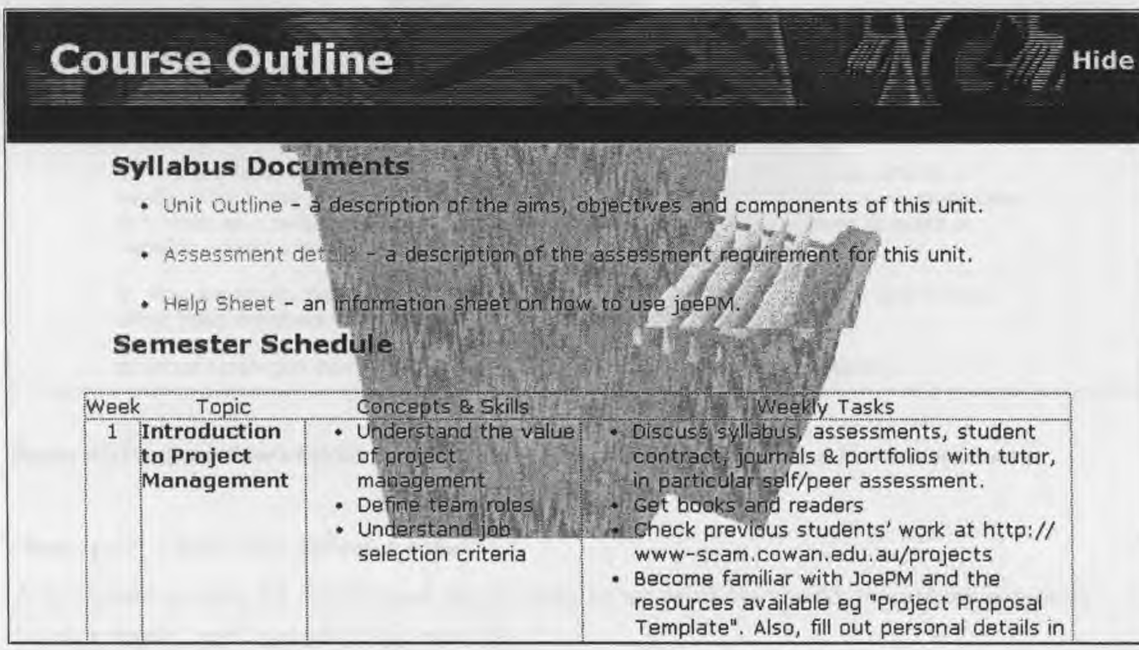
Other Learning Resources

Information and Resources

Online information and resources were to be made available through the "Filing Cabinet" from which students could freely access resource materials and then decide which were most appropriate in helping complete weekly tasks. The following resources were to be made available in the "Cabinet Drawers".

"Drawer 1" – General Course Information

General course information would be included with the unit outline, assessment details, help sheets and the full semester schedule outlining weekly topics and the required tasks for each given week (Figure 4.26). Help sheets were provided for both students and tutors (Appendices 2 and 3).



Course Outline

Hide

Syllabus Documents

- Unit Outline - a description of the aims, objectives and components of this unit.
- Assessment details - a description of the assessment requirement for this unit.
- Help Sheet - an information sheet on how to use joePM.

Semester Schedule

Week	Topic	Concepts & Skills	Weekly Tasks
1	**Introduction to Project Management**	• Understand the value of project management • Define team roles • Understand job selection criteria	• Discuss syllabus, assessments, student contract, journals & portfolios with tutor, in particular self/peer assessment. • Get books and readers • Check previous students' work at http:// www-scam.cowan.edu.au/projects • Become familiar with JoePM and the resources available eg "Project Proposal Template". Also, fill out personal details in

Figure 4.26: Course information provided in resource centre

"Drawer 2" – the "Brief"

Outline of the skills being targeted, items that needed to be completed for the week, as well as focus questions to help promote reflective thinking about the weekly topic (Figure 4.27).

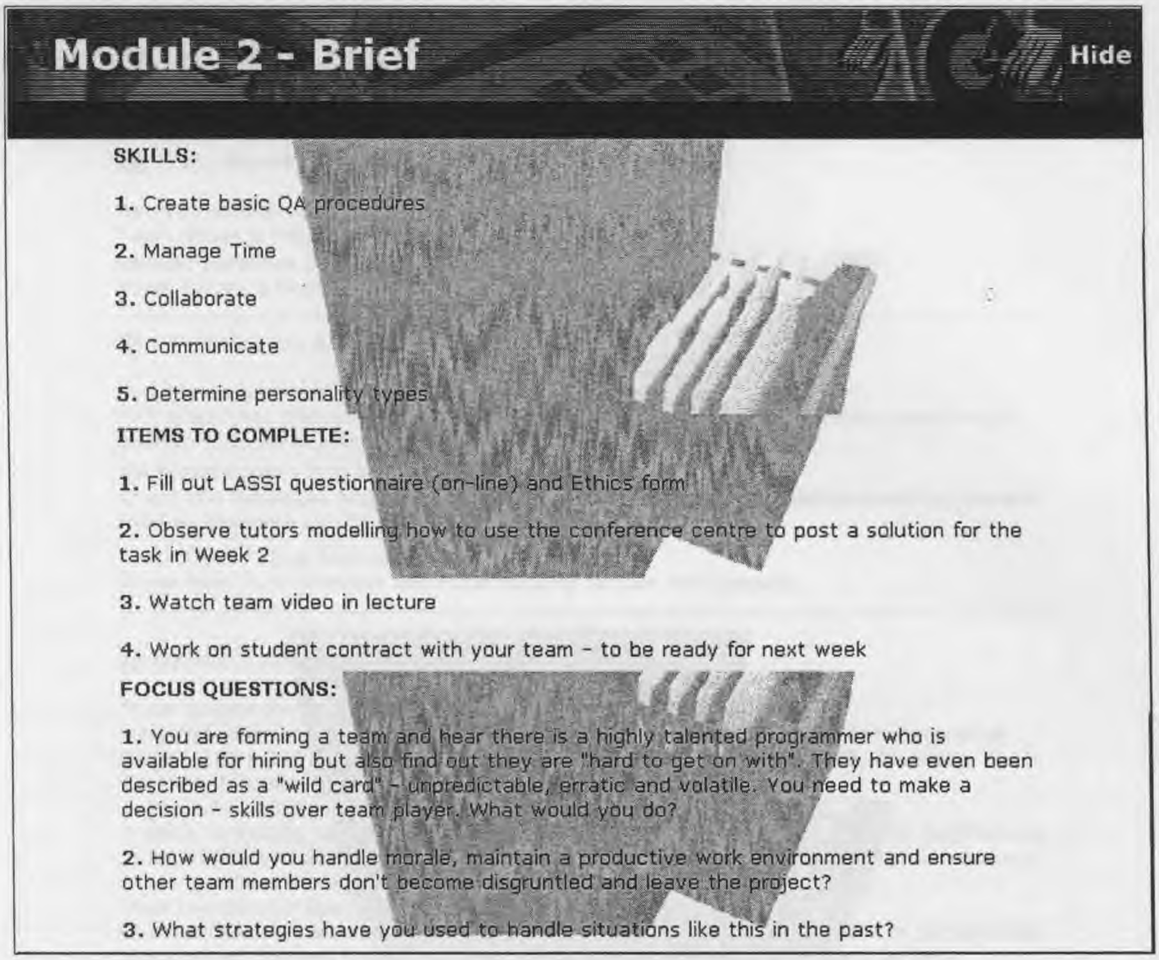


Figure 4.27: Overview of skills targeted and items to complete provided in resource centre

"Drawer 3" – Resources and Information

A template was to be developed to provide a range of standard resources for each weekly topic, and include (Figure 4.28):

- Reference to the textbook that was written specifically for this unit (Luca, 1997);
- Reference to two readers that contained a range of contemporary journal articles related to each weekly topic being covered;
- Information and examples – included Powerpoint slides and other notes or templates needed for the weekly topic;
- Useful links related to the topic; and
- A variety of perspective's from industry representatives about the topic using streaming video (Figure 4.29).

Module 2 - Resources

Hide

TEXT, READERS and LIBRARY:

Read textbook Chapter 6.2
Team issues & basic QA
Reader sections 5-10
Team Issues & basic QA

INFORMATION & EXAMPLES:

PPT Slides for Week 2
PPT slides that discuss team issues, & basic QA principles needed to help students get started with developing procedures
QA Procedures - See Week 11!!
Check the resources and training in Week 11 (QA), for more detailed procedures. Samples from ex-students Lyn Chalwell, Janine Rea & Kylie Dodd.

The rules of Time Management
Some rules from Chalmers and Fuller relating to time management.

USEFUL LINKS:

Myer Briggs per
Very detailed - relates to the Myer Briggs personality test. Look at "Team Description Roles" - for broad definition of roles classified into 8 major roles: Coach, Crusader, Explorer, Innovator, Sculptor, Curator, Conductor, Scientist.
A guide to setting
A guide to setting up teams includes key definitions and explanation of roles, helpful hints in organising and administering teams, the role of leadership, quality assurance measures, etc. Very informative and well-worth the effort to make time to visit!
How to manage tean
Click on the link workteams. This sites looks at how groups function, how to successfully manage self directed teams and their attributes. Other topics of interest include leadership development, benchmarking, best practice. An excellent resource.
The function of different
Describes who does what in team roles - the specific functioning of each team role.
Tips for helping teams succeed
Details communication and team strategies with pointers on how teams succeed or fail. Additional online exercise for team effectiveness and gives reasons why self assessment is helpful for teams.

PERSPECTIVES:

PPT slides for
A PDF file of the slides and information covered in the second lecture
Video: Generic S
Steve Pretzel (Pretzel Logic) discusses the importance of Generic Skills when developing multimedia
Video: Communica
Shows Steve Pretzel discussing the importance of collaboration skills when developing multimedia
Video: Brainstorming
Ex-student Lyn Chalwell discusses how effective brainstorming can be
Video: Collaboration
Ken Ireland (Western Mining) discusses the importance of collaboration when working in team based projects

Figure 4.28: Resource materials

Figure 4.29: Streaming video of Steve Pretzel – CEO of Pretzel Logic

"Drawer 4" – Training Materials

Would include team based and individual training activities that were scaffolded and modelled in the tutorial sessions (Figure 4.23).

Timesheet Application (Time-clock)

An online timesheet entry application was to be included to help students track their times (Figure 4.30). These times would be reflected in the self-assessment journals (Figure 4.20) and help students track their commitments. The web-centric application would allow students to input their times on or off-campus and instantly update the teams total time usage in the classified categories. This would give teams instant updates of how actual times compared to estimated times for agreed deliverables, and also allow the development industry metrics to help estimate future multimedia development work.

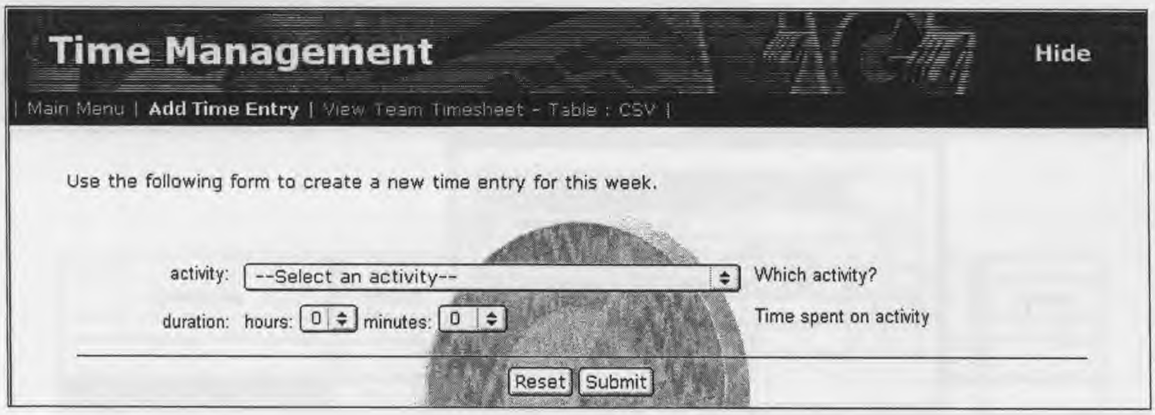
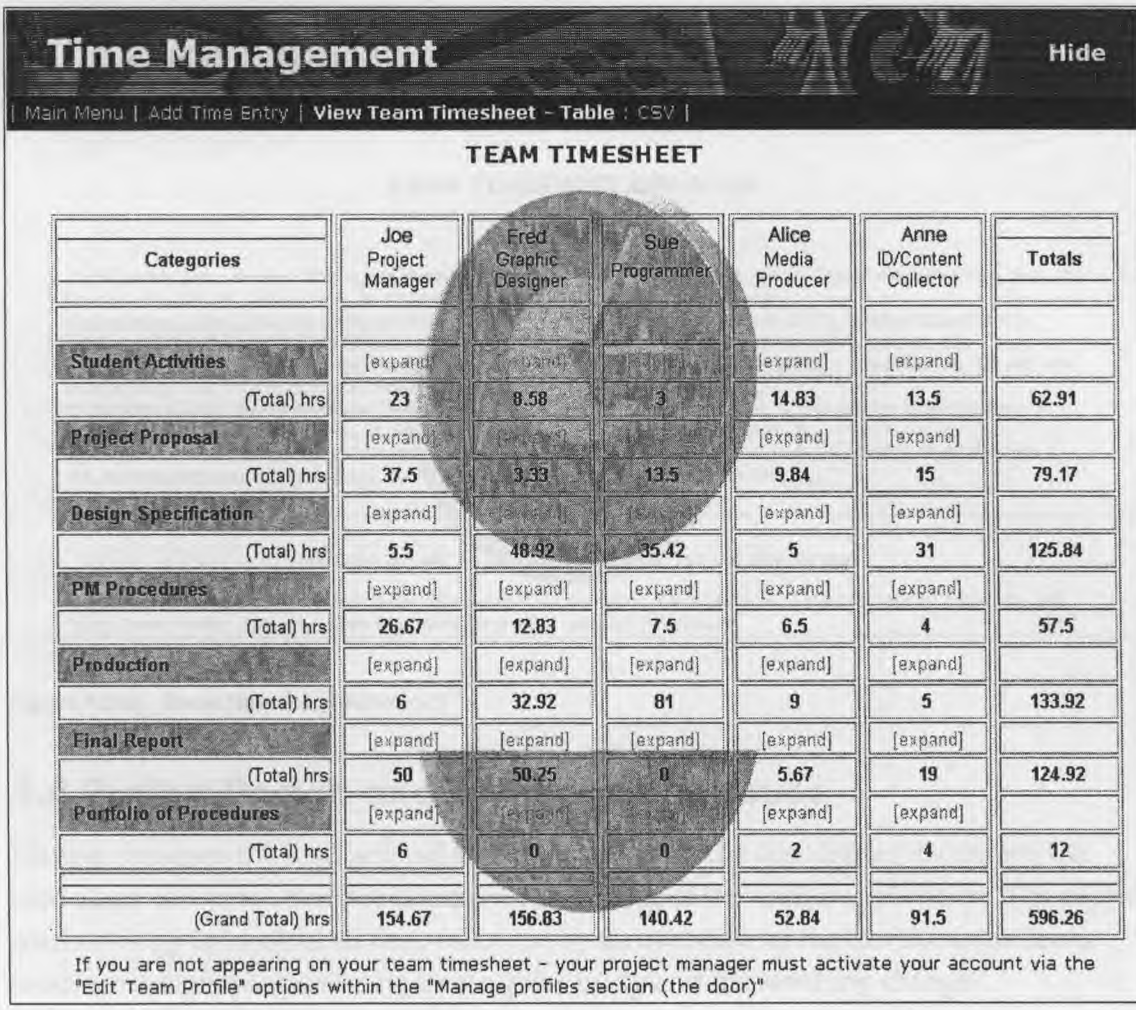


Figure 4.30: Timesheet entry application

As team members progressively entered their times during the week, the online application would aggregate individual times into a consolidated matrix for quick scrutiny (Figure 4.31). All team members could quickly check the team's progress, and if necessary, also check finer granularity of time allocation by also specific individual categories (Figure 4.32).



Categories	Joe Project Manager	Fred Graphic Designer	Sue Programmer	Alice Media Producer	Anne ID/Content Collector	Totals
Student Activities	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	23	8.58	3	14.83	13.5	62.91
Project Proposal	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	37.5	3.33	13.5	9.84	15	79.17
Design Specification	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	5.5	48.92	35.42	5	31	125.84
PM Procedures	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	26.67	12.83	7.5	6.5	4	57.5
Production	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	6	32.92	81	9	5	133.92
Final Report	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	50	50.25	0	5.67	19	124.92
Portfolio of Procedures	[expand]	[expand]	[expand]	[expand]	[expand]	
(Total) hrs	6	0	0	2	4	12
(Grand Total) hrs	154.67	156.83	140.42	52.84	91.5	596.26

Figure 4.31: Team timesheet summary

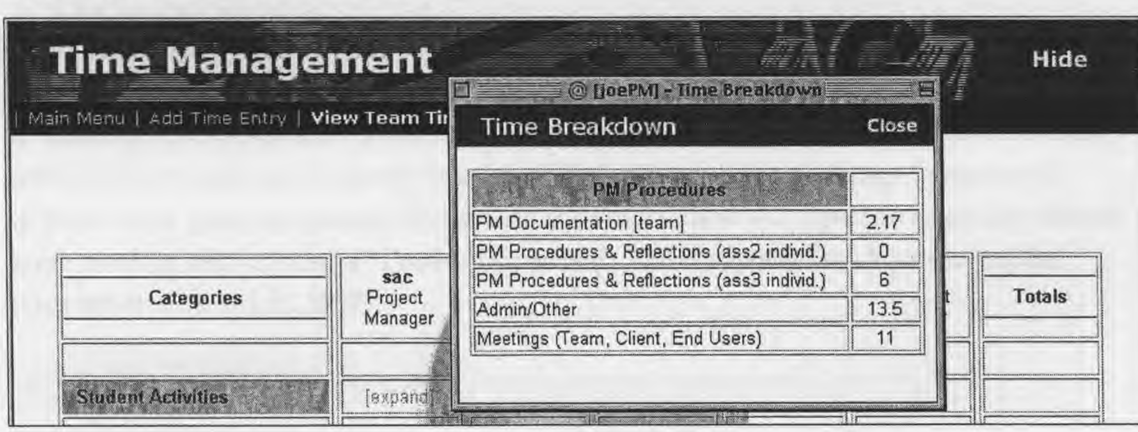


Figure 4.32: Specific timesheet category

The application would also allow timesheet data to be exported in CSV format (Figure 4.33). This would allow students to import the data into spreadsheets and apply hourly rates, and also develop progress charts.

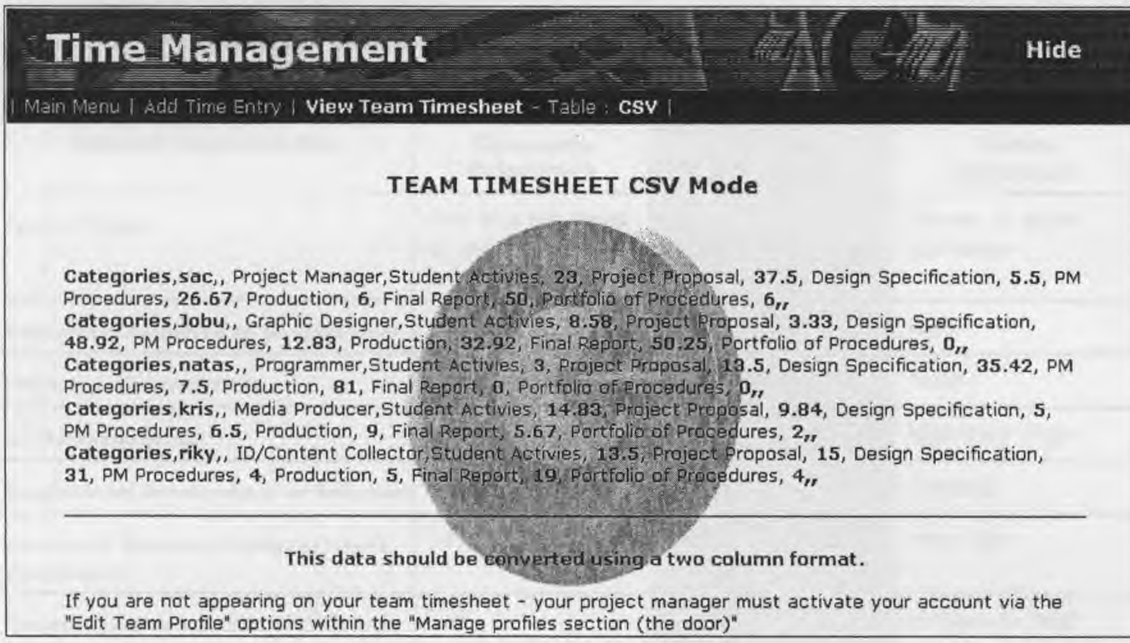


Figure 4.33: Team timesheet summary

4.4 Project Design and Development Issues

Having designed the instructional features needed for the learning environment, the next stage concerned the development and testing of the online application. The project methodology is considered first, followed by an overview of the development team, interface design, programming issues, pilot study and the resulting changes.

Project Development and Design Methodology

There is one model commonly used in project management methodology called ADDIE and stands "Analysis, Design, Development, Implementation, and Evaluation" (Fardouly, 1998). But there are many other models to choose from. The development methodology used in this study was based on an instructional design framework derived from general systems theory. As shown in Table 4.7, specific selection criteria were used to help choose a "Product Oriented" instructional development model (Gustafson & Branch, 1997).

Table 4.7: A taxonomy of instructional development models based on selected characteristics (Gustafson & Branch, 1997, p.30).

Selected Characteristics	Classroom Orientation	Product Orientation	System Orientation
Typical Output	One or a few hours of instruction	Self instructional or Instructor-delivered package	Course or entire curriculum
Resources Committed to Development	Very Low	High	High
Team or Individual Effort	Individual	Usually a Team	Team
ID Skill/Experience	Low	High	High/Very High
Emphasis on Development or Selection	Select	Develop	Develop
Amount of Front-End Analysis/Needs Assessment	Low	Low to Medium	Very High
Technological Complexity of Delivery Media	Low	Medium to High	Medium to High
Amount of Tryout and Revision	Low to Medium	Very High	Medium to High
Amount of Distribution/ Dissemination	None	High	Medium to High

Using the instructional strategies outlined in Chapter 3, and comparing other models and processes focused on product oriented instructional development models (Bergman & Moore, 1990; Blum, 1995; England & Finney, 1999; Greer, 1992; Hedberg, 1993; Howell, 1992; Luca, 1997), a project design and development model was established (Figure 4.34).

A focus was placed on rapid prototyping to allow for quick development of graphics, navigational strategies and programming solutions to help evaluate how effective the application was in presenting the desired instructional strategies. Prototyping is promoted as being an important evaluation tool for client, key stake-holders and end users (Northrup, 1995). It allows end users and client to make constructive comments before significant investment of time is made into developing the project.

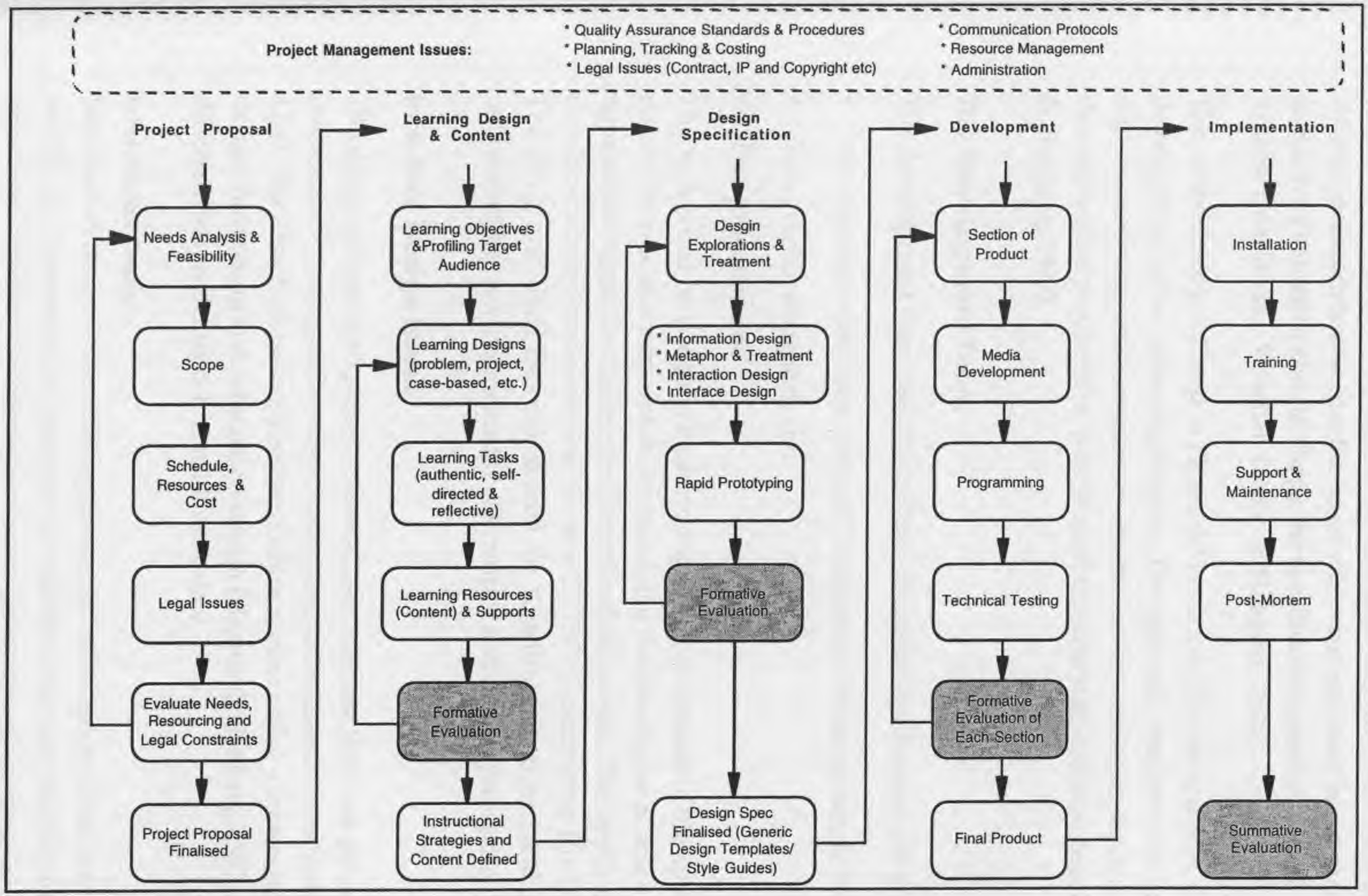


Figure 4.34: Project design and development methodology

Formative evaluation featured strongly in each phase of the proposed model. The continual collection of data and information from end users, clients and expert reviews is used to help improve quality of the product. The idea that a design team can and should predetermine all that the users will want and need is not appropriate. Instead, formative evaluation should shape the specification process, as well as the production process (Maslowski, Visscher, Collis, & Bloemen, 2000).

The methodology outlined in Figure 4.34 was used for the analysis, design and development of the online application. The approach was iterative in nature, using rapid prototyping and formative evaluation as key strategies for designing and developing the product that was focused on satisfying end user requirements (Harper & Hedberg, 1997).

The Development Team

The development team used to produce the online application program consisted of:

- One content expert, instructional designer and video producer (the researcher);
- Two graphic designers; and
- Two programmers.

This group met on a regular basis during the development of the application. The researcher was also responsible for managing the development and allocating appropriate resources during the lifecycle of the project. The application was developed using funds received from a CUTSD (Committee for University Teaching and Staff Development) for "Creating integrated and collaborative online learning environments for off-campus and on-campus students" in 1999.

Interface Design Issues

The design phase attempted to create a user interface that was pleasing and easy to understand by using an iterative prototyping and evaluation methodology (Figure 4.34). The design phase required a constant review of the – information design, visual design, navigation and interaction design (Harper & Hedberg, 1997). Each of these different design elements is considered below.

Information Design

Information design is the defining, planning, and shaping of the contents of a message and the environments it is presented in with the intention of achieving particular objectives in relation to the needs of users (International Institute for Information Design, 2002). In many cases, design principles are applied with a view of translating complex, unorganised, or unstructured data into valuable, meaningful information that is easy to understand and interpret by end-users.

Considering different ways of organising and presenting content in an web application can radically change the whole interface metaphor i.e. information can be presented as an alphabetical listing, by time organization, through natural location maps, as categories, continuums etc. In some cases, a variety of these may be included to provide choices for different types of learners. It is important to profile the target audience to determine their needs and wants in helping to determine the correct design specifications for the given context (Gould, 1995). This is often an important pre-cursor to overall design process, and as shown in Figure 4.34 this is considered first in the design cycle.

In this application access to course information was based on the semester week number as shown on "Whiteboard" (Figure 4.5). Students were familiar with the concept of having different topics presented on consecutive weeks during a semester program. The week number provided a key navigational strategy for accessing resources. It synchronised information stored in the database to the weekly topic, which included weekly tasks, journal entries, conference postings and resources for the week. The design strategy attempted to minimise students' cognitive load by using a consistent information access method based on the topic/week number.

Metaphor and Treatment

Many software developers understand the importance of using appropriate metaphors. Apple Computer adopted the use of simple metaphors such as folders and the desktop in 1985 to help users gain a basic understanding of computer operation (Hamilton, 2000). The selection of a Web site metaphor is a creative process, and can more productively be established as a team, by brainstorming the following questions (Harris, 2001):

- What is the predominant purpose of the site?
- Who will be the primary audience?
- What will the services and resources at the site have in common?
- How will visitors be using the resources offered by the site?
- Would a living or non-living metaphor be more appropriate? Why?
- What contexts contain elements and processes that are parallel to the elements and processes that will be supported by use of this new Web site?

These items were used in brainstorming sessions with the development team, two end users and one expert reviewer. The consensus was to use an office metaphor, as this was considered the most appropriate interface for the given context, target audience and required services with a business and interaction based treatment.

A series of interfaces were then developed and evaluated by the group for suitability (Figures 4.35 and 4.36). Much discussion ensued about icon design that minimised end-user cognitive load and clearly represented the given resources such as filing cabinets, journals, contracts, phone, conference centre, bulletin boards, project viewing area, team area and communications centre. Through iterative design sessions agreement was reached. In all cases a rollover feature was considered necessary that would also explicitly explain the function of each icon.

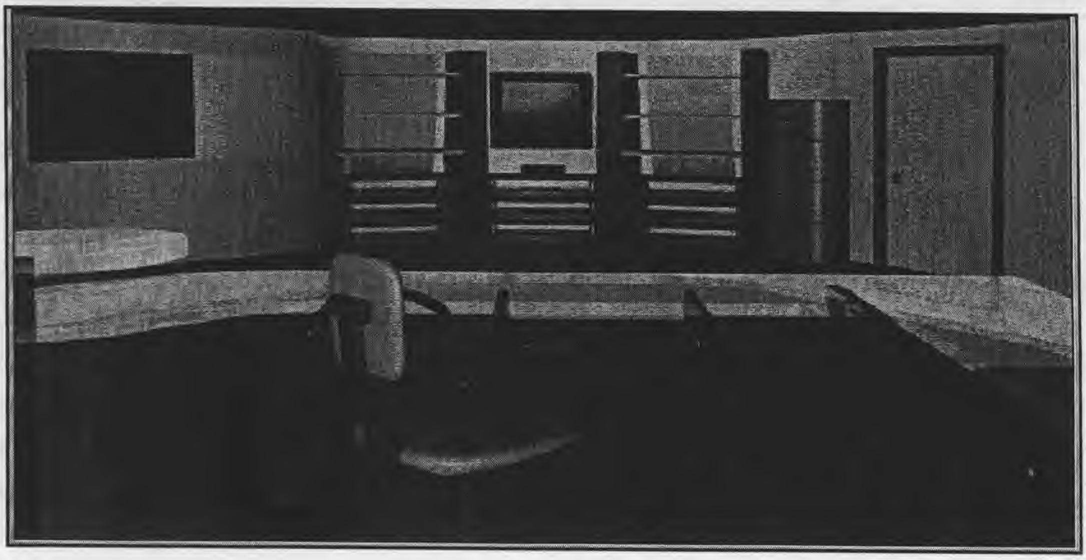


Figure 4.35: Interface design exploration 1 - rejected

Figure 4.36: Interface design exploration 2 - rejected

Interaction Design

Interaction design deals with dynamic and non-linear process in which conditional events occur in response to several parameters that have occurred within the application. Anticipating dynamic changes in parameters and then being able to visualise the ensuing event is a formidable task for designers. In ideal situations, interaction design professionals are able to introduce interaction design concepts early in product design and then iteratively develop interface specifications through a cycle of user testing (Bell, Gupta, Kolli, & Manhartsberger, 2002).

The interaction design process used for this project attempted to promote effective user interaction with content through a system of clear messages and feedback by allowing users to find and manipulate required information as quickly and efficiently as possible (Harper & Hedberg, 1997). While many dimensions of interactivity are well documented, considerable uncertainty remains about how best to design and implement interactions to achieve desired learning goals (Sims, 2001). In designing the application, an iterative prototyping methodology was used to create the icons, navigation and message design in an effort to achieve the best possible design for the target audience and required objectives (see evaluation section). Also, students were required to login into the system using names and passwords with a view of promoting the development of a customised environment. Students could enter private details, solutions and share common file storage areas with their team. The aim was to develop a learning environment that promoted high levels of user control and interactivity to help students feel they were part of the learning process and promote a sense of ownership (Harper, Squires, & McDougall, 2000).

Interface Design

Designing the interface required consideration of usability principles for each component. Usability heuristics developed by Nielsen (1994) were used to help guide the design as follows:

- Visibility of system status – the application attempted to keep end users informed at all stages of where they were through the use of messaging in rollovers, and appropriate message design in lower level menus. Options that weren't available to students were dimmed, to clearly alert users that options weren't available;
- Match between system and the real – appropriate feedback, menu items and messages were designed with end user help to "speak the users language". The information was ordered in a weekly fashion that appeared in a logical order as would be expected by higher education students;
- User control and freedom - users were able to choose any week and access information related to any of the advance topics. They were also able to enter information in journals, and post solutions before the due dates. At any stage they could then edit or delete these until the assignment due date. Also, project

managers were given extra editing facilities to change team composition and team member roles;

- Consistency and standards – a template was used to develop the weekly resources and activities, which helped maintain consistency and standards across each of the topics;
- Error prevention – a pilot study was implemented before implementation to help find design faults. End users, tutors and expert reviewers were used to load test the application and help discover areas that were likely to cause problems;
- Recognition rather than recall – the main office interface used easily recognisable icons, though for each one a clear message was visible as students rolled over the option. This avoided having to remember what icons represented. In other menus, students could along select menus that were highlighted;
- Flexibility and efficiency of use – an alternative icon based interface was created for remote users using slow modem connections and older browsers. This avoided loading Shockwave™ and allowed users to access information more rapidly. This interface was also used by experienced users who knew the system, and wanted quick access;
- Aesthetic and minimalist design – all dialogue was kept to a minimum, and resources were stored in Adobe PDF file format to avoid screens of scrolling text. As much as possible a strong presence of white space was maintained in each screen to promote clarity of messages and information;
- Help users recognize, diagnose, and recover from errors - error messages were presented in clear language without any programming codes. If system errors did occur then a standard message would occur to contact the programmer with his email address attached (this provided strong motivation to build a robust system); and
- Help and documentation – in the first "drawer" of the filing cabinet help files were stored for students. These gave an overview of the system, as well as specific help for each of the features.

These design considerations were taken with a view of creating an interface that supported knowledge construction through active student participation based on authentic learning tasks and mediated by tools (technology) and signs (semiotic tools) (Harper, Hedberg, & Wright, 2000).

Programming and Development Issues

There has been a proliferation of Web-based course management systems in higher education institutions and corporate training sectors, involving both back-office and front-office aspects (Landon, 2002). These systems combine database and Web functionality to support online teaching and learning strategies. These are seen as having administrative benefits as well as instructional benefits for students (Williams & Peters, 1997).

Front-office aspects are those seen and manipulated by instructors and students. Back-office aspects include the security of the system, the assignment of access rights and privileges to different categories of users, and the procedures needed to integrate database and http server functionalities. Back-office aspects are directly responsible for helping improve usability and performance of the system for students and instructors (Maslowski et al., 2000). In the design and development of this setting the programming and development of these back-office aspects of this system considered the following aspects:

- The programming applications and hardware used;
- Implementation issues;
- Access restrictions for different user types;
- Database design; and
- Enhancements resulting from pilot study.

Software and Hardware Issues

A variety of programming applications and hardware consideration had to be considered for the product development as follows:

- *Hardware and Target Browsers* - The system was designed to run in both Macintosh® and Windows® environments which covered the majority of end users within the expected scope of the application. Initially the system was hosted on a Macintosh G4 with 256mb of RAM, running Mac OS9.1 and using Filemaker's own built in web server. The application was optimised for Microsoft Internet Explorer 5 or higher, due to the inability of Netscape Communicator 4+ to adequately display Cascading Style Sheets (CSS).
- *FileMaker Pro 5®* - was chosen as the database backend for a variety of reasons. Prior experience with the database software within the School of Communications and Multimedia had shown the application to be reliable and relatively inexpensive to install and configure. The application can also be run on either a Macintosh or Windows server with no special hardware or configuration.
- *Macromedia Director 8.0® and Shockwave®* - The application interface was developed in Macromedia Director 8.0 and deployed as a Shockwave movie for Web based delivery. This delivery method was chosen over more traditional models, such as image based navigation bars incorporating JavaScript® roll-over effects, because the Shockwave compressor generated comparable file sizes to the traditional method but allowed extra facilities to be built into the interface. The Shockwave shell was designed to be modular in its use. The desire to create an interactive product, which could be used as a shell for delivering a task orientated

course, is rooted in its construction. The ability to perform active scripting on the client side enabled the creation of a Shockwave application that inputs data via parameters passed to it within the *HTML* embed process, as well as reading in a text file containing module descriptions, the course schedule and database actions. By utilising a text file, the application can manipulate which sections become accessible within the Shockwave application and what action is to be performed upon its activation. This functionality could be extended to allow a generic model to be created which would allow the facilitator of a course to activate only the options of the interface that were necessary.

- *QuickTime®* - was used in the extensive delivery of video footage, taken from a variety of local multimedia industry representatives. The video was streamed for either 56kps or LAN (T3) connections. Using QuickTime Streaming Server 3 running on a Mac OSX server.

Access restrictions: User types

Five levels of access were built into the application. These included administrator access, tutor access, project manager access, user access and guest access. The system options and configuration change depending on the user type and mode of access. There are:

- *Administrator access* - the highest level of access and would allow the administrator to alter of number of different features as follows:
  - ⇒ Add, delete and modify course content, media and weekly tasks;
  - ⇒ Alter dates for team assessments;
  - ⇒ Allocate teams for inter-team peer assessment;
  - ⇒ Lock assessment deadlines;
  - ⇒ Create tutors and allocate privileges;
  - ⇒ Edit team members profiles; and
  - ⇒ Check student and tutor access.
- *Tutor access* - student teams and end-users were required to register through the online application and select a tutor. Tutors would then be able to view all records (student teams) allocated to them. This included authority to access all user based information such as weekly self-assessments, time entries, personal information and student contracts, as well as team-based information such as peer assessments, weekly task submissions and total time expenditure per team. Tutors were assigned authority to re-assign team members and delete users that were allocated to them. This access provides a mechanism in which tutors could view a student or team's progress at any given time within the semester. In traditional teaching, access to this information is usually only available at assessment time;

- *Project manager access* - In an effort to make the system reflective of real life practice, the project manager of each team was given extra access privileges. They could re-assign and delete members of their team, manipulate the teams' timesheets, and specifying a project URL address, and a team email;
- *Team member access* - This access level catered for all other users who were not project managers in their team. They had access to all resources and the teams' profile area; and
- *Guest user access* - guest users were able to access the courseware databases and the weekly task tray, but not able to make any submissions or contributions.

Database design

The application used 16 relational databases. Most of these databases had a many to many relationship with each other. The original design was focused on creating many inter-connected databases holding specialist data, rather than larger ones encompassing a larger amount of information. This approach was taken for two reasons. The first was the amount and frequency of use for the system, while the second was the large amount of collation required to bring together individual user records into larger, more meaningful team records.

In a two-hour tutorial there could be anywhere from 50 to 100 students accessing the system at one time across several computer labs. This amount of use and the frequency at which the users access the system could create much network traffic. By separating larger databases into smaller ones it was easier to effectively manage the databases and share the system load. In this way, database actions, especially search requests, can be performed faster. This strategy proved to be particularly effective across the university network.

In using the system, students would be continually making a variety of different database entries. The need to correlate a number of users' individual records into a larger team record highlighted the need for a relational database structure. The design structure adopted in the application was to use a database that drew data from a number of smaller databases and then presented the summary information (Figure 4.37). In this case the master file draws summary data from the three databases to allow for the real-time reporting.

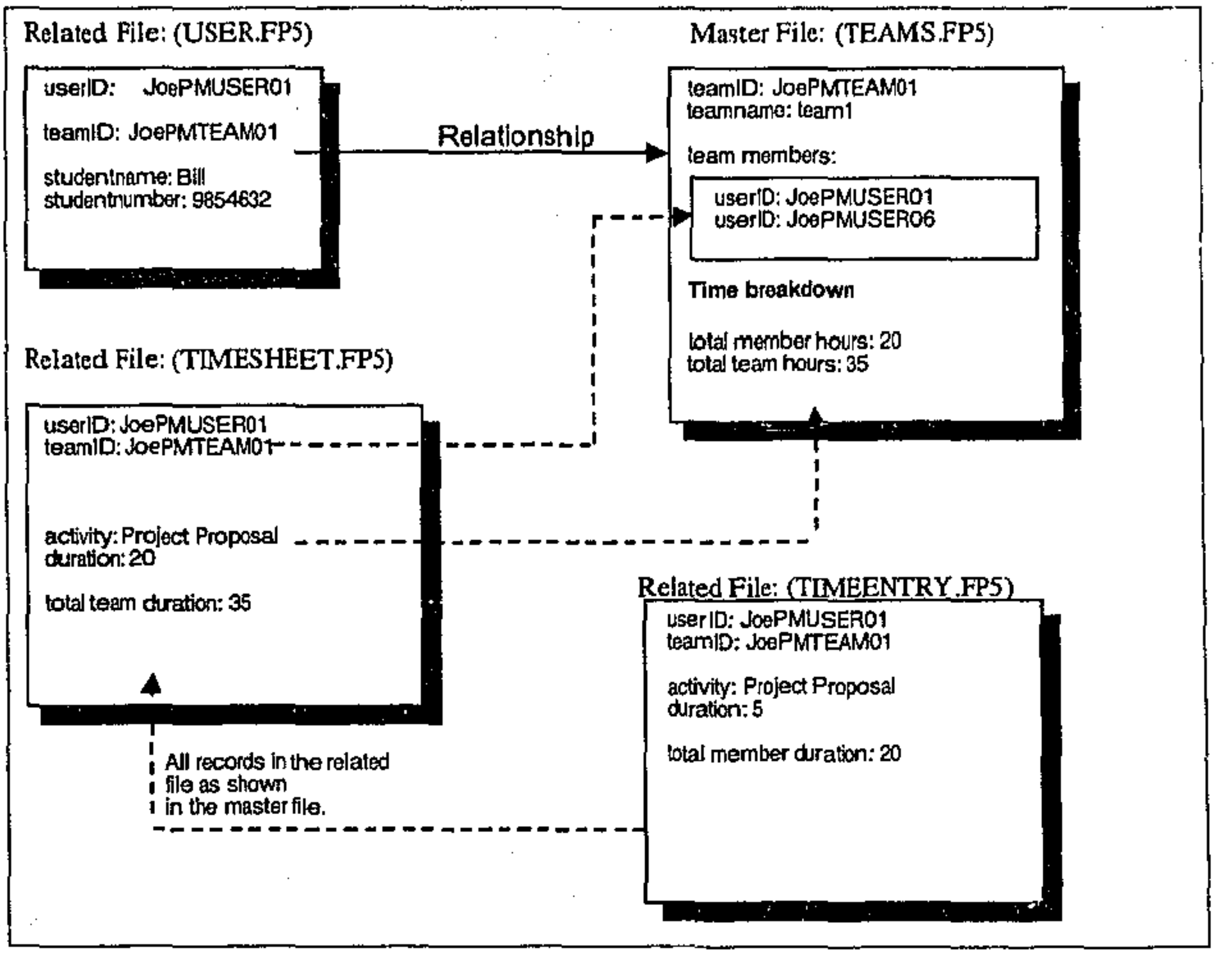


Figure 4.37: Relational databases

The system correlates relevant data and makes use of in-line database queries (supported by FileMaker) to process more complex queries, such as connecting the journal and time entry databases (Figure 4.38). Although these two databases do not have any relationships defined within the databases, they are connected when displaying the data in a meaningful manner. Summary times are extracted from the time entry database using self-joins. This data is combined with the initial student contract via an in-line query to the user database. This information is then combined with the user's self-assessment from the previous week, again via an in-line query. All this information is presented in one page – from which users complete the self and peer assessment tasks each week.

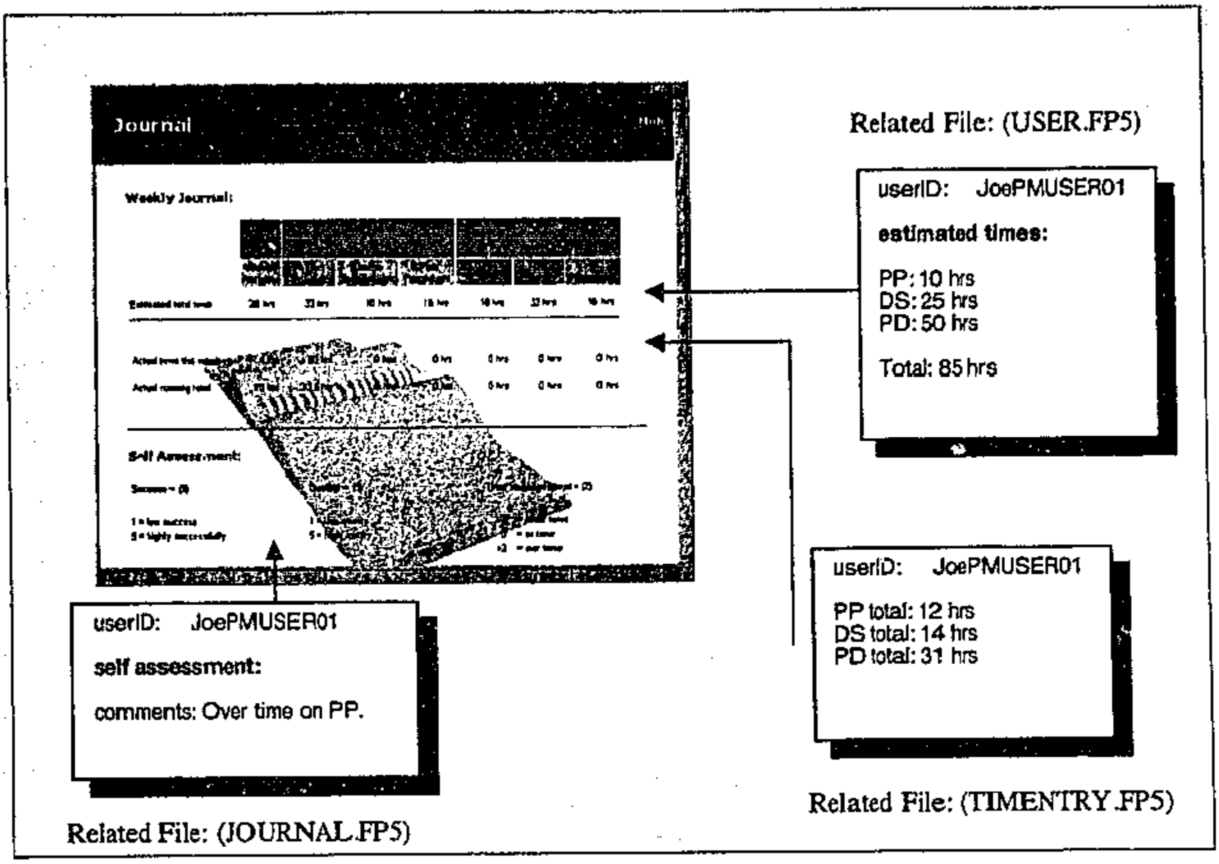


Figure 4.38: In-line actions within a Web page.

This method of joining database entities essentially replicates the function performed by creating many to many relationships between databases. The difference is only that it creates a link to the data when necessary. This reduces the number of inter-related databases, which in turn reduces the load on the whole system.

Summary

The online application has been conceived as a shell that can be used to implement any course. The use of relational databases integrated many of the courseware components, facilitating real-time reporting of information for tutors and students. This automatic integration, combined with the easy to use development tools helped to promote the creation of a sophisticated end user experience.

Video Production

To help promote authenticity and provide multiple perspectives, a range of video scenes were developed for each weekly topic. This section considers the candidates used, how the video was taken, and strategies used to convert it to streaming video.

Selection of Candidates and Question Style

Industry experts, employers and ex-students working in the multimedia industry were asked to volunteer for the video shoots and share their experiences. All candidates were sent the questions that would be asked prior to the video shoot, and informed that each segment would be edited down to 30-60 seconds. Sample questions included:

1. What value do you place on employees being able to understand project management principles?
2. Can you comment on the value or importance of (one or two of these):
   - Following a project management sequence
   - Scoping a project properly
   - Planning and scheduling
   - The design phase
   - Version control and change control in production
   - Evaluation and testing
   - Implementing QA procedures
   - Legal Issues
3. What value do you place on employees being able to collaborate in a team?
4. What value do you place on employees being able to manage their time? (can consider timesheets, ability to plan and follow schedules)
5. Can you comment on any other important generic skills employees should exhibit?
6. What do you like to see when potential applicants apply for a job?

A client selection matrix was developed to match appropriate topics to selected clients (Table 4.8).

Table 4.8: Video and client topic matrix

Topic	Concepts and Skills	Person
ECU Course	How it helped and value of	CEO Pretzel Logic, Senior Project Manager (Western Mining), Project Manager (Dow Digital)
	Getting Jobs	Senior Project Manager (Western Mining)
Project Management	Importance of PM and Models	Project Manager (Dow Digital)
Team Issues	Generic Skills	CEO Pretzel Logic
	Collaboration	CEO Pretzel Logic, Senior Project Manager (Western Mining), Ex-student
	Communication	Ex-student
	Time management	CEO Pretzel Logic, Senior Project Manager (Western Mining)
	Personality types	Ex-student
	Brainstorming	Project Manager (Xpedior)
	Giving and accepting criticism	Ex-student
	Client Relationships	CEO Pretzel Logic
Financial Management	Costing and budgets	CEO Pretzel Logic
	Timesheets, categories and metrics	Ex-student
Project Proposal	Feasibility, Risk Analysis, Needs Analysis, Scoping and Content Collection	Senior Project Manager (Western Mining), Ex-student, Project Manager (Dow Digital)
Scheduling	Planning and Scheduling	CEO Pretzel Logic, Ex-student
	GANTT charts, MS Project	Ex-student
Design	The design process Storyboards and prototypes	Senior project Manager (Xpedior)
Evaluation and Testing	Evaluation and Testing (Planning, tools, analysis and reporting)	CEO Pretzel Logic, Project Manager (Dow Digital)
Production	Integration, timing and processes	Senior project Manager (Xpedior)
Quality Assurance	QA (General)	CEO Pretzel Logic, Project Manager (Dow Digital)
	Procedures and templates	Ex-student
	Version Control	Project Manager (Dow Digital)
Legal	Contracts and IP and Copyright	Solicitor (Michael Paterson)
Hand-over	Implementation, Closing and backup and Post-mortem	CEO Pretzel Logic
Presentation skills	Presentation skills	Senior project Manager (Xpedior)

Equipment and Video Shooting Techniques

The researcher used a Digital Video Camera (Sony MiniDV Handycam DCRTRV15) for the video shoots. Extra resources needed included:

- Lapel microphone;
- Headset to check audio signal while recording;
- Spare battery; and

- Camera light.

The equipment provided a quick and economical means of capturing and developing video. The two most important elements that affected shooting the video were sound and light. The use of a lapel microphone attached to the presenter's shirt helped to enhance the sound quality, which was monitored with headphones during the recording sessions. Headphones were critical, as in one case the batteries in the lapel microphone were not working properly, and this would not have been detected without the use of headphones.

Lighting was another critical aspect that needed careful consideration to create high quality video. In general, good quality digital video cameras do not have high Lux ratings. Lux rating specifications are influenced by the size and number of pixels used in the camcorder's CCD chip(s). With high-resolution cameras this means that extra light is needed for quality video recording. So, when shooting video it was essential to have the subject in a well-lit area – either powerful lights or bright sunlight. Also, the position of the subject was also critical, and care had to taken not to have them in front of window or have any bright lights in the background. It was found that the use of the Sony camera light (attached to the top of the unit) proved not be a good option. It tended to cause much reflection, and in many cases made the subject squint, as the light would be aligned directly in their eyes. Separate video lighting could have been used, but would have been expensive to purchase and cumbersome to transport and set up.

As well as selecting well-lit areas, appropriate backgrounds were also carefully chosen. Busy backgrounds not only distracted from the main subject, but also added overheads to compression. Best backgrounds were found to be plain in colour without any movement or activity.

Production into Web Format

The video recordings were captured in digital video format stored on DV mini tapes. These were transferred to an Apple MacIntosh computer using Firewire™ transmission onto a hard disk. The iMovie (Apple Computer Inc, 2000a) video editing application was then used to edit the movies and create titles for each segment. When completed, they were exported using Quicktime (Apple Computer Inc, 2000b) in Streaming Web Movie format. This produced final movies that were at a size of 240x180 pixels and presented at 12 frames per second.

4.5 Pilot Study and Resulting Changes

An evaluation of the application was conducted through a pilot study that focused on collecting data that would help guide the decision making process in developing a more stable and usable product. Gaining constructive opinion on how best to maintain alignment between the original objectives and the final product was important at this stage of the development cycle. End users, tutors and expert reviewers were involved in giving feedback with a view of developing a product that would allow end users to complete tasks without having technology get in the way (Norman, 1990).

The evaluation methodology used for this study (Figure 4.39) was based on formative-evaluation models used for multimedia and web based products (Maslowski et al., 2000; Nielsen, 1994; Online Computer Library Centre, 2002; Reeves, 1992; Scriven, 1991). Each of these steps are considered in this section.

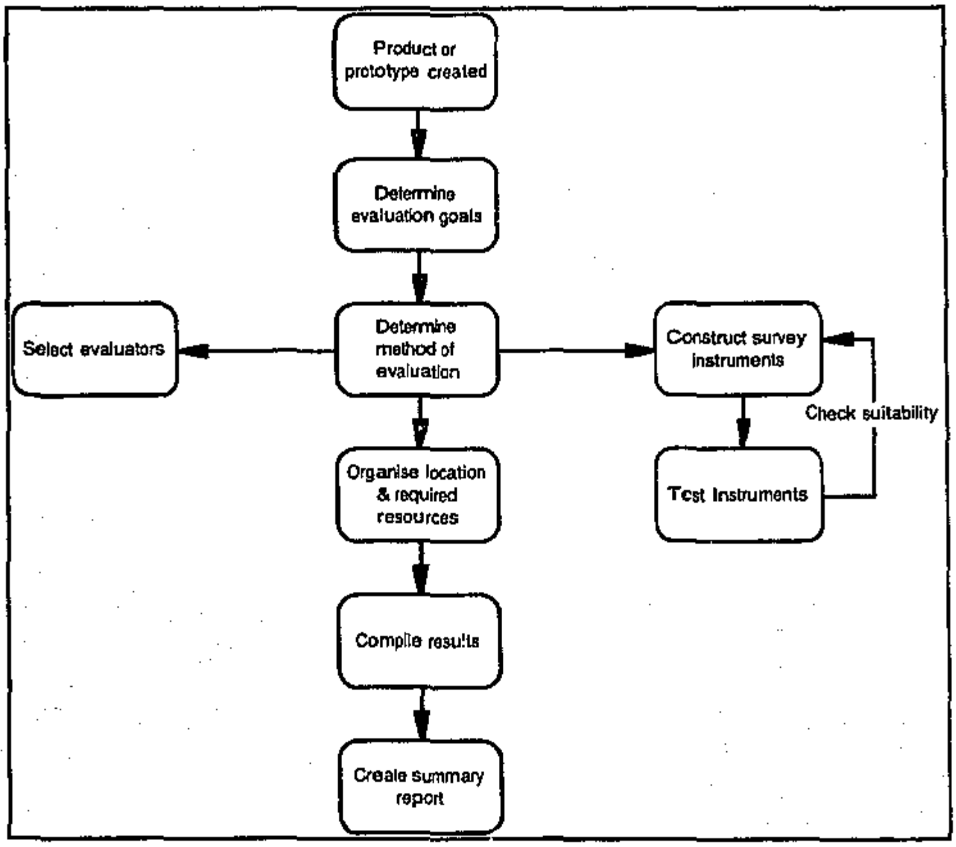


Figure 4.39: Evaluation methodology

What was the primary purpose of the evaluation? Were each of the following being tested - interface design, instructional design or navigation? The purpose of this evaluation was to test the usability of the system for two specific user groups - students and tutors. The aim was specifically to gain feedback from these users that would help improve the usability of the product, and reduce cognitive load.

Once the goal of the evaluation was decided, the evaluation methods had to be chosen. Should specific tasks and instruments be developed for the reviewers to ensure a specific part of the application is tested? Or, should just the goals of the study be provided to reviewers and allow them to freely navigate and interact with the system? At what stage should these evaluation tests occur? There are a wide variety of evaluation methods that can be implemented at different times during the production lifecycle and require varying amounts of resources and time. A summary of various usability testing methods are outlined in Table 4.9 (Nielsen, 1994). Each of these methods have advantages and disadvantages, so must be chosen according to the given context and specific information required. In this study, a combination of heuristic testing, interviews and focus groups were used as part of the evaluation process. Reviewers selected to be involved in the evaluation study included:

- Typical end users – three students who were in their third year of study in the multimedia program and would be taking this unit;
- Two tutors who would be teaching the unit; and
- Two expert reviewers –one academic with a long history of developing online instructional materials and one industry representative.

The students were given specific tasks to complete as part of the evaluation study. They were asked to:

- Create a student contract;
- Post a solution on the conference and assess the work of two other teams;
- Access the weekly resources with the view of solving the weekly task for week 3;
- Access information related to your team;
- Use the bulletin boards;
- Upload information on the web server and create a rapid prototype; and
- Use the self and peer assessment journals for three consecutive weeks.

Tutors were also given specific tasks to compete as follows:

- Assess the work of three comments and post appropriate comments;
- Compile information gained from the self and peer assessment journals to help provide data on individual student performance;
- Respond to information posted on the bulletin boards; and
- Access weekly resources with a view of providing supporting resources.

Table 4.9: Summary of usability methods (Nielsen, 1994, p. 224)

Method Name	Lifecycle Stage	Users Needed	Main Advantage	Main Disadvantage
Heuristic evaluation	Early design, "inner cycle" of iterative design	None	Finds individual usability problems. Can address expert user issues.	Does not involve real users, so does not find "surprises" relating to their needs
Performance Measures	Competitive analysis, final testing	At least 10	Hard numbers. Results easy to compare	Does not find individual usability problems
Thinking aloud	Iterative design, formative evaluation	3-5	Pinpoints user misconceptions. Cheap test	Unnatural for users. Hard for expert users to verbalise.
Observation	Task analysis, follow-up studies	3 or more	Ecological validity; reveals users' real tasks. Suggests functions and features	Appointments hard to set up. No experimenter control
Questionnaires	Task analysis, follow-up studies	At least 30	Finds subjective user preferences. Easy to repeat	Pilot work needed (to prevent misunderstandings)
Interviews	Task analysis	5	Flexible, in-depth attitude and experience probing	Time consuming. Hard to analyse and compare
Focus groups	Task analysis, user involvement	6-9 per group	Spontaneous reactions and group dynamics	Hard to analyse. Low validity
Logging of actual use	Final testing, follow-up studies	At least 20	Finds highly used (or unused) features. Can run continuously	Analysis programs needed for huge mass of data. Violations of users' privacy
User feedback	Follow-up studies	Hundreds	Tracks changes in user requirements and views	Special organization needed to handle all replies

Expert reviewers were told what the goal of the application was, and provided with a list of broader questions referring to structure and navigation, readability of text, appropriateness of graphics, clarity and quality of information, suitability of external links, and motivating characteristics of the learning environment (Lockyer, Patterson, & Harper, 1998).

In all cases reviewers were asked to access the application from both on and off the campus. All users had access to a computer laboratory during the evaluation period, and a room was also booked for interviews and focus group sessions. These sessions were recorded on audiotape and transcribed by a research assistant. Student, tutor and expert comments were then summarised with recommendations for changes to be made (Table 4.10).

Table 4.10: Resulting changes from pilot study

Reviewers	Issue	Resolution Strategy
End Users/ Students	*Shockwave™ interface* - in some cases students found this problematic when used off-campus with modems, older browsers and older equipment. Users complained about getting a black screen, and consequently loosing all ability to interact with the application.	Created an alternative icon based interface not reliant on Shockwave™ (Figure 4.41). End users could then choose which interface was most appropriate.
	Bulletin boards – Students found it difficult to locate new messages posted. They would have to navigate through each category to check if new messages had been posted, which was laborious.	Created a message tracking system that counted the number of new messages posted since the last login in the opening screen, and also highlighted these in their appropriate categories (Figure 4.44)
	Individual and team contracts – students felt they would not have the necessary skills needed to predict time and required deliverables for their team roles at the beginning of the semester.	• A greater emphasis placed on explaining team role responsibilities and time needed to perform specific duties through tutor led meetings • Sample contracts provided for each team role • Tutor led sessions with each team discussing roles and responsibilities
Tutors	*Peer assessment journals* – tutors found the effort required to create consolidated peer assessment reports for each team member was time consuming and they often had to develop hand written summary reports.	Developed customised reports that reduced tutor effort in gained consolidated information needed in tutor led peer assessment sessions (Figure 4.43)
	Tracking student usage – tutors wanted facilities that provided information about the usage of course resources by students to help gauge how active they had been in using resources.	Developed student tracking tools that provided student usage statistics (Figure 4.42)
	Managing individual and team profiles – tutors wanted more flexibility in changing team names, moving students from one team to another, and deleting teams	Database back-end adjusted to provide greater flexibility in managing team and individual profiles.

Reviewers	Issue	Resolution Strategy
Expert Reviewers	*Timing the usage of resources* – a concern was raised as to how users recognised when and how to use each feature such as the conference centre, journals, resources, timesheets and file resource area.	• Modelling by tutors needed in the first 3 weeks of semester • Help sheets required • Reference to site needed at each lecture illustrating relevant features • Overview of features and resources by tutors at each tutorial session
	Access to generic skill resources – generic skill resources should be more prominent and provide succinct information and resources for each generic skill being targeted	Online resource developed with definitions and a variety of online resources and training activities to support generic skill development

An alternative interface was developed to prevent students from having to load Shockwave™ when accessing the system from remote sites with slow modems and older equipment (Figure 4.40)

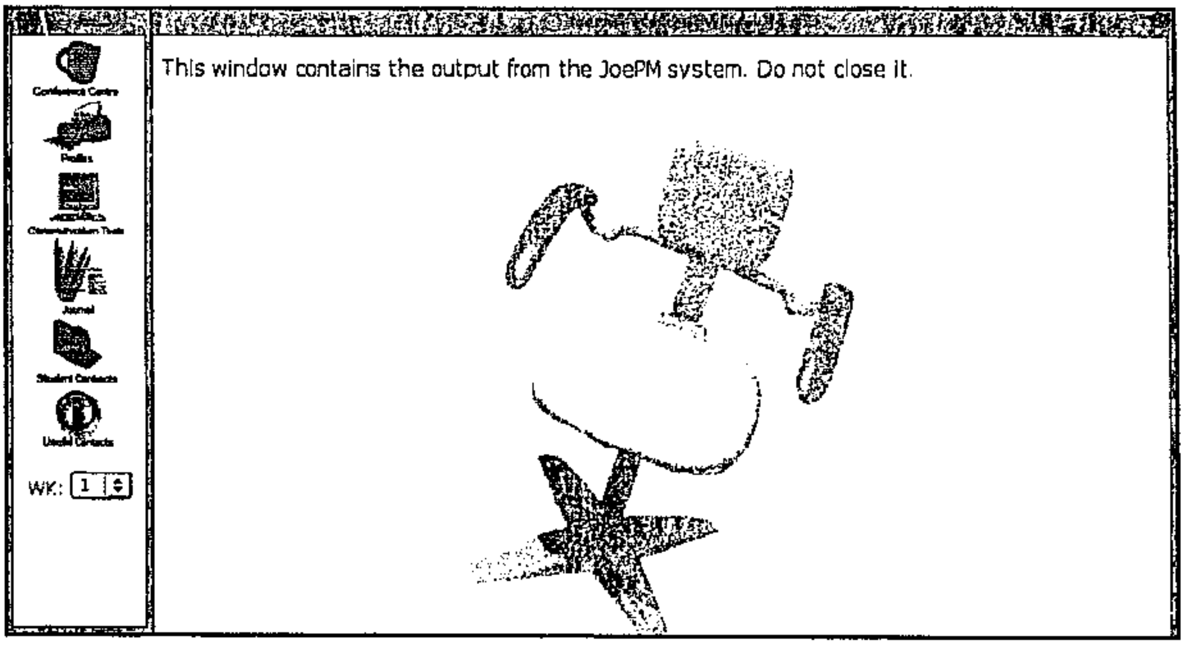


Figure 4.40: Icon based interface

Student tracking tools were developed to give tutors information on how regularly different teams, and individuals within the team had logged into the system and accessed resources (Figure 4.41)

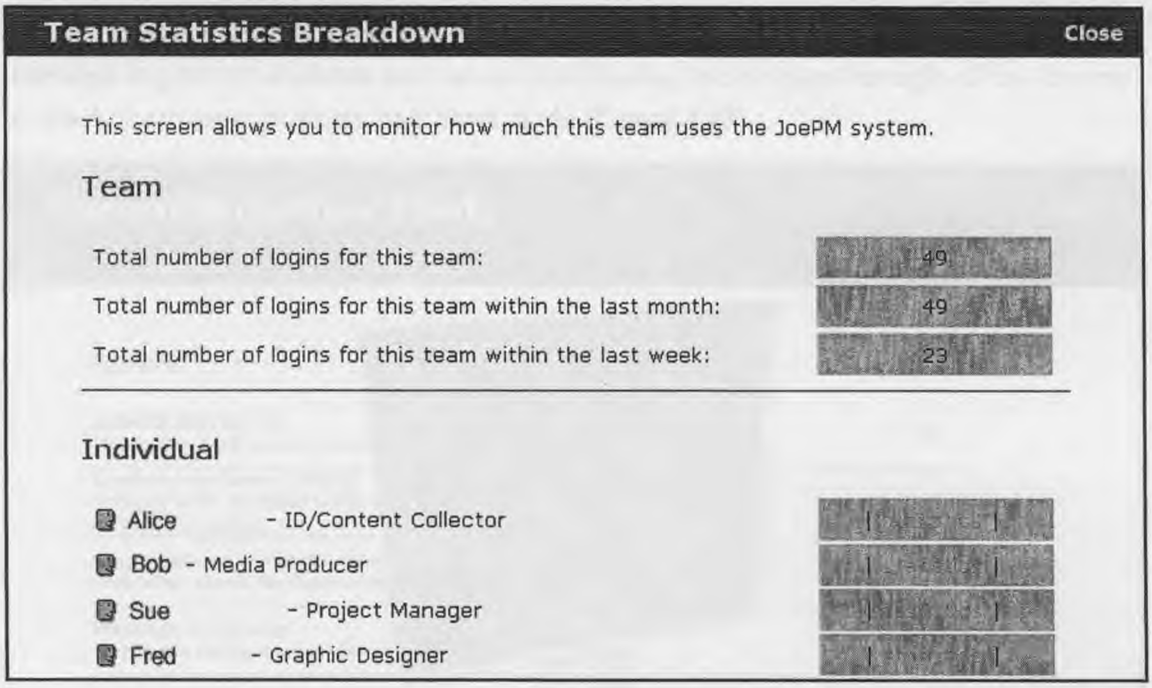
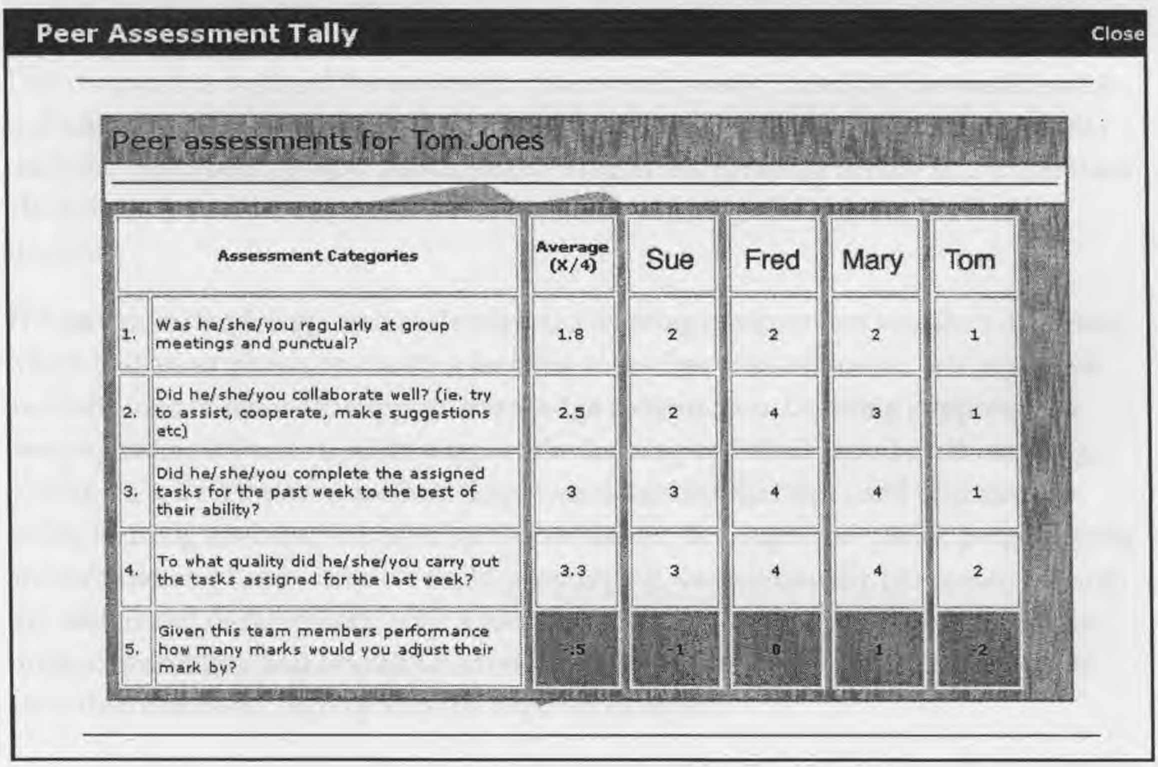


Figure 4.41: Team and individual usage statistics

Reporting system developed that consolidated each team members scores and opinions for individuals team members into one report. This would give tutors a quick summary of how individuals rated within their teams, and if there were any problem areas that needed further investigation (Figure 4.42)



	Assessment Categories	Average (X/4)	Sue	Fred	Mary	Tom
1.	Was he/she/you regularly at group meetings and punctual?	1.8	2	2	2	1
2.	Did he/she/you collaborate well? (ie. try to assist, cooperate, make suggestions etc)	2.5	2	4	3	1
3.	Did he/she/you complete the assigned tasks for the past week to the best of their ability?	3	3	4	4	1
4.	To what quality did he/she/you carry out the tasks assigned for the last week?	3.3	3	4	4	2
5.	Given this team members performance how many marks would you adjust their mark by?	-.5	-1	0	1	-2

Figure 4.42: Team and individual usage statistics

Forum posting was modified to show new postings since the last login. This was intended to prevent students and tutors from having to navigate through all the forums to check if any new postings had been made (Figure 4.43).

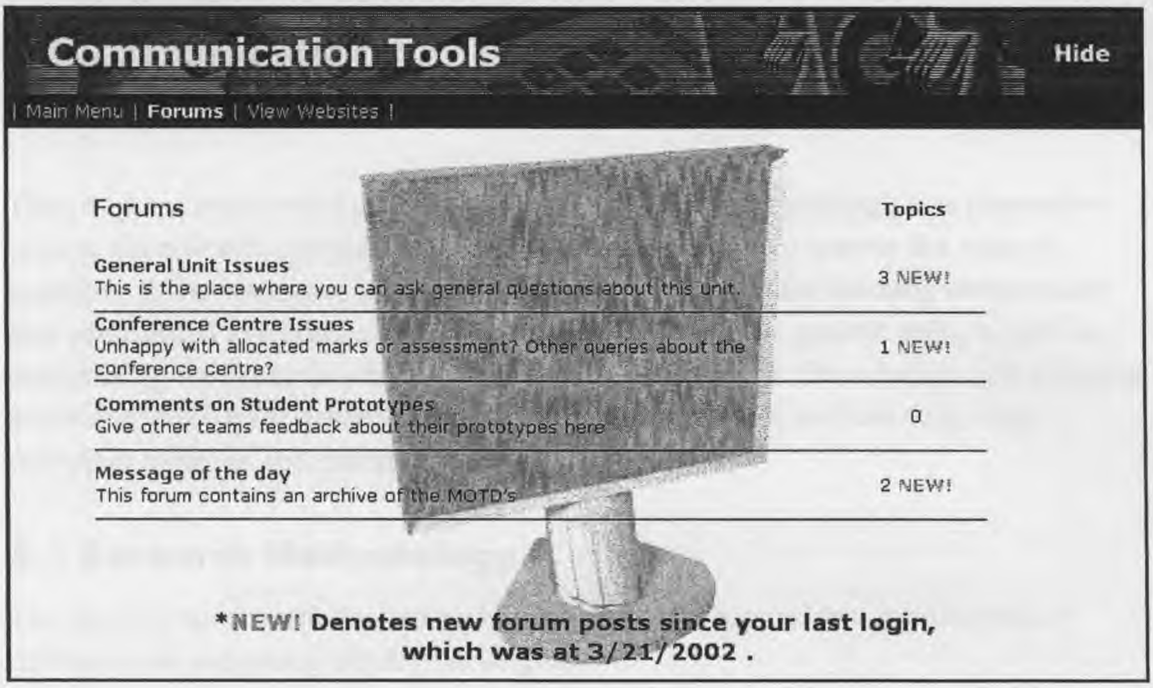


Figure 4.43: New messages highlighted in Forums since last login

4.6 Summary

This chapter has outlined the context for the overall study, including the participants and unit of study that was targeted – a group of final year higher education students studying multimedia project management. Within this context a review of the literature identified a list of eleven generic skills that were considered necessary for these students.

The design methodology used to develop the learning environment was then described, which had an emphasis on creating learning tasks that were authentic, self-regulated and reflective in nature to support knowledge construction. Learning supports and learning resources were used to support the learning activities. Based on these design principles, a development methodology was described that was used to create the online learning environment, which included design, development, media, programming and evaluation phases. Iterative rapid prototyping was continually reinforced through the design and development, with a focus on collecting user feedback to enhance the product's usability and overall effectiveness. The results of formal evaluation study were then discussed, highlighting the required changes.

Chapter 5

Research Methodology

This chapter describes the process by which a research methodology was planned to answer the research questions in a valid and reliable way. To answer the research questions it was necessary to ascertain the salient factors in the learning environment that contributed to students practising and developing their generic skills, as well as determining the extent to which these skills were developed. The selection and planning of the methodology is described by considering the research methodology, data collection methods and instruments used.

5.1 Research Methodology

The qualitative/quantitative research debate revolves around two fundamentally different and competing inquiry paradigms:

1. Logical-positivism, which uses quantitative and experimental methods to test hypothetical-deductive generalisations, versus
2. Phenomenological inquiry, using qualitative and naturalistic approaches to inductively and holistically understand human experience in context-specific settings. (Patton, 1990, p.37)

Quantitative research methods have traditionally been used in science, for two primary functions: "the development of theory and the testing of substantive hypotheses that are deducted from theory" (Best & Kahn, 1993, p. 7). However, research into human nature is complex and difficult to predict using theories, as human are all different and human behaviour is hard to predict.

Over the past 40 years an increasing number of researchers have recognised the value of qualitative research in education and social science that focuses on human and individual experiences within a social environment. It has become a competing paradigm with scientific and quantitative research that attempts to create general rules or principles from which predictions can be made. This approach is particularly relevant within the physical science area. The human or subjective element which qualitative research focuses on, has been identified as a critical factor in finding truth and knowledge within educational research, that is, "what people say and do is a product of how *they* interpret the complexity of their world" (Burns, 1994).

The theoretical perspective (or way of looking at the world) for qualitative researchers is focused on interpreting understandings and different points of view. The theoretical perspective for positivism is focused on emphasising facts and causes of behaviour (Bogden & Biklen, 1992). Features of qualitative research, which are not prescriptive to every qualitative research study, but appear in most to some degree (Bogden & Biklen, 1992), were particularly suitable in this study:

- *Have a natural setting for data collection, and the researcher is the key instrument,* researchers must enter schools, families or other communities in location to gather data;
- *Be descriptive,* data collected must be in words or pictures rather than numbers, such as quotes, interview transcripts, field notes, photographs, videotapes, personal documents and other official records;
- *Be concerned with process rather than just outcomes of products,* how do people negotiate meaning. This is particularly relevant in educational research concerning issues such as self-fulfilling prophecies where students' performance is affected by the teacher's expectation;
- *Analyse data inductively,* qualitative researchers do not search out data or evidence to prove or disprove a hypothesis, rather abstractions are built as data that have been gathered are grouped together, which is a bottom up approach; and
- *Be concerned with the "meaning" of data,* researchers are interested in the ways different people make sense of their lives, that is, the participants' perspective.

Salomon (1991) proposes that the quantitative/qualitative debate is not one between *basic and applied* research, it is rather a debate concerning an analytic and systemic approach to research. "The Analytic Approach capitalizes on precision while the Systemic Approach capitalizes on authenticity" (p.16). Salomon suggests the "legitimate complementarity of paradigms" (p.10) in place of this dualist argument, and recommends that "...the war of paradigms...should be put to rest" (p.11). This approach is taken in this study.

Selecting a Research Methodology

In selecting a research methodology, and the corresponding research methods, Crotty (1998) argues that there is a "bewildering" array of methodologies and methods, and how these relate to theoretical perspectives is often unclear. He contends that there are four basic elements needed in any research process (Table 5.1) as follows:

- *Research methods*: the techniques or procedures used to gather and analyse data related to some research questions or hypothesis. Activities to gather and analyse data, such as developing detailed explanations of interview process or participant observation;
- *Research methodology*: the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to

the desired outcomes. For example, an ethnographic inquiry in the spirit of symbolic interactionism (the theoretical perspective) will promote the use of unstructured interviews;

- *Theoretical perspective*: the philosophical stance informing the research methodology and thus providing a context for the process and grounding its logic and criteria; and
- *Epistemology*: the theory of knowledge embedded in the theoretical perspective and thereby in the methodology.

Table 5.1: Four elements of research (Crotty, 1998, p. 5)

Epistemology	Theoretical Perspective	Research Methodology	Research Methods
Objectivism	Positivism (and post-positivism)	Experimental research	Sampling
Constructivism	Interpretivisim	Survey research	Measurement and scaling
Subjectivism (and their variants)	• Symbolic interactionism	Ethnography	Questionnaire
	• Phenomenology	Phenomenological research	Observation
	• Hermeneutics	Grounded theory	• Participant
	Critical inquiry	Heuristic inquiry	• Non-participant
	Feminism	Action research	Interview
	Postmodernism	Discourse analysis	Focus group
	etc.	Feminist standpoint research	Case study
		etc.	Life history
			Narrative
			Visual ethnographic methods
			Statistical analysis
			Data reduction
			Theme identification
			Comparative analysis
			Interpretative methods
			Document analysis
			Content analysis
			Conversation analysis
			etc.

Each of these four elements of research is considered below in relation to the context of the study.

Epistemology

The predominant epistemology that described and informed the learning in this study was constructivism (Table 5.1). Constructivist learning theory proposes that truth, or meaning, comes into existence from our engagement with the realities in the world (Bruner, 1990; Jonassen, 1999; Piaget, 1969; Vygotsky, 1978). In this paradigm, learners construct their own reality through interpretation or perceptions of their experiences. An individual's prior knowledge, mental structures and beliefs are used to interpret objects and events. Constructivists emphasise the design of learning environments within authentic (or simulated authentic) environments, rather than designing instructional practices and content (Jonassen, 1994). This is in alignment with the conceptual framework proposed in this study, in which constructivist-learning principles play an important role in designing the learning environment.

Constructivist learning theory has gained increased acceptance over recent years, with the view that learners construct their own world picture from their own individual experiences and meaning, that is, there is no meaning without experience or mind. This contrasts the view of objectivist epistemology, which considers that learners are "empty vessels" waiting to be filled with the correct knowledge and meaning exists apart from any consciousness. As a teaching and learning approach, constructivism is based on the premise that learning is the result of mental construction, that is, students learn by fitting new information together with what they already know, which is affected by the context in which the idea is taught. Constructivist elements such as these are now almost ubiquitous throughout cognitive learning theory. Piaget, Bruner and Vygotsky all promote constructivist-learning elements, as do learning theories such as cognitive flexibility theory, generative learning and cognitive apprenticeship.

Theoretical Perspective

The theoretical perspective that was selected to inform the study was mainly interpretivistic-phenomenological in nature (Table 5.1). As advocated by Bogden (1992), researchers using a phenomenological approach attempt to understand the meaning of events and interactions of a group of people within a particular situation. In this study, the individual students' perceptions were aggregated to determine how successful the online learning environment was perceived to be in developing their generic skills, as well as determining the learning strategies that helped the students practice these.

The study sought to understand the students' experiences within a context-specific setting by focusing on the question: "What is the structure and essence of experience of this phenomenon for these people?" (Patton, 1990, p.69). The approach examined how students constructed meaning within the learning environment, that is, the research questions were concerned with the meaning of the phenomenon and the essence of their experience (Morse, 1998).

Research Methodology

An action research methodology (Table 5.1) was chosen as the basis of the study. The researcher was involved in lecturing and tutoring in the unit with a view to improving the process. Action research focuses on a specific program at a specific point in time where the people in the situation are directly involved in gathering information and then analysing the results to attack specific problems (Patton, 1990). It has as its goal, the involvement of both research specialist and teacher in the study, and the application of research to educational problems in particular settings (Best & Kahn, 1993).

Zuber-Skerritt (1990) argues that "action research is not only a possible alternative to advancing knowledge in higher education; it is also a more effective and immediate way of improving Higher Education learning and teaching practice" (p.10). This is supported by Reason (1998) who affirms that action research makes qualitative research more humanistic and relevant by co-creating reality through participation, experience and action. Zuber-Skerritt (1990) contends that action research is an alternative approach to traditional social science research in that it is:

- *Practical*: the results and insights gained from the research are not only of theoretical importance, but lead to practical improvements;
- *Participative and collaborative:* the researcher is not considered an outside expert, but a co-worker doing research with others;
- *Emancipatory:* all the people involved are equal participants contributing to the enquiry;
- *Interpretive:* solutions are based on the views and interpretations of the people involved in the enquiry; and
- *Critical:* the participants all attempt to improve the task as well as themselves throughout the process.

These conditions for action research are aligned with the study, as the researcher was actively involved in attempting to improve the course of study, and was not considered an outsider performing research.

Research Method

A case study research method (Figure 5.1) was used to perform a detailed examination of a group of people who were considered suitable for the research (Bogden & Biklen, 1992). A case study represents an exemplar of, or prototype of a situation involving a group of people suitable for researching the given topic (Best & Kahn, 1993). A general framework was created for developing students' generic skills in higher education institutions. To test the effectiveness of this framework, a group of eighty students studying multimedia project management were selected to enable a detailed analysis of the learning environment so that rich information can be gleaned from the phenomenon in question (Patton, 1990).

The usage of case study approaches has been steadily increasing in educational research. There has been a move away from investigations seeking to develop simple laws of learning to investigations that provide thick descriptions of complex teaching and learning episodes (McAninch, 1993). In keeping with case study investigations, Patton (1990) argues that descriptions must be carefully separated from interpretation. Thick description is firstly required to provide solid descriptive data that sets up and makes interpretation possible. To enable the collection of rich data this study sought to record data using mainly qualitative strategies such as observation, focus group interviews and one-to-one interviews.

Research Process Used in Study

Using the four elements of research outlined by Crotty (1998) this study planned can be summarised as being focused on a constructivist epistemology, based on interpretivist-phenomenology theoretical perspective with an action research methodology and a case study research method (Figure 5.1).

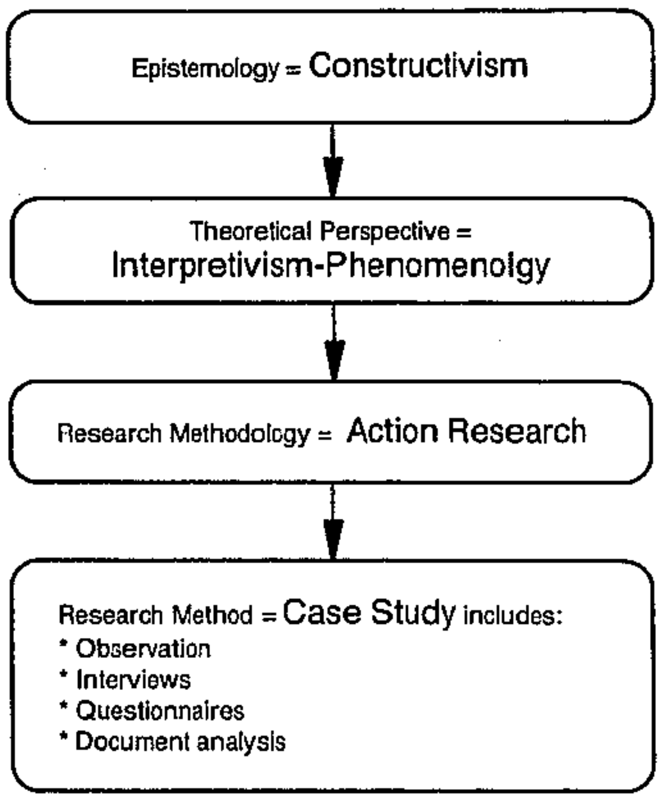


Figure 5.1: The research process

Ensuring Validity and Reliability

Although qualitative research would be the prominent paradigm, some quantitative research methods were also planned to support findings (triangulation). The combination of these research methods can produce results that highlight strengths of each methodology and should be supported during study design phase (Miles &

Huberman, 1994; Nau, 1995; Patton, 1990). Reeves also cautions against wholesale replacement of quantitative methods of research with qualitative research methods, stating: "Interpretivist, qualitative inquiry must also be well-conceived and rigorously applied" (Reeves, 1993, p.44).

By using different sources and methods of data collection at different stages of the study, it is possible to build on the strength of each type of data collection method and minimise weaknesses of any single approach. A multi-method approach to data collection strengthens both the validity and reliability of the results. This approach, called triangulation is often mentioned as the advantage of a mixed method approach (Mathison, 1988; National Science Foundation, 1998).

This view is also supported by Patton (1990): "Triangulation is a powerful solution to the problem of relying too much on any single data source or method, thereby undermining the validity and credibility of findings because of the weaknesses of any single method" (p.193). Using triangulation is recognition that the researcher needs to be open to more than one way of looking at things. The combination of both qualitative and quantitative research methods was planned in this study to improve data collection approaches and results.

Also, as this thesis was being written, many parts of the literature review, conceptual framework and online learning environment were reviewed through refereed conferences, journal publications and book chapters. This allowed peers to evaluate many aspects of the study, and provide valuable feedback to enhance the validity of the study. See Appendix 8 for a full list of refereed articles.

5.2 Data Collection Methods

Having a clear understanding of the purpose of the study and carefully defining the research questions is an important first step in designing the data collection methodology, "You must know what you're trying to find out; when you finally know this, the problem is heading toward a solution" (Burns, 1994, p.18).

In this study, the key research question sought to examine the extent to which each learning principle (authenticity, self-regulation and reflection) contributed to students' practising their generic skills by considering:

- Student activity found to be most prevalent in practising skills (i.e. how students practised each skill);
- Aspects of the course that motivated students to practice skills (i.e. why students wanted to practise skills); and
- How each learning principle influenced student activity and motivated practice.

The second research question was focused on determining the amount of skill improvement, if any, that occurred over the duration of the course.

Determining which data collection methods were most reliable and valid for this study was based on a review of the literature by considering the strengths of different methods (Table 5.2). Through this process it became clear that no single method could provide all the required data. A combination of focus group interviews, one-to-one interviews, observation and questionnaires was necessary to triangulate data, as the strengths of one approach helped compensate for the weaknesses of another (National Science Foundation, 1997).

Table 5.2: Data collection methods - advantages and disadvantages

Method	Strengths	Sources
Observation	• Provides direct information about the behaviour of individuals and groups as it occurs in the natural setting • Provides opportunities to identify unanticipated behaviour • Allows the researcher to understand the situation/context	• (American Statistical Association, 1998) • (National Science Foundation, 1998) • (Patton, 1990)
One-to-one Interviews	• Can use open-ended, semi-structured or structured interview strategies depending on data needed • Can get in-depth information • Interviewer can be flexible for particular individual s and circumstances giving extra explanations when needed • Can yield new unexpected insights	• (Burns, 1994) • (National Science Foundation, 1998) • (Patton, 1990)
Focus Group Interviews	• A wide range of information can be gathered in a relatively short time span; • The moderator can explore related but unanticipated topics as they arise in the discussion; • Dynamics of the group process mean that lively discussion reveals agreements, disagreements, different perspectives, and related ideas. • Provide some quality control on data collection in that participants provide some checks and balances on each other	• (American Statistical Association, 1998) • (Morgan, 1997) • (Paulson, 2001) • (Patton, 1990)
Questionnaires	• Can be completed anonymously • Inexpensive to administer • Easy to compare and analyse -consistent data • Respondents are free to answer at their own rate and confidentially • Fear and embarrassment of direct contact is avoided • Can easily administer to many people	• (Burns, 1994) • (National Science Foundation, 1998)

Using Table 5.2 as a guide, a data collection-planning matrix was established (Table 5.3) to help identify suitable data collection strategies for the study (LeCompte &

Preissle, 1993). The matrix included research questions, required data and data collection method that would be used:

- The first research planned to use qualitative, in-depth data to help determine the factors that contributed to students practising their generic skills. It was decided that observations could be used to help gather firsthand information from a wide variety of behaviours. Data collected from these would then help create questions used in one-to-one interviews to get richer data about observed behaviours. These would then help provide a structure to develop focus group questions to try and reach a consensus of opinion, or consistent viewpoints;
- The second research question planned to use two different questionnaires to determine changes in students' generic skills over the duration of the semester; and
- A summative evaluation of the course was also planned, using a combination of questionnaires and focus group interviews.

Table 5.3: Data collection planning matrix

Question	Data Needed	Data Collection Method
Research Question 1 What factors contribute to students practising generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?	How often and in what ways were generic skills practiced due to each learning principle? • Which learning activities encouraged students to practise generic skills? • Why students practised these generic skills?	Observation, reflective reports and online journals
		One-to-one interviews to obtain in-depth information about how and why students practised using generic skills
		Focus group interviews to help obtain a consensus of opinion, and generate new perspectives
Research Question 2 To what extent do students develop generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?	Difference in scores for workplace competencies	Workplace competencies questionnaires (pre and post)
	Difference in scores for student perceptions of their own and their peers' generic skill development	Skills comparison questionnaire designed to compare changes in self and peer skills over the semester (pre and post)
Course Evaluation	Student and tutor perceptions of the course, and suggestions for improvement	Course evaluation questionnaires: • Institutional; and • Customised.
		Skills perception questionnaire designed to evaluate student perceptions about their generic skills
		Student focus group interview to collect data on how students perceived the course
		Tutor focus group interview and course evaluation questionnaire

5.3 Data Collection Strategies Used in Study

The study was conducted with 96 final year undergraduate and postgraduate students enrolled in the unit *IMM 3228 Project Management Methodologies*. This unit was run in the first semester of the final year of study as a pre-requisite for *IMM 3330 Industry Project* unit. Each week had a one-hour mass lecture for all the students, followed by five tutorials (two hours each) with approximately 25 students. These tutorials were serviced by five different facilitators – one full time university lecturer (the researcher) and four sessional tutors. All the tutors were active multimedia project managers in the industry, or had substantial industry experience in developing multimedia.

Within this setting, data was collected using observation, reflective reports, online journals, interviews and questionnaires. These strategies are outlined below.

Observation, Reflective Reports and Online Journals

Observation, reviewing reflective reports and online data were used to help identify issues that needed further investigation.

Observation

As a tutor in the unit, the researcher had the opportunity to observe students on a weekly basis with minimum interference or disruption. Each weekly tutorial session consisted of one hour of student/tutor interaction discussing the readings, solutions and issues related to the unit content. In the second hour, students had team meetings and discuss project related issues with the tutor. During this time, it was possible to make observations of how teams were interacting, listen to comments being made, and record points of interest. Observation recording sheets were developed which included:

- Date of observation;
- Team or student/s being observed;
- Session context and focus (i.e. issues being discussed, meeting format, dominant speaker, intensity of meeting, etc); and
- Issues discussed that may have affected generic skill practice and deserved further investigation through interviews.

Journals and Reflective Reports

Weekly student reflections were planned for use throughout the semester using the online application. These were confidential, so students would be able to reflect on and discuss sensitive or embarrassing issues. Students would be required to reflect on their own and their peers' progress (Chapter 4), which included:

- A score rating of self and peers across four dimensions using a scale from 0 (no contribution) to 4 (excellent contribution);

- Comments justifying the allocated scores; and
- A summary of the timesheet data in the major categories, with comments about how they managed their time in accordance with the team's schedule and their time management plan;

Also, students were required to complete three private reflective reports, focused on how they were performing in the unit, outlining strengths, weaknesses, and how they could improve on their performance.

Bulletin Boards

Students were able to ask questions and make comments about the unit, or issues surrounding the unit. This would provide a source of information that would be useful in helping to detect student opinions about various issues within the unit, in particular peer assessment.

Interviewing - Focus Group and One-to-One

A semi-structured or interview guide approach was planned for interviewing students. The issues that needed to be covered were specified in outline format, and then the interviewer decided on the sequence and wording of the questions during the interview (Burns, 1994; Patton, 1990). This style of interview approach helped encourage free and open responses, as well as capturing responses from participants in their own words. The goal of these interviews was to illicit rich, detailed material from participants that could productively be used in the analysis phase of the study (Lofland & Lofland, 1995).

One-to-one as well as focus group interviews were planned to collect data. One-to-one interviewing was used to help get a deeper understanding and perspectives of how and why students were practising their generic skills, as well as investigating interesting issues that were noticed through observations and journals.

Focus group interviewing is an interview with a small group of people on a specific topic (Patton, 1990). Focus groups exploit group dynamics by generating data and insights that would be unlikely to emerge without group interaction. Participants are generally a relatively uniform group of people asked to reflect on questions posed by the researcher. Within this setting, participants hear others responses and make additional comments beyond the scope of an individual interview. The object is to "get high-quality data in a social context where people can consider their own views in the context of the views of others" (Patton, 1990, p.335). Unlike the one-on-one interview, focus groups generate new data through group discussion as people share and compare ideas and viewpoints. In this study, these were planned to complement and corroborate data collected from observations, and one-to-one interviews.

Interview sessions should have a consistent form and structure. Based on techniques promoted by Patton (1990) and the National Science Foundation (1997), the following process was planned for the interview implementation.

- An interview location and environment that would be comfortable, non-threatening, private and without any distractions such as phones, computers or other students/staff being visible. The environment should be conducive to students putting forward their own opinions, perceptions or feelings without any reservations (National Science Foundation, 1997);
- Introductions would be firstly made outlining the researcher's background and then introducing participant/s if necessary. The purpose of the research would then be explained, with the assistance of support materials if necessary;
- Confidentiality and informed consent would be established. The research would follow strict ethical guidelines in order to protect students' rights. All contributions taken from participants would be treated with complete confidentiality, and the aim of the research, as well as the participants' roles would be made as clear as possible. Participants should be comfortable in the knowledge that their responses will not prejudice them in any way so that they actively engage with the data collection sessions without any reservations (Miles & Huberman, 1994);
- Format of the interview session and data collection method would be explained to students, making them aware of the method used to collect data, and clearly outlining how and why the equipment was being used;
- Information would be given about the content being discussed (if necessary), and participants given the opportunity to ask and pre-interview questions about the research;
- The interview would then be conducted using interview techniques established by Patton (1990); and
- For closure and analysis, at the end of the interview session all participants would be thanked for attending the session, and reminded that their comments are valued. Analysis would be conducted as soon as possible after the interview to help consolidate ideas and issues collected during the interview.

Confidentiality and Informed Consent

Most universities have information located at their web sites about issues related to ethics and research. At Edith Cowan University the ethics web site contains policies, procedures, guidelines, application forms and declaration forms needed to conduct research on both humans and animals (Edith Cowan University, 2001).

Ethics procedures have been established to protect and inform research subjects. Typically the following information should be made available before research proceeds:

- What are the research benefits of the study, that is, why is the study being conducted? Who will benefit from the results?
- How will participant responses be kept confidential?
- How will responses be used?
- How much effort is required? Is there any compensation?
- Who else can I contact to confirm the research is valid or ask questions?

The research in this study followed strict ethical guidelines developed by Edith Cowan University in order to protect students' rights, which had to be approved by the University's Ethic Committee. Students would be informed about their rights, who would have access to the data, how it would be analysed and how it would be used. Students would be reminded that their identity would always remain confidential and private.

Interview Techniques and Questions

Patton (1990) suggests that there are six types of interview questions that can be asked in terms of the past, present or future:

- Behaviours – about what a person has done or is doing;
- Opinions/values – about what a person thinks about a topic;
- Feelings;
- Knowledge;
- Sensory; and
- Background/demographics

In this study interview question were planned to be in two stages. Experiential or behaviour questions would be asked first, that is, asking students what they had done in a non-controversial manner, and making them easy to answer. By answering these, the respondents would build a context or descriptive picture of their situation before then asking opinion questions (Table 5.4 and 5.5). Probes were prepared for each question to enable the interviewer to generate more discussion if needed. The final question was an opinion question. At this point, the context was clearly set which enabled a clear response from students:

Table 5.4: Focus group interview – how and why students practised using generic skills

Question 1:	**What activities are taking most of your time so far in this unit?**
Experience Question	Students are required to give a description of events that have taken place. This question helps set the context and get students thinking about what they have been doing in the unit.
Probes	• Team role? Forming a team? • Meetings? Setting up procedures etc..
Question 2:	**Which generic skills (as shown in the table), have you been practising the most?" This is just a RATING question i.e. the most through to the least practice.**
Experience Question	• Different students may have different answers • As students RATE these, use the checklist to develop an order. Some students may be practicing skills more or less than others? Opinion or experience? • Students will be given a questionnaire to monitor these
Probes	Mention specific skills such as time management, taking responsibility for own learning, leadership, interpersonal skills, communication, research skills, problem solving and task management.
Question 3:	**Can you give examples of how you practised using these generic skills? i.e. WHAT things did you do to practise these skills?**
Experience Question	Get descriptive accounts of how generic skills are being practised by the students i.e. what they did when they were practising them. Use the checklist to probe on generic skills that haven't been discussed by the students.
Probes	• Any awkward or uncomfortable situations? • Timesheets and tracking time? • Finding and synthesising information for weekly activities? • Self and peer assessment through journal entries
Question 4:	**In your opinion, what is causing you to practise generic skills in this unit? i.e. WHY are you practising these skills?**
Opinion Question	Trying to establish why students are practising these skills. Which elements of the learning environment have the greatest influence?
Probes	• High marks? • CV item? • Commitment to team role and contract? • Self and peer assessment

Table 5.5: Course perception interview

Question 1:	**What aspects of this unit appealed to you?**
Experience Question	Students asked to discuss aspects of the course they enjoyed.
Probes	• Working in teams, contracts and peer assessment • Creating a CV item • Having real clients • The weekly problems • Tutor led peer assessment
Question 2:	**What aspects of the unit didn't you like?**
Experience Question	Students asked to discuss aspects of the course they didn't enjoy.
Probes	• As above • Did you work long hours • Did you learn only because you spent more hours?
Question 3:	**Can you suggest any improvements?**
Opinion Question	Asking for opinions on how to improve the course.
Probes	• How could it be improved? • Exam? • Weekly problems? • Teamwork?
Question 4:	**Do you think that this unit was successful in teaching you the project management content as well as generic skills?**
Opinion Question	Trying to establish if students felt that the unit was successful in both teaching the project management content as well as developing their generic skills
Probes	• Knowledge of how to run a multimedia project? • What generic skills do you consider important when developing multimedia product? • What would you look for in a team member?
Any other comments?	

One-to-one interviews were planned during the semester. These would occur when the researcher gained information about particular students through observations, online journals or reflective reports. Using the above methodology students would be interviewed regarding issues such as:

- Peer assessment, and tutor led peer assessment sessions;
- Teamwork and the distribution of tasks within the team;
- Conflict resolution and problem solving; and
- Skill practice (discussing selected generic skills).

It was planned that during these sessions the interviewer would use various interview techniques to help with the collection of valid and reliable data. These included:

- Remaining neutral at all times and not giving personal opinion;
- Encouraging students through active listening techniques such as nodding and using positive body language gestures;
- Changing questions by summarising the information from the last question before introducing the next question;
- Keeping discussions on topic by summarising relevant issues discussed so far and then repeating the original question; and
- Continually checking the status of the tape recorders.

Questionnaires

Five different questionnaires were planned to be used in this study. Two would measure changes in generic skill development that occurred over the semester using:

- Workplace competencies questionnaire; and
- Generic skills comparison questionnaire.

Two other questionnaires were planned to be used to evaluate the effectiveness of the course:

- Institutional course evaluation questionnaire; and
- Customised course evaluation questionnaire

Another questionnaire was developed to determine how and why students practised using their generic skills (generic skills perception questionnaire). These are described below.

Workplace Competencies Questionnaire

The Workplace Competencies Questionnaire (Miles & Grummon, 1996) was created in the United States through a series of national and state surveys of workplace skills, reviewed to determine generic skill areas that are considered critical by employers (Carnevale et al., 1991; Commission on the Skills of the American Workforce, 1990; Secretary's Commission on Achieving Necessary Skills, 1991).

The questionnaire is a self-assessment package for workplace skills, designed to help students understand what skills employers require, and how they rate against these. These skills are generally different to the regular academic and technical competencies students are normally tested for. The questionnaire is designed to give students feedback on nine professional or generic skills, to help tutors and students identify areas in which students can benefit most from educational interventions to develop customised strategies. The instrument was given at the beginning of the semester (pre-test) and end of semester (post-test).

The skills initially targeted twenty-four competency areas, which were reviewed by a panel, based on prevalence in the literature, ability to be taught or trained, and clarity with which it could be defined in assessment. Based on this analysis, nine scales or professional skills were developed, with fifty diagnostic items. The items were field tested in 1995 with sixteen different institutions in rural and city areas, and modified based on statistical results derived from reliability analysis. The following scales were selected. A full description is available in Appendix 4:

- Taking responsibility;
- Working in teams;
- Persisting;
- A sense of quality;
- Life-long learning;
- Adapting to change;
- Problem solving;
- Information processing; and
- Systems thinking.

The Workplace Competencies Questionnaire is charged at a rate of US $2.50 for each student impression (pre-test and post-test). In return, students are given immediate feedback through the web site when they complete the pre and post questionnaires in the form of average scores for each of the nine competencies, with an advisor or counsellor's report. The following online information is provided for administrators:

- Student's name and student key along with the following information;
- Pre-test and post-test percentile rankings along with an explanation of the nine competency scales;
- Percentage increase/decrease in percentile scores;
- Pre-test and post-test composite raw scores;
- Percentage increase/decrease in composite raw scores;
- Pre-test and post-test literacy level; and
- Demographic data.

Further information about this instrument is available at H and H Publishing Company (1996) web site.

Generic Skills Comparison Questionnaire

This questionnaire was planned to ask students to consider how proficient each team member was in using their generic skills according to a five-point Likert scale (Table 5.6). The questionnaire would be issued in Weeks 4 and 15 to compare changes in student perceptions over the semester. This would be used in conjunction with the Workplace Competencies Questionnaire to triangulate results on generic skill improvement over the duration of the semester.

Table 5.6: Generic skills comparison questionnaire

NA	Not Applicable	Not able to assess at this time
1	Poor	Needs improvement
2	Fair	Adequate in some respects but could be improved
3	Good	Has an acceptable skill level in this area
4	Very Good	Always performs well in this area
5	Excellent	Excellent in all respects related to this skill. Difficult to improve on

Skills Related to:		Generic skill	Your NAME:	Team Member 1 NAME:	Team Member 2 NAME:	Team Member 3 NAME:	Team Member 4 NAME:
	Self	1. Managing time and setting objectives					
		2. Taking responsibility for own learning					
		3. Self-assessment					
	Others	4. Using leadership and negotiation skills					
		5. Collaboration and interpersonal skills					
		6. Communicating					
		7. Peer-assessment					
	Info	8. Research skills to locate information					
		9. Analysing and synthesising information					
	Task	10. Using problem solving skills					
		11. Task management					

Course Evaluation Questionnaire (CEQ) - Institutional

Student evaluation of units and of instruction is an important source of information to help gauge the effectiveness of a course (Ramsden, 1992). The CEQ at Edith Cowan University is used for summative evaluation of units and provides statistical results based not just on the standard questions, but also can also be customised to relate to particular units being tested. This allows diagnostic conclusions to be made, which can be helpful to the instructor, and suggest strategies for improving the teaching programme. The advantages of this are that results will give staff and academic units an indication of current students' perceptions of the teaching and learning areas that will be surveyed in the CEQ. It also includes some further questions on issues of importance to the University and its teaching.

Edith Cowan University has both unit and the teaching effectiveness questionnaires. Both were used in this study, however the Unit Evaluation Instrument (UEI) is the most important for this study. This instrument has been designed to evaluate student satisfaction with the unit and is usually administered during the last two weeks of the semester. It comprises of:

- Fifteen core items (no variation allowed)
- Up to a maximum of fifteen additional items used to obtain more specific feedback than is available from the core items;
- Up to three open-ended questions inviting written feedback from students.

All core and additional items use the five-point agreement response scale (strongly disagree, disagree, neutral, agree, strongly agree). The intention is to get students to rate the level of their agreement to each of a set of relevant statements about the unit. Unit evaluation sub-scale measures are determined as the numeric mean of all responses to relevant core items (Table 5.7).

Table 5.7: Unit evaluation core item groupings

UEI Sub-Scale	UEI Items
Unit design and content	2, 4, 10, 12, 14
Assessment	5, 9, 11
Generic skills	1, 3, 6, 7, 8, 13
Overall	15

The set of core items for this questionnaire comprises of the following:

1. This unit developed my problem-solving skills.
2. The workload was too heavy in this unit.
3. This unit developed my analytic skills.
4. I usually had a clear idea of where I was going and what was expected of me in this unit.
5. To do well in this unit all you really needed was a good memory.
6. The unit helped me develop my ability to work as a team member.
7. As a result of this unit, I feel more confident about tackling unfamiliar problems

8. This unit improved my skills in written communication.
9. The assessment tested what I had memorised rather than what I had understood.
10. It was often hard to discover what was expected of me in this unit.
11. The assessment methods employed required an in-depth understanding of the unit content.
12. There was too much unreasonable pressure on me as a student in this unit.
13. This unit developed my ability to plan my own work/learning.
14. The sheer volume of work to be got through meant that it couldn't all be thoroughly comprehended.
15. Overall, I was satisfied with the quality of this unit.

It was planned to give this questionnaire in the last week of semester (Week 15) to all students in order to gain an independent evaluation of the course.

Course Evaluation Questionnaire (CEQ) - Customised

A course customised course evaluation questionnaire was planned to collect data from all students at the end of semester (Table 5.8). Students would be asked to rate how successful they considered the course had been according to specific course centric attributes, and would be anonymous.

Table 5.8: Course perceptions questionnaire

Question	Not Much	A Little	Average	More than average	• Very much so • Lots • High
Contribution to learning i.e. how successful was this unit in -					
Teaching you project management content and principles?					
Developing your generic skills?					
Motivating you to spend time on it?					
How much did the following appeal to you?					
• Working in teams					
• Creating a "real" web site					
• Having a product at the end of the course to promote skills to potential employers					
• Having to research information for solutions, in order to learn the course content					
• Posting our weekly solutions on-line					
• Assessing other students' solutions					
• Seeing other students' solutions and work					
• Committing to a "Student Contract"					

Question	Not Much	A Little	Average	More than average	• Very much so • Lots • High
• Filling out the weekly journals to help track progress					
• Performing self assessment					
• Performing peer assessment					
• Having tutor led peer assessment sessions					
• Having presentations at the end of the semester					
What else appealed?					
•					
What else didn't appeal?					
•					
General					
How much did you enjoy having a unit in this mode?					
How much more effort needed in this unit, than in others?					
How often have you learnt like this in other units?					
How much would you like to see other units structured like this?					
Do you think this unit helped in preparing you for the industry?					
Overall, how would you rate your satisfaction with this unit?					

Students would then given the opportunity to write comments and suggestions for improvement under the following four headings:

- What aspects of the unit didn't you like?
- Can you suggest any improvements? Was there anything in the course that "held you back"?
- What aspects of this unit appealed to you?
- Other comments?

Generic Skills Questionnaire (How and Why)

It was planned to give students a generic skills perceptions questionnaire in the middle of the semester to collect data on "How" and "Why" they practised using their generic skills (Appendix 5). Data collected from this questionnaire would be analysed for patterns and themes, and used to help construct interview questions to probe for a deeper understanding of how and why students were using their generic skills in the learning environment. The questionnaire would ask students to rate themselves against eleven generic skills and give an indication of:

- How often they practised using generic skills ("Never" through to "Always");
- If they considered that they showed skill improvement over the semester for each of the generic skills ("Not at all", through to "A Large Degree");
- How they practised these skill? Aspects of the unit caused them to practice?;
- Why they practised these skills? What were their personal motivations?; and
- A blank page for extra comments if required.

Tutor Questionnaire

Tutors would be asked to complete a questionnaire at the end of the semester to collect information about their perceptions of the course as a learning experience for the students (Table 5.9).

Table 5.9: Tutor questionnaire

Question	Not Much	A Little	Average	More than average	• Very much so • Lots • High
Contribution to learning i.e. how successful was this unit in					
Teaching project management content and principles?					
Developing generic skills?					
Motivating students to spend time on it?					
How much did the following appeal to students?					
• Working in teams					
• Creating a "real" web site					
• Having a product at the end of the course to promote skills to potential employers					
• Having to research information for solutions, in order to learn the course content					
• Posting weekly solutions on-line					
• Assessing other students' solutions					
• Seeing other students' solutions and work					
• Committing to a "Student Contract"					

Question	Not Much	A little	Average	More than average	• Very much so • Lots • High
• Filling out the weekly journals to help track progress					
• Performing self assessment					
• Performing peer assessment					
• Having tutor led peer assessment sessions					
• Having presentations at the end of the semester					
What else appealed?					
•					
What else didn't appeal?					
•					
General					
How much did students enjoy having a unit in this mode?					
How much more effort was needed in this unit, than in others?					
Do you think this unit helped in preparing students for the industry?					
Overall, how would you rate student satisfaction with this unit?					

The written portion of the questionnaire also intended tutors to comment on the following:

- What aspects of the unit didn't you like? What did you think was difficult to teach or not effective in this unit?
- What aspects of this unit appealed to you as a tutor/teaching?
- Can you suggest any improvements? Was there anything in the course you would change to help in the teaching/tutoring?
- Other comments from a tutor's perspective?

5.4 Data Collection – Chronological Overview

The study was conducted with a class of 85 final year multimedia project management students. These students were required to attend a one-hour mass lecture each week, followed by a two-hour tutorial in a computer laboratory with about 20 students. In these tutorials, students were encouraged to engage with the content through learning activities that supported collaboration, communication and reflective practice. The main assessment items were:

- Weekly problems based on the topic being covered. Students were required to develop solutions and post to an online forum for assessment and discussion;
- An individual portfolio with procedures, templates and samples of work related to their specified team role;
- Three major assessment items required for their project work, required for both clients and tutors – project proposal, design specification and web site; and
- Presentation of documentation and web site to an audience of peers, industry representatives and tutors.

The following provides a chronological overview of how the course was run, and how the data was collected. A week-by-week description is given to help provide a context of the data collection process, and how students interacted with team members, the online environment and engaged with learning activities.

Week 1

Learning Activities – Introduction

Students were introduced to how the unit would run and given an overview of the syllabus, assessments, student contract, journals, self/peer assessment and reflective reports. As the unit was project based, students were required to consider what role they wanted in a team, who would be their team members, and what project topic they would choose. Tutors created a skill matrix on the board with each student's preferred role, and suggested team combinations. However, students were given the freedom to choose their own teams with a view of encouraging ownership of their team roles. Other tasks for this week included:

- Checking previous students' work at http://www-scam.cowan.edu.au/projects;
- Becoming familiar with the online application (JoePM) and the resources available such as templates, tutorial exercises, procedures, URLs, document downloads and PowerPoint slides;
- Entering personal and team details in JoePM; and
- Completing the weekly team exercises on JoePM.

Data Collection

The main data collection activity in this week was the administration of the first Workplace Competencies Questionnaire. All students were required to subscribe on the system with a username and password, which they would use again at the end of the semester for the post-test. The following was discussed at the lecture:

- The generic skills that would be assessed - taking responsibility, working in teams, persisting, a sense of quality, life-long learning, adapting to change, problem solving, information processing and systems thinking;
- How students could use feedback from the system (after completing the questionnaire) to help improve their skills in problems areas;
- How students could use support material stored in the online application (JoePM) to help problem areas, as well being able to get support from tutors and student academic support advisors;
- The benefits of being able to compare pre and post scores at the end of the semester and evaluate the strategies they used to develop these skills; and
- Some sample questions and scales were discussed to illustrate the style and format of the questionnaire.

The questionnaires were completed in the tutorial sessions, with all students keen to be involved. All students signed an informed consent form (Appendix 6). The researcher was available in all tutorials sessions to help with queries or technical problems.

Also, in this first week the key focus group was formed. A class of thirteen students participated in the study, which consisted of three teams. Students were given a full explanation of what the research entailed and their commitments. All the students agreed to be involved, and signed the ethics clearance form before any data was collected (Appendix 7).

Week 2

Learning Activities – Team Issues and Basic QA

The lecture this week was concerned with teamwork, team formation and collaboration issues. A twenty-minute video was shown on working together in small groups that outlined the stages of team formation – finding common ground, roles and goals, getting the job done and reflecting (Black, Evans, & Bull, 1996). Also, approaches to developing quality assurance procedures were discussed, with templates and examples given to help students get started in their development of these.

In the tutorials, the tutors modelled how to use the given resources, and also how to structure an answer for the given weekly problem:

What strategies would you recommend your team adopts in order to ensure deadlines are met and all tasks are performed satisfactorily by all team members and to the required standard? (400 words or less)

After discussing various approaches of how to develop a solution, the tutors showed students how to post this to the "Conference Centre" using the online application (JoePM).

A key activity for students in the tutorials this week was to complete individual and team contracts by negotiating their roles and commitments with their peers. Once completed, these were then entered into JoePM (Figure 4.7). Also students were required to complete the weekly team exercises on JoePM.

Data Collection

Data collection for this week was through observation. The researcher was able to watch students negotiate their team roles, responsibilities and commitments with other team members. Notes were taken on the level of interaction, and how each student negotiated their requirements and position in the team.

Week 3

Learning Activities – Financial Management

The lecture considered how timesheets could be used to develop metrics and track time and help teams keep to budget. Students were shown how to implement timesheet-tracking systems using spreadsheets, with consistent categories. A quality assurance procedure was discussed that enabled team members to enter time spent so the project manager could consolidate time and compare estimated against actual times.

In the tutorials, tutors modelled how to assess the work of other teams using the online "Conference Centre". Each of the three allocated solutions was discussed with students. Assessment criteria were considered, and a mark allocated with a comment. Also, students were required to create spreadsheets for their team, with formulas and standard categories that would allow consistent tracking of times. By 4pm on Friday, students were then required to enter data into the online timesheet sheet system so that the team could start tracking their time through online system, which automatically consolidated entered times.

This week, teams were also required to complete weekly exercises on JoePM, as well as posting a solution for the first weekly problem:

All project managers struggle to keep within budget over the lifecycle of a project. Prioritise three procedures that you consider essential for your team to follow in order to help with budgeting (400 words or less).

This required teams to research information from a variety of sources – textbook, readers, JoePM , online sources, and by interviewing industry experts. To create the solution on time, students had to share the research tasks between themselves, and then synthesise concise solutions based on the collected information. Each team had to consider how to divide tasks and responsibilities to get these solutions done.

Another requirement this week was having the team contract signed by the tutor. Tutors had a meeting with each team, and discussed each team member's responsibilities and time estimates for each major assessment point. The main consideration was the development of the web site with all the accompanying documentation. This required careful consideration of team roles such as programmers, graphic designers, media developers, instructional designers and project managers. Tutors would check the allocated duties and if necessary advise the team to be more specific with allocated duties to help clarify each team member's responsibilities. Also, the expected quality of each team member's work was discussed to help clarify team expectations.

Data Collection

The researcher was able to observe student teams as they negotiated the team contract. All team members had to be satisfied with the allocated duties before each team member and tutor would sign the contract. Students were also negotiating templates and procedures to track their team time. Notes were taken on their level of interaction, negotiation strategies and how they resolved problems.

Students also started recording data in the online self and peer assessment journals this week, which provided information on how students perceived their own progress, as well as others.

Week 4

Learning Activities – Project Proposal

The lecture focused on how to develop a project proposal, which included scoping, performing a feasibility study, needs analysis, creating risk analysis matrices, collecting content and developing legal documentation. Understanding these concepts was important, as the first assignment required students to develop a project proposal for their clients.

In the tutorials, tutors modelled the process of checking the results and comments given to other teams through the "Conference Centre", as well as viewing the best three solutions. They then used Bulletin Boards to ask any questions and to raise relevant issues about the validity of the marking. This was the last stage of the modelling process, so students were now familiar with the full process needed to post, assess and comment on solutions through bulletin boards.

This was also the first week students were required to assess the solutions of other teams using the "Conference Centre". Each team was allocated three other teams to assess - randomly and anonymously. Teams were required to read the solutions, consider the assessment criteria and then allocate a mark and comment. Students were already familiar with the content, as they had all researched and completed solutions for the same problem in the previous week. Teams had to consider, who would be responsible for reading and assessing these solutions on a weekly basis.

Other activities for this week included:

- Completing online timesheets and self/peer assessments journals by Friday 4pm;
- Completing the weekly team exercises on the JoePM;
- Posting a solution to the "Conference Centre" for the weekly problem:

  What do you consider to be the 5 essential elements of a project proposal that will ensure that both the client and producer will be satisfied with, and will form the basis of a trouble free product? (400 words or less)

Also, the first major assignment was due in three weeks, so it was important that teams started to share tasks in an effective manner to make deadlines.

Data Collection

Two major data collection sessions were conducted in this week.

Skills Comparison Questionnaire (Pre-Test)

Students in the focus group were asked to complete the first Skills Comparison Questionnaire (Table 5.6). Students were required to rate themselves and each of their team members against eleven generic skills.

Focus Group Interview 1 - Generic Skills

The first focus group interview was conducted using the techniques outlined in the interview section, with the questions shown in Table 5.4. The session took one hour and fifteen minutes to complete, and the thirteen students proved to be keen participants.

All attempts were made by the interviewer to create a non-threatening environment by listening attentively, asking appropriate questions, and not putting forward their own opinions, perceptions or feelings (National Science Foundation, 1997). The interviews were run in a private seminar room with no distractions. Students were offered refreshments before the interview started. Introductions were then made, outlining the researcher's background:

> *Thank you for attending this data collection session. My name is Joe Luca. This research is part of my PhD studies, which are focused on trying to further knowledge about how*

best students learn to develop generic skills, while at the same time learn the subject material.

The purpose of the research was then explained, discussing the nature and definition of the generic skills being targeted:

The purpose of this session is to get information based on your insights to help determine how the learning environment in this unit helped you to practise and develop generic skills. As someone who is in the program, you are in a unique situation to describe how the environment affected you and others. That's what this interview session is about: your experience so far with the program and your thoughts about your experiences. Collected data will be combined into a research report that will be used to try and improve the quality of students' generic skills and learning in the future.

Students were then reminded about confidentiality and ethics issues that were covered in the informed consent form (Appendix 7) and reinforced with the following statement:

Everything you say in this interview is completely confidential. Please feel free to discuss any issues during this session. Nothing you say will ever be identified to you personally, as outlined in the ethics clearance form.

The method being used to collect data was then specified, clearly outlining how and why the equipment was being used:

There are two tape recorders being used to record our conversation. One is a backup. I will also try and record major issues and points being made on paper. The information collected on the tape recorders will be transcribed and analysed for patterns of opinion.

This interview should take approximately one hour. If there is anything you like to follow up on after the interview you can contact me by phone, email or at my office.

Before the interview was started, students were asked if they fully understood the purpose and conditions they had agreed to, and if they had any further questions they wanted to ask before the interview started.

The strategy of asking experiential questions to set the scene, and then moving onto opinion questions worked well (Table 5.4). While asking students to describe their experiences, I found that they would "wander off" the topic and start discussing issues that weren't so relevant to the question, at which point I had to gently bring the conversation back to question being asked. It was a balance of letting students feel that this was an arena in which they could discuss issues that were important to them, without being told *"This is NOT relevant, please keep to the topic!"* A good strategy was to summarise relevant issues that had been discussed and then repeat the original question.

The final question was an opinion question. At this point, the context was clearly set. The question was:

> *You have told me WHAT you have been practicing, and how often you have been practicing these skills. Can you now tell me WHY you have been practicing these skills?*

The response from the focus group was very enthusiastic with many students speaking at the same time. All participants were thanked for attending the interview, and reminded that their comments were valued and would be analysed for patterns and trends. Students were reminded that they could contact the researcher at any time if they had any other comments after the meeting. As I was ready to leave, two students returned to the classroom and wanted to say that they felt that the focus group was a valuable experience to them for the following reasons:

- It improved their understanding about what generic skills were;
- They felt relieved that other teams were experiencing similar problems to their own in getting tasks completed; and
- They gained insights into how other teams were coping with time management, problem solving and other related skills in managing their tasks.

The tapes were labelled, and notes made of any issues that were apparent after the interview session. Transcription and analysis started soon after the data was collected. This ensured that ideas and information gleaned from the interview in notes and thoughts could be effectively synthesised with transcribed data. Prompt analysis can also uncover emerging ideas that can be further explored in the next interview. The process of interviewing and analysing data then became an iterative process, providing information to enhance each phase.

Equipment Issues

Even though the equipment was checked the day before the focus group session, a final check one hour before the session started found the boundary microphone not working! The battery in the microphone was flat, which used AAA batteries, and a replacement battery was impossible to locate at short notice! Fortunately, a replacement boundary microphone was located that used AA batteries, which were available. Equipment issues to consider included:

- The use of boundary microphones to produce better quality playback than a traditional cassette recorder with no external microphone. They eliminate much background noise and have no inference from the motor;
- Careful testing of all equipment, in particular batteries located in boundary microphones;
- Use of tape recorders that display a meter that showing input signal strength being recorded;

- Use of a backup tape recorder in case problems occurred with the main recording equipment; and
- Retain a backup copy of the tape when the original is handed over for transcribing.

Week 5

Learning Activities – Scheduling and PM Models

The lecture considered how to schedule, plan and track time using GANTT charts, consistent categories, Work Breakdown Structures and project management models. MS-Project® was demonstrated, and sample GANTT charts were given to students as exemplars of how to structure these charts.

In the tutorials, students were also required to complete weekly exercises on JoePM, develop a GANTT charts using MS-Project® for their team. They also needed to complete timesheets, journals, mark other students work and post a solution for the weekly problem:

> *In order of priority, outline what you consider to be the essential procedures/commitments needed to effectively track the progress of a project* (400 words or less).

Data Collection

Many postings were now being made to the bulletin boards, in which students were discussing a variety of issues, including peer assessment and evaluating other students' rapid prototypes. Also, the researcher continued to observe students communicating and collaborating within their teams during tutorial sessions. Much more negotiating was occurring as well as discussions about pending deadlines.

Week 6

Learning Activities – Design Specifications

The lecture this week was focused on how to prepare design specifications, by considering a full design methodology. This included performing a situation analysis, needs analysis, content analysis, design exploration, creating templates, style guides, storyboards (script and visual), rapid prototyping and end user evaluation.

In the tutorials, students were required to complete weekly team exercises on JoePM, complete timesheets, journals, mark other students work and post a solution for:

> *Outline your strategy for developing a design specification that will satisfy the needs of the client, producer and end users* (400 words or less).

The first tutor led peer assessment session occurred this week. Tutors were required to meet each team and discuss their progress and individual efforts. They used information collected through the online journals (Figure 4.22) to help them decide on who was, or was not contributing to the team effort (based on both quantity and quality), and consequently how many marks to transfer between students.

Data Collection

Data continued to be collected through online self and peer assessment journals, which included students' reflections of their own progress, and the progress of their peers, as well as the quality of the work.

Students were observed negotiating tasks, scheduling time, discussing the quality of work submitted peers, and discussing strategies for collecting data for solving the weekly problem.

Week 7

Learning Activities – Evaluation

The lecture considered how to design and plan an evaluation study to measure the effectiveness of their product. Processes were considered for how data would be collected, analysed, and then synthesised into recommendations for improvement.

In the tutorials, students were required to complete the weekly exercises on JoePM, complete timesheets, journals, mark other students work and post a solution for:

> *In order of priority outline what you consider to be the key processes that will really make a difference to the final quality of your product?* (400 words or less)

Also, this week students were required to submit their first major assignment – the project proposal and design specification for the development of their web site. This was a large milestone and had to be submitted to the tutors for checking (especially legal contracts) and then to clients. This required much effort and consideration by all team members. Also, at this stage it became more apparent to team members how effective their peers were, as the quality of the multimedia production capabilities would now be assessed.

Many student teams now had rapid prototypes of their web sites available on JoePM, for others to view and provide feedback on.

Data Collection

This generic skills perceptions questionnaire ("How and Why") was administered to all students this week at the end of the lecture. The questionnaire asked students to consider how and why they were using generic skills in this unit (Appendix 5). Forty-one students completed the questionnaire, which took about 15 minutes to complete.

Weeks 8 and 9 – Contact Free

These two weeks were free of lectures and tutorials, though student teams were all actively working on developing their web sites and preparing documentation for both the project and the weekly problems.

During these two weeks, the researcher was able to have the results of the generic skills perceptions questionnaire transcribed and analysed for patterns and themes that could help in the construction of interview questions and probes. These would help the researcher strive for a deeper understanding of how and why students were using their generic skills in the learning environment through one-to-one interviews.

Week 10

Learning Activities – Production

The lecture considered the production phase of multimedia development and considered how media elements could be integrated into the production schedule, while maintaining agreed standards, tracking resources and considering all the legal issues.

In the tutorials, students were required to complete the weekly exercises on JoePM, complete timesheets, journals, mark other students work and post a solution for the weekly problem:

> *When you are in the production phase, how will you ensure that you keep to budget, time and agreed quality?* (400 words or less)

Data Collection

The first set of one-to-one interviews was conducted this week, using information taken from the questionnaires, first focus group meeting, online data and observations to help formulate questions and probes.

Three students were interviewed from the focus group, to help collect data on the use of contracts, learning to learn skills and time management skills. The interviews took about thirty minutes each. All the students were happy to discuss the issues, and freely volunteered information.

Questions asked about their use of *contracts* included:

- What tasks did you negotiate to perform to as part of your contract? Was it easy to negotiate these with your team members? Are you happy with the how your team shared the workload?
- Why did you select these tasks - why do you consider the tasks you selected in your contract to be important?
- Any other comments you would like to make about the use of contracts in this unit?

Questions asked about *learning to learn skills* included:

- Are you learning any new skills as part of your team role? Can you describe these?
- Why did you choose these skills to learn?
- What learning strategies are you using to enhance these skills? How did you decide that these learning strategies were the best to use?
- How do you get feedback on how successful you have been?
- Why are you motivated to learn new skills that aren't part of the syllabus?
- Any other comments you would like to make about how this unit has encouraged you to learn new skills?

Questions asked about *time management skills* included:

- What activities are taking most of your time this semester?
- How are you managing your time? Do you set priorities? Do you make plans in a diary? Do you monitor your progress?
- What aspects of the unit are encouraging your management of time?
- Why do you think it's important for you to manage your time?
- Any other comments you would like to make about how you used time management skills in this unit?

Week 11

Learning Activities – Quality Assurance

The lecture considered how to create quality assurance procedures and implement standards for multimedia development. In the tutorials, students were required to complete weekly exercises on JoePM, enter timesheets, complete their online journals, mark other students work and post a solution for:

> *Almost all teams experience difficulties in handling documentation and production standards e.g. working with old versions of documents, coping with clients whom change their minds etc. Outline a strategy you will implement to ensure "quality" documentation and standards* (400 words or less).

Also, the second tutor led peer assessment session occurred this week. Again, tutors compiled reports from the online journal system and discussed how the team was performing, and whether any marks needed to be transferred. In some cases students found these sessions to be very intimidating when the tutor asked them to explain their perceived lack of performance. These sessions also provided the opportunity for tutors to raise positive issues related to the team. Whenever possible compliments and advice were given to help encourage the team and keep them focused. Often, issues related to clients would be discussed.

Data Collection

Three students were interviewed from the focus group to help collect data for communication and collaboration strategies being used in the learning environment.

Questions asked about *communication* strategies included:

- What communication strategies does your team use for team meetings? Writing reports? Listening? Presenting information?
- Do you think these strategies are effective?
- Why do you think it is important to communicate in an effective manner with your team?
- Any other comments you would like to make about how communication skills have been supported and promoted in this unit?

Questions asked about *collaboration* strategies included:

- Has your team developed any procedures to promote collaboration and teamwork? Do team members try to help others? Respect others' needs?
- What strategies do you use to collaborate with your team? Is it effective?
- How do you know if you are successfully in collaborating in your team? Feedback in meetings, journals etc?
- Why do you think collaboration is important for your team?
- Any other comments you would like to make about how collaboration skills have been supported and promoted in this unit?

Data also continued to be collected through online journals, bulletin boards, as well as through observation.

Week 12

Learning Activities – Legal Issues

Legal issues related to multimedia development were presented and considered. These included confidentiality, contracts, patents, intellectual property rights and protecting specialised code and graphics. In the tutorials, students were required to complete weekly exercises on JoePM, enter timesheets, complete their online journals, mark other students work and post a solution for:

> *Legal contracts are important for any multimedia production effort. Using key headings, develop a Client/Developer template that covers essential legal issues needed in multimedia productions* (400 words or less).

Data Collection

Two students were interviewed from the focus group to help collect data on their research skills and the ability to analyse and synthesis information.

Questions asked about *research skills* included:

- What process does your team use to solve the weekly problems?
- Is the question carefully analysed? Does the team identify key research areas? How does your team do this? Do you think it is effective?
- Are you convinced that the team has a strong understanding of question being asked before the team starts collecting information? If not, how could this be improved?
- How does your team locate necessary information? What sources of information does your team use?
- Why do you think it is important to have effective research skills?
- Any other comments you would like to make about how research skills have been supported and promoted in this unit?

Questions asked about students' *skills in analysing and synthesising* included:

- What strategy does your team use to organise and analyse information collected from different sources?
- Does your team evaluate collected information for suitability before creating a solution? How does your team do this?
- How does your team synthesise collected information into a solution?
- Why do you think it is important to effectively analyse collected information before synthesising a solution?
- Any other comments you would like to make about how analysis and synthesis skills have been supported and promoted in this unit?

Week 13

Learning Activities – Handover

This lecture discussed responsibilities that needed to be considered at handover, as well as important implementation issues, how to close projects and conducting a post-mortem. In the tutorials, students were required to complete weekly exercises on JoePM, enter timesheets, complete their online journals, mark other students work and post a solution for:

> *What issues need to be considered in the final phase of the project's life cycle? Outline in order of priority, essential procedures for this phase of the project* (400 words or less).

Data Collection

Three students were interviewed from the focus group to help collect data on self/peer assessment and leadership skills.

Questions asked about their use of *self/peer assessment skills* included:

- How long does it take you complete the self and peer assessment journals? Do you find this an effective means of tracking everybody's effort?
- What strategy does your team use to discuss team performance issues at meetings? Is this an effective means of moderating team effort? Could it be improved? How?
- Can you explain what happened at the tutor led peer assessment sessions? Do you think they were effective?
- How did your team organise the inter-team peer assessment using the "Conference Centre" in JoePM? Did you find it valuable assessing the solutions of other teams? Why?
- Why do think it is important to use self and peer assessment when working in teams?
- Any other comments you would like to make about the use of self and peer assessment in this unit?

Questions asked about their use of *leadership skills* included:

- Can you explain how your team appointed a leader? Is it just one person, or do all team members have to show leadership in their roles?
- How do you try to show leadership in your role? How do you prioritise important team tasks that you are responsible for? Do you use contingency plans?
- When organising a task, do you consider other team members' strengths and weakness? How is this done?
- How are your expectations communicated and reinforced to others when you are organising a task? How do you follow up for completion?
- Why do you think leadership skills are important for your team?
- Any other comments you would like to make about the use of leadership in this unit?

Week 14

Learning Activities – Presentation Skills

The lecture focused on helping students develop their presentation skills in preparation for the presentation night. In the tutorials, students were required to complete weekly exercises on JoePM, enter timesheets, complete their online journals, mark other students work and post a solution for:

Outline in order of priority what you consider to be essential aspects of performing a quality presentation that will impress clients in a large audience (400 words or less).

Data Collection

Students were asked to complete four different questionnaires.

Workplace Competencies Questionnaire (post-test)

The second WORKING questionnaire was given to all the students. Students required username and password that was issued in the first questionnaire, so that the web-based application could compare differences in students' pre and post scores. After completing this questionnaire students were able to print the results and reflect on the changes that occurred. This was conducted during the tutorial session.

Course Evaluation Questionnaire – Institutional

The Edith Cowan University unit evaluation questionnaire must be invigilated by students and the lecturer must leave the room as students fill out the questionnaire. The forms are then collected and sealed in an envelope before the lecturer is permitted to come back into the class.

Course Evaluation Questionnaire – Customised

The customised course evaluation questionnaire was also distributed to these students at this session. The survey was anonymous, and again was invigilated by students, so students did not feel compromised in giving honest responses.

Week 15

Learning Activities – Project Presentations

Students were required to formally present their web sites to a group consisting of industry representatives, peers and university staff of approximately 150 people using prescribed headings (Figure 5.2). The presentations were run from the server, and students were responsible for making sure that all technical issues related to running their web sites had been catered for. The presentation and assessment criteria were clearly outlined as shown below and in Table 5.10.

Assume that the audience are your potential clients. Your job is to SELL your product to them. The following represents the order of your presentation (from the online presentation area):

- Title of product
- Product description and purpose
- Team members
- Show the product - features that make it desirable such as technical enhancements, special design features, media usage etc. (Most of time on this point!!)
- Show teams' online CV is completed and encourage audience to visit the site
- Comparison of estimated versus actual hours, total cost, cost of each phase and cost per screen
- Honest comments about strengths and weaknesses of the product
- Three lessons learnt while developing this product
- Questions from Audience - 2 minutes

Students are required to keep their presentation time to 5 minutes or less! You WILL BE STOPPED after 5 minutes, so you must rehearse the presentation before the night. Keep the following in mind:

- Clearly demonstrate the quality, quantity and significance of your product
- Students are NOT to read from a script! Presenters need to engage the audience by talking clearly and confidently, and making it interesting, professional and if possible entertaining.

Figure 5.2 Presentation night - guide

Table 5.10: Assessment criteria for presentation night

Quality, quantity and significance of product - Technical enhancements, design, navigation and use of media	8
Clear description of products purpose and use	1
How convincing was the presentation to a potential client	2
Validity, clarity and honesty of strengths and weaknesses of the product	2
Validity, clarity and honesty of lessons learnt	1
Completed online CV	1
TOTAL	15

Data Collection

Three students were interviewed from the focus group to help collect data for problems solving and task management strategies being used in the learning environment.

Questions asked about *problem solving* strategies included:

- What strategies does your team use to try and work out problems? Does your team try to understand different perspectives and viewpoints for problems? How do you do this?
- Can you describe a problem that your team encountered during the semester? What strategies did your team use to try and solve it? Do you think they were successful?
- Why do you think it's important to use effective problem solving strategies in your team?
- Any other comments you would like to make about how problem-solving skills are supported and promoted in this unit?

Questions asked about *task management* strategies included:

- What strategies does your team use to manage team tasks? Does your team set priorities? Does your team use plans and schedules? How are these monitored for success? Is feedback given to team members on their performance?
- Do you think the team's task management process can be improved? How?
- Why do you think it's important to manage tasks effectively in a team environment?
- Any other comments you would like to make about how task management skills are supported and promoted in this unit?

Week 16

This week was not part of the academic semester. Students involved with data collection exercises came to university in their own time.

Data Collection

Focus Group Interview 2 – Generic Skills and Course Evaluation

The second focus group interview was conducted with the same group of thirteen students that were used in Week 4. The session took almost one and half-hours, in which time the students proved to be very enthusiastic contributors. In fact, at times it was difficult to transcribe discussions, as two or more students would try to answer questions simultaneously. The same interview techniques that were used in week 4 were applied.

Skills Comparison Questionnaire (Post-test)

The second skills comparison questionnaire was conducted with the same group of thirteen students as in week 4. This then allowed a comparison of pre and post scores to be performed (Table 5.6)

Tutor Questionnaire – Course Evaluation

Four tutors were asked to complete a questionnaire assessing how effective they perceived the learning environment (Table 5.9)

Data Collection Schedule

Table 5.11 shows a summary of the data collection strategies used during the semester.

Table 5.11: Timetable for collecting data

Week	Research Question 1	Research Question 2	Course Evaluation
1	• Observation	Workplace competency questionnaire (pre)	
2	• Observation		
3	• Observation and online data		
4	• Focus group interview 1	Skills comparison questionnaire (pre)	
5	• Observation and online data		
6	• Observation and online data		
7	• Generic Skills Questionnaire (How and Why)		
8&9	Mid Semester Break		
10	• One-to-one interviews (1) (Contracts, Learning-to-learn and time management) • Observation and online data		
11	• One-to-one interviews (2) (Collaboration and communication) • Observation and online data		
12	• One-to-one interviews (3) (Research and Synthesis) • Observation and online data		
13	• One-to-one interviews (4) (Self/peer assessment and leadership) • Observation and online data		
14	• One-to-one interviews (5) (Problem solving and task management)	Workplace competencies questionnaire (post)	• Course Evaluation Questionnaires x 2
15	• Observation and online data		
End of Semester			
16	• Focus group interview 2	Skills comparison questionnaire (post)	• Student focus group interview – course evaluation • Tutor focus group

The students in the focus group were exposed to continual research and data collection sessions, which may have heightened their perceptions about their generic skill development through the Hawthorne effect (Mayo, 1933). Other implementations of this study may not produce such overt results as seen in this study, as students were asked to continually reflect on their behaviour and their work. This cycle of reflective practice is one of the key pedagogical principles promoted in the design of the learning environment, and was also promoted through the extensive research conducted with the focus group.

5.5 Summary

This chapter has described the methods used to design a research methodology and collect data to help provide answers to the research questions. Data was collected from a range of sources – through observations, online journals, one-to-one interviews, questionnaires and focus group interviews. These instruments were designed, and the data was analysed using both qualitative and quantitative techniques in an effort to develop valid and reliable conclusions.

Chapter 6

An Analysis of Student Activity

Developing students' generic skills has become an increasingly important issue for all higher education institutions. While many universities have embraced this challenge, relatively little is known about effective course design features and technology support to help promote the development of these skills. In this study, an online learning environment was designed to promote the development of students' generic skills using three key learning principles: authenticity, self-regulation and reflection.

The research question addressed in this chapter is focused on determining how and why students practised using their generic skills in the learning environment, with a view of determining the effectiveness of the design strategy i.e.

> *What factors contribute to students practising generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?*

Using the methodology outlined in Chapter 5, this chapter provides an investigation of the factors that contributed to students' practicing generic skills, that is, how and why students practised using generic skills. The following aspects are considered:

- The method of analysis;
- How and why students practised generic skills in the learning environment; and
- Summary.

6.1 Method of Analysis

The design of the learning environment required students to perform authentic activities that were student-centred and reflective in nature. These were the guiding principles used to develop activities for the learning environment. Careful consideration was given to selecting authentic activities that suited the context – in this case, the development of a team-based web site for an industry client, which on completion could be used in an e-portfolio to enhance students' opportunities for employment. This authentic task helped motivate students to engage with student-centred learning activities such as negotiating team roles, project topics and planning and scheduling their time. Their success in performing these tasks was monitored through a range of reflective activities such as online journals, self/peer assessment, reflective reports, project presentations and bulletin boards.

Eleven generic skills were considered appropriate for the given context – final year project management students in a higher education institution. It was proposed that the conceptual design of the learning environment (Figure 6.1) would encourage students to practise and develop these skills.

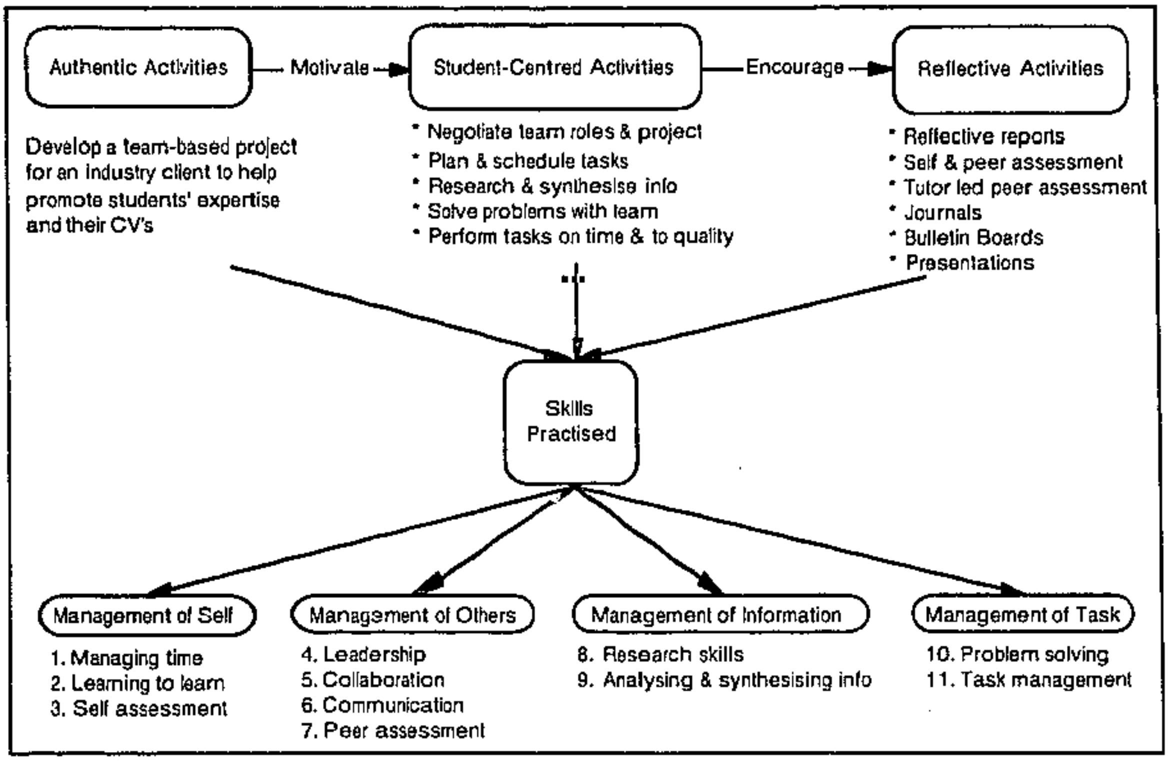


Figure 6.1: Conceptual map

The data analysis used functional categories that were not assigned on *a priori* basis, but emerged from the data as it was collected and analysed into themes and patterns (Patton, 1990). Initially data was collected through observation, online journals, questionnaires and reflective reports. This data was transcribed, analysed and reduced into themes that were then used for deeper interrogation through focus group and one-to-one interviews. The analysis involved a three-step process proposed by Miles and Huberman (1994) – data reduction, data display, and conclusion drawing/verification (Figure 6.2). Data reduction procedures were applied by highlighting transcripts and creating tables with a word processor, to help identify topics and categories that formed higher-level propositions for further interrogation through interview sessions.

The data analysis approach used in this study attempted to provide a detailed, rich description across multiple sources of data, by seeking regular patterns of student behaviours by sifting, coding and sorting data as it is collected, and then following up the analysis with ongoing observations and interviews to explore and refine these patterns (Savenye & Robinson, 1996).

Over the semester, these methods were used to interrogate student behaviours with a view of determining how each of the pedagogical principles used to design the learning environment influenced students in practising and developing their generic skills.

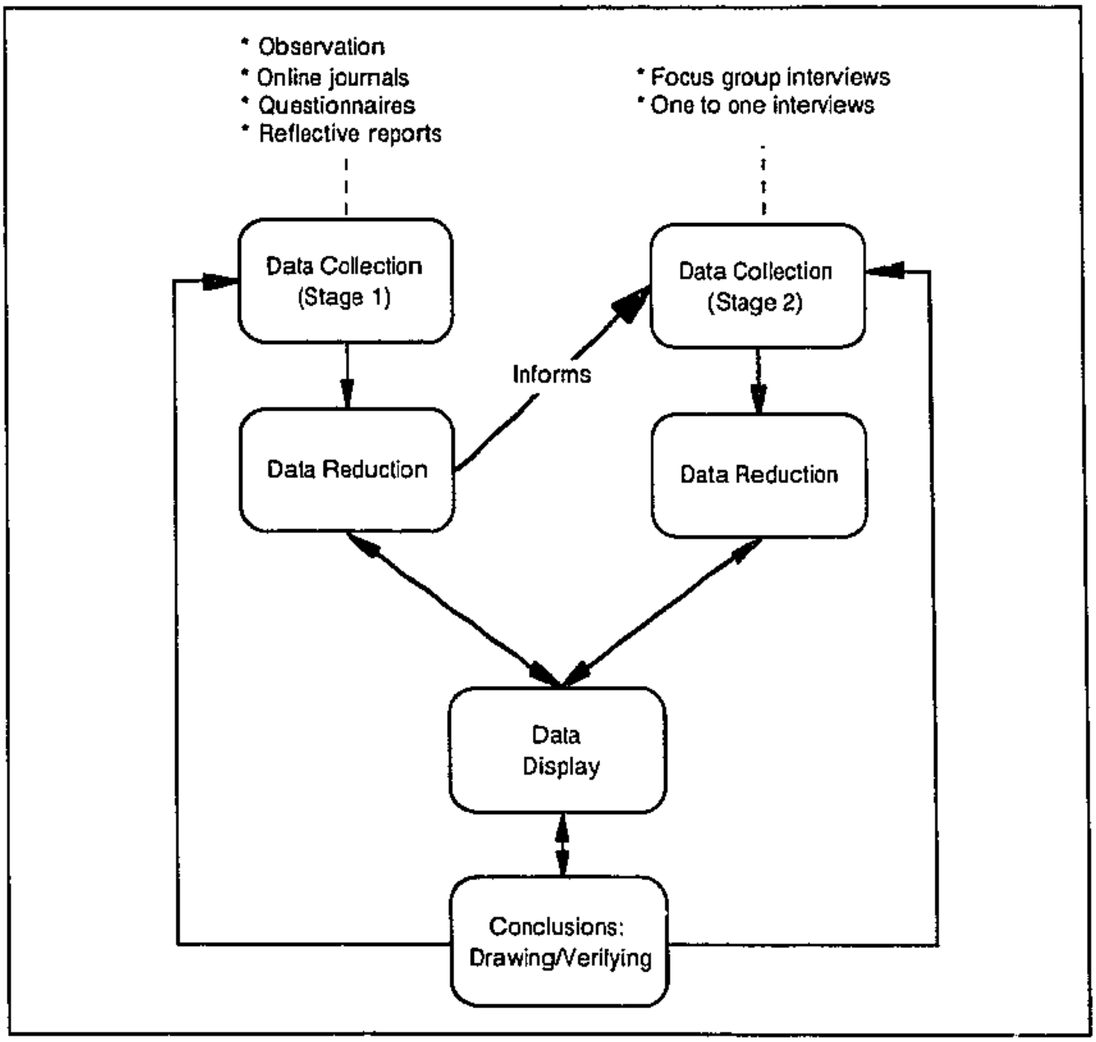


Figure 6.2: Components of Data Analysis: Interactive Model (Modified from Miles & Huberman, 1994)

Throughout the analysis, three teams were used in the focus group. Pseudonyms were used for team members within each team as follows:

- Team 1 – Sue, Nash, Pat, Chris and Rose;
- Team 2 – Lex, Alice, Jeff and Giff; and
- Team 3 – Liz, Suzie, Bob and Don.

6.2 How and Why Students Practised Using Generic Skills

This section considers how and why students practised using generic skills with the learning environment. Design features are discussed for each generic skill, and an analysis of how and why students practised these skills is discussed. For each generic skill, the information is presented in the following fashion:

- A description of the skill;
- Forms of student activity needed to develop this skill;
- Unit design features aimed at promoting skill development;
- How students practiced this skill;
- Why students practiced this skill (i.e. factors of the unit that motivated students to practice);
- A summary discussing the data and results.

Eleven generic skills are discussed, with the view of establishing the effectiveness of the learning environment to help promote the development of students' generic skills.

1. Time Management Skills

The principles of time management cut across different disciplines, industries and lifestyles, and when practiced, lead to more satisfying personal and professional lives (Morgenstern, 2000). This has been recognised in the training area, and a whole industry has emerged to help serve the needs of people who "waste time" or "cannot get organised". Seminars, workshops, training packages, videos, audiotapes and a range of different diary formats have been developed to help manage their time. Stephen Covey, has based the success of his entire business (Franklin Covey Company) on training and retailing items which help people manage time and set their priorities.

An environment designed to support the development of these skills needs to encourage participants to:

- Identify and set objectives and priorities (Johns, 1995; Peters & Homer, 1996);
- Estimate time needed for completing tasks (Peters & Homer, 1996; Pettersen, 1991);
- Schedule a suitable course of action (Johns, 1995; Posner, 1987); and
- Monitor progress and take appropriate action when necessary (Pettersen, 1991; Posner, 1987).

Activities likely to result in the development of these competencies were integrated in the design of the learning environment, as shown in the next section.

Course Design Features

Learning activities that could potentially improve students' time management skills were considered important in this unit, as these students were being prepared for the multimedia industry as prospective project managers. Students were required to continually record their times in standard categories to develop "metrics", or units of measurement that could be used in future projects to predict costs.

The online time management system allowed team members to record their time in appropriate categories (Table 6.1) and then automatically collated their entries to produce a consolidated report showing team totals at the end of the week. These totals were compared to original estimates used to schedule milestones and deadlines to consider progress and make changes if necessary.

Table 6.1: Sample of standard timesheet categories

Timesheet Categories						
Categories	**PM**	**Graphic Designer**	**Prog**	**Media Producer**	**ID/ Content**	**Totals**
Student Activities						
Weekly Activities						
R&D (Learning new information)						
Tota						
Project Proposal						
Feasibility, Needs Analysis and Scope						
Estimating Cost						
Scheduling and Milestones						
Legal Contract and Acceptance Criteria						
Content Issues, Collection and Map						
Implementation and Maintenance Issues						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
Design Specifications						
Interface/Graphic Design						
Navigation Structure						
Style Guides and Screen Templates						
Visual Story-Boards						
ID Story-Boards						
Rapid Prototype						
Evaluation						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
PM Procedures and Documentation						
PM Documentation (team)						
PM Procedures and Reflections (ass 2 -						

Students were required to create schedules based on agreed objectives and milestones, then track their progress against estimated time by entering, collating and comparing timesheet data against original estimates. The following assessment item shows the summary level information students were required to provide at the end of the semester based on timesheet data collected during the semester:

> *Students are required to develop metrics and provide a critical analysis of all timesheet data. Cost per screen, cost per graphic, different quality of graphics and other forms of costing are required. Also, provide an analysis of the hours input by each team member and how this compared to original estimates i.e. actual versus estimated time? Were there any surprises or discrepancies? If so, why?* (Extract from IMM 3228 syllabus, see Appendix 2)

As can be seen from this syllabus extract, practising time management principles was a key competency required in the project management unit.

The next section reports on the extent to which students engaged with activities that were likely to contribute to the development of their time management skills.

Activities that Promoted the Development of Time Management Skills

Data were gathered in a number of forms that provided evidence of the scope and extent of activities chosen by students that may have improved their time management skills. The following list of common themes emerged from questionnaire and interview data, and represents the main form of activity used by students to manage their time:

- Setting priorities;
- Planning and scheduling; and
- Monitoring progress.

Each of these is discussed below, highlighting how they were used, as well as indicators that showed improvement.

Setting priorities

The self-regulated nature of the learning environment allowed students to manage a range of different activities through their own volition. Students had to make decisions on what tasks they would undertake, how much time they would allocate to them, and in what order they would be completed. Most students firstly determined their major objectives or goals and then established sub-tasks or specific activities for each goal. They had to determine how much time they would attribute to each of these, based on their importance or priority. Most students found this a difficult task that required careful judgement and continual refinement. For example Liz, found it important to continually remind herself of her own, and her team's major objectives. Having these clearly defined and continually referring to them, helped her maintain a valid priority list, sub-tasks, and the amount of time needed for each of these:

> *I had to keep reminding myself of what we were supposed to be doing. What were the deadlines, what was really important, what really needed doing? I would plan to do the most important things first and think about how time I would need for all the activities related to it. Then I'd fit the rest of the jobs into the time left over. Though I found it hard to judge, and sometimes I spent much more time on things than I first figured.*

That's why I really made sure that things were important before putting up the top of the priority list. (Interview with Liz)

Most students used "To Do" lists derived from team meetings as the main organising structure to help prioritise their tasks. For example, Nash used the teams' task summary to develop his priority lists. He recognised that he had to take these into consideration when determining how he would allocate his time for team and individual tasks. Judgement was required to determine which tasks needed the most attention:

Working out what jobs I should do first was a balance between my own things, new jobs from this week, and old jobs that I hadn't finished from other weeks. I would use the To Do list and try to judge which jobs were the most important for me to do. Which ones would cause me the greatest grief if I didn't do them? Or, which ones could I leave without affected anything. (Interview with Nash)

Nash also felt it was important to confirm the team's quality expectations when tasks were being assigned. He found that the expected quality of tasks was often misunderstood by different team members and could greatly influence how tasks would be prioritised. His passion to develop high quality graphics sometimes clouded his judgement in allocating the correct priority and amount of time to perform the task. Understanding the project quality requirements and objectives was important in helping to determine the right priorities:

It was easy to get distracted making the worlds best graphics, which I really enjoy doing. But at the end of the day it's important to look carefully at all the priorities and tasks, and consider how much time you can really afford to spend on this. I found during the semester that I didn't have the luxury of spending heaps of time on getting the graphics perfect, because I really didn't have the time, and other jobs would suffer. At the beginning of the semester I created a fantastic graphic for the splash screen that took ages of time, only to be told it was just an idea, and an important part of the project. (Interview with Nash)

As the semester progressed students increasingly recognised the value of defining priority lists that clearly reflected major goals and objectives. Sue, the project manager of her team, found it valuable to carefully consider the team's deadlines and objectives before meetings and would prepare priority lists that were discussed at these meetings. This provided a forum at which students could give comments and feedback on how valuable they considered the identified priorities were, and make changes if necessary:

It's easy to miss things if you don't keep checking on major objectives and what the rest of the team is focusing on. I made checklists of important things that needed doing, and brought them along to all the team meetings. Everybody had a chance to comment on them, and make changes if they thought they weren't right. (Interview with Sue)

The examples above provide evidence that most students created priority checklists to help achieve their goals and objectives. Students recognised that it was important to keep focused on delivering major objectives by creating sub-tasks and using detailed priority checklists. The design of the learning environment allowed these students to receive regular feedback from their team and tutor, which then allowed them to reflect on how successful they had been in achieving their objectives and priorities. This cycle of reflective practice helped students identify and refine techniques to help achieve their objectives and priorities.

Planning and scheduling

Students were required to develop a web site for a real client, in which they were required to identify major milestones and then schedule time needed to meet these objectives. As a team they made judgements about starting and finishing major tasks to comply with the project and other unit requirements. Once these were established students then scheduled their individual short-term tasks to meet these commitments. At the beginning of the semester many students took an ad hoc approach to planning these tasks, though some found they missed deadlines as they had many and varied tasks to consider. After a few weeks many students resorted to using a diary to help schedule these tasks. For example, Rose forgot to do some tasks and missed deadlines early in the semester as a result of not scheduling her time carefully in her diary. After the first few weeks she started using her diary to enter major milestones in the yearly planner and then scheduled specific times in the daily diary. She found this was a useful method to help manage her time:

> *At first I just looked at the team's schedule and worked from that. But in the first few weeks I found I forgot to do things, and also missed deadlines. I needed to plan my time more carefully in the diary. I put all the major dates and deadlines in the yearly planner at the front of the diary, and then worked back to set days and times for when I needed to start doing things during the week. This helped a lot.* (Interview with Rose)

As well as scheduling their times in a diary, many students also recognised they needed to consider when they worked most effectively. Working at times which are most conducive for an individual's temperament can affect their productivity, that is, whilst some prefer to work late at night others are early risers and are most effective in the mornings (Morgenstern, 2000). Jeff used his diary to "block time" during periods when he felt most productive:

> *I'm really hopeless in the mornings. After I started using the diary to plan my jobs, I blocked time at night for hard things, and did busy work things in the morning. This way I would psyche myself up for the night to get things done, and sometimes worked late to finish them off. I had to give myself set jobs to finish in these times, otherwise it was easy to slack off.* (Interview with Jeff)

Students also found that even though they scheduled times in diaries, they would sometimes miscalculate the required time if they didn't correctly interpret the scope of the task. For example, Suzie found at the beginning of the semester she misjudged the amount of time needed to perform tasks, as she didn't fully understanding the scope of what was required:

> *You have to be really clear about you're supposed to be doing, and what you're going to show the team when it's finished. I started some jobs and realised I didn't know when to stop. Like one job was 'Get the content for the Legal section'. I ended up wasting my time that week, as I wasn't sure how specific I had to be. So, even though I had scheduled time properly I still didn't get it done.* (Interview with Suzie)

The above examples provide evidence that the learning environment helped students became aware of the importance of carefully planning and scheduling their time. Students were encouraged to carefully consider the scope of their tasks to use their diaries block time and track their progress. Students would obtain regular feedback from peers, tutors and clients and were able to consider how appropriate their planning and scheduling strategies had been and then make adjustments if necessary. The fact that these students regularly practised planning and scheduling their time would have helped the development of this skill, a key competency needed for time management.

Monitoring progress

Students were required to continually monitor their progress against schedules developed with their team at the beginning of the semester, which indicated their responsibilities and duties. They needed to continually check how successful they had been in meeting these objectives and make adjustments if necessary to meet agreed deadlines.

Many students found tracking their time a laborious and boring task and at the beginning of the semester failed to record their time and simply estimated their figures. However, as the semester progressed students recognised that by recording their time accurately they could make better judgements about their progress and collate information (metrics) for future projects. For example, Suzie initially found it difficult to record her time and couldn't see the value in doing it. However, as the weeks progressed she realised that this was a "necessary evil" and needed to compare how much effort team members had put it and how this compared to the original estimates to enable vital team planning decisions to be made:

> *Recording my time was a really difficult thing to do. It was a nuisance, and easy to forget and sometimes I made the times up. Though as the weeks rolled by I realised that this torture was the only sensible way our team could compare how much effort everybody was putting in. Like when someone hadn't finished their job, or they done it badly, you could ask them how much time they'd spent on it, and see if it all made*

> *sense. But most importantly, when everybody put their times in, it let us make comparisons to the original schedule to see how what changes were needed, and helped us calculate accurate metrics.* (Interview with Suzie)

To help record and aggregate their times most students recorded their times on paper in standard timesheet categories (Table 6.1). At the end of the week the totals for each category was entered into the online timesheet application that created a summary report comparing estimated times against original times for the whole team. As the semester progressed students recognised that by monitoring these times accurately the team was able to make prudent decisions on assigning and allocating duties for coming weeks. For example, Liz initially would estimate her times because she hadn't developed a routine for recording her times. However, after a few weeks she established a method of monitoring her times by recording them on paper every fifteen minutes and on Friday she would enter the totals into the online timesheet application from which the project manager would then print a consolidated report for the whole team. This information was then used at meetings to compare the team's actual and predicted progress and based on this information decisions would then be made about the following week:

> *At first I would just guess or estimate how time I had put in. I didn't have a system. After I while I found it awkward at meetings when I said time that others questioned me on. So, I started recording my times on paper during the week every fifteen minutes and on Friday I 'd enter the totals into JoePM. Then, at our team meeting on Wednesday the project manager would have all the totals for the team and we would discuss how we were going and what we needed to do to make sure that we made all the deadlines. By doing it this way it was easy to justify my time.* (Interview with Liz)

Students were required to continually monitor how they used their time in order to compare actual time used against scheduled time. This information not only allowed students to calculate how much time each team member was contributing to the team's effort, but also allowed the team to judge how the overall project was evolving in terms of effort, cost and profitability. From the above examples it can be seen that students initially found this a laborious process, but from discussions and feedback received at regular team meetings they came to recognise that carefully monitoring their time was a valuable process needed by the team to help make important planning decisions. The fact that students actively set priorities to achieve objectives by estimated time, planning, scheduling, and then receiving feedback at regular team meetings is likely to have helped promote the development of students time management skills.

This section has considered ways students undertook tasks that were likely to develop their time management skills. It is interesting to explore the factors that were seen to help motivate students to practise these skills.

Student Motivation to Practice

Developing a multimedia product (the basis of this unit) is heavily focused on project work which requires careful planning, scheduling, tracking and costing. These are all largely dependent on time management skills. In this unit, student teams were required to develop web sites which required up to 500 hours of combined teamwork. Within this setting, most students recognised the value of time management and carefully planned and tracked their time with peers to meet deadlines and develop metrics. Consequently, many students chose to create time management quality assurance procedures as part of their portfolios to help improve team efficiency and also show potential employers as part of their CV. For example, as the semester progressed Bob recognised time management to be an important skill needed to complete the team's project and satisfy the client's needs. He also considered it a valuable exercise to develop quality assurance procedures to show prospective employers as discussed by guest speakers:

> *There's too many things and people to think about in this unit. If you don't manage your time, you'll never get it all done, and end up with an unhappy client. It' really what all the guest speakers said – 'Plan and track your time carefully'. We blundered along in the first few weeks until we firmed up our schedules and started tracking time properly. I also developed a time management procedure for my portfolio, which had categories for developing metrics. This will be handy to show employers that I understand how to track time.* (Interview with Bob)

Many other students also acknowledged the value of time management to help determine expenses and profit margins. For example, though Don didn't enjoy recording his time, he recognised its value in order to calculate how profitable the job had been and determining where most of the effort had been applied. He concluded that time management is essential for team based projects in any setting as evidenced by the job advertisements shown in class during the lecture sessions, and in the unit web site:

> *Even though I found it a real pain to record my time, you have to do it. Otherwise you don't know how much time everybody has put in, and it's hard to keep track of the project. When you're costing a job there's no other way. You have to know how much time everybody has used to work out profits. Even here at uni, you still need to know what's going on, and who's put in the time. I suppose that's why all the job advertisements ask for this skill.* (Interview with Don)

Student were required to develop multimedia web sites for real clients that were similar in nature to industry standards. Within this setting, students recognised the value of carefully planning their time to meet required deadlines. Also, students were encouraged by guest speakers from industry, who promoted time management skills as being a necessary for all new employees in the workplace. This helped motivate students to embrace the concept of time management and utilise appropriate strategies for their situation.

Summary

The findings from this exploration of student activity suggest that the implemented learning design was successful in helping students develop time management skills. The evidence suggests that each of the essential design features contributed in the following ways:

- Authentic activities – students were required to perform time management activities within a learning environment that reflected tasks commonly used in the industry and were highly valued by potential employers. Embedding learning in a realistic and relevant context appeared to motivate students to want to practice these skills with a view of developing industry relevant expertise to enhance their career opportunities, and also to complete the project in a timely manner;
- Self Regulation - within this context, students were given the freedom to make their own decisions about how they scheduled and managed their time. They were able to test their own strategies for time management or apply recommended strategies from the online application. This helped students take ownership over the tasks and then reflect on their success;
- Reflection –students were required to record and monitor their progress against predicted deadlines. They would actively track their progress and discuss with their peers and at regular meetings justifying or defending the use of their time. They would receive immediate feedback on their progress that would then enable them to modify and refine their strategies for continual improvement.

The design of the learning environment motivated students to actively engage with authentic activities that promoted the use of time management skills. Within this setting, the self-regulated nature of the environment freely allowed students to experiment with a range of time management strategies, and then reflect on their performance before re-attempting the task. This cycle of reflective practice helped to promote the development of students' time management skills and actively engage them in deep and meaningful learning experiences.

2. Learning to Learn

Current projections are that most people will have three or four changes of occupation during their working lifetime. Along with this, rapid and ongoing changes in technology and information access make learning-to-learn skills a vital and overarching set of accomplishments that include and subsume many other generic skills. It involves using the higher order skills of analysis, synthesis and evaluation, the ability to think critically, to construct meaning and reconstruct understanding in light of new learning experiences. (Candy et al., 1994, p.100). Learning-to-learn is also recognised as a key generic skill by the Edna VET Advisory Group (2000) in the context of the information economy:

> *Increasingly skills will become more sophisticated and will need to be developed in the workplace in a 'just-in-time' and 'just-for-me' basis in response to fast changing work practices and preferences. Learning to learn will become the bedrock capability of both individuals and organisations.* (p.8)

A number of reports have addressed the issue of how students develop learning to learn skills. The following list represents the views of a number of authors, of competencies needed to effectively manage their own learning:

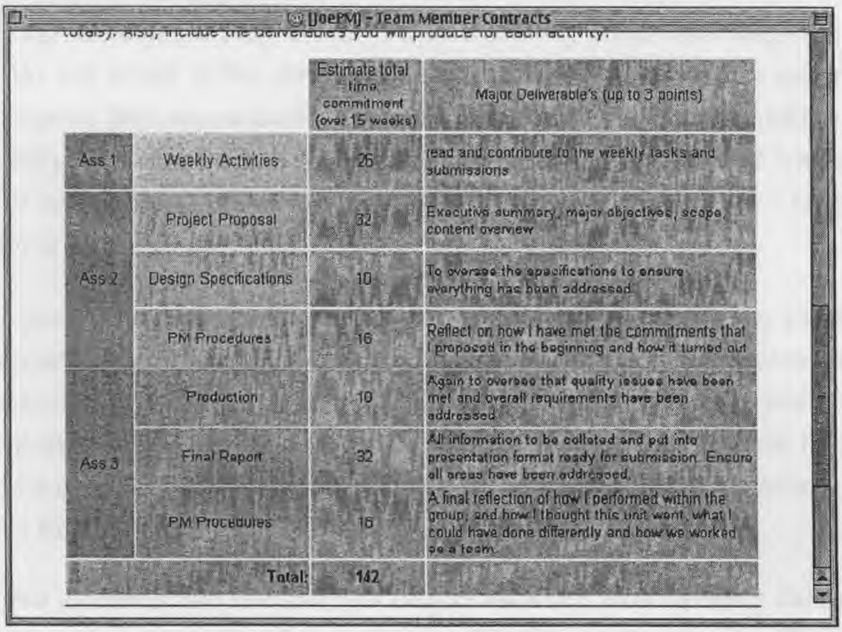
- Decide on what should be learnt by analysing the learning task (Clanchy & Ballard, 1995; Coates, 1995; Dearing, 1997; Miles & Huberman, 1994; Peters & Homer, 1996);
- Set specific learning goals (Clanchy & Ballard, 1995; Dearing, 1997; Marginson, 1993);
- Develop appropriate learning strategies (Dearing, 1997; Marginson, 1993; Peters & Homer, 1996; Zimmerman, Bonner, & Kovach, 1996); and
- Monitor their effectiveness in achieving these goals (Clanchy & Ballard, 1995; Coates, 1995; Marginson, 1993; Zimmerman et al., 1996).

The learning activities likely to result in the development of these competencies that were integrated in this unit are discussed in the following section.

Course Design Features

The course was designed with a focus on student-centred and team-based learning. Team-based activities represented seventy five percent of the course assessment, in which students were required to take responsibility for delivering a range of services to their team. Commitment to perform these tasks was promoted through the use of student contracts, completed at the beginning of the semester (Figure 6.3), signed by all team members and the tutor. The contract outlined their areas of responsibility, estimated hours of commitment and the major deliverables. This helped clarify everybody's exact responsibilities so there was no confusion during the semester about who should compete scheduled tasks.

Different projects required different technical and design features, as determined by the clients' needs. If other team members didn't have necessary skills, then in some cases students accepted being responsible for creating elements of the project that required the development of new skills. Students had to negotiate their responsibilities, and use their own judgement to determine their responsibilities and what new skills they needed to learn to help satisfy these.



		Estimate total time commitment (over 15 weeks)	Major Deliverable's (up to 3 points)
Ass 1	Weekly Activities	26	read and contribute to the weekly tasks and submissions
Ass 2	Project Proposal	32	Executive summary, major objectives, scope, content overview
	Design Specifications	10	To oversee the specifications to ensure everything has been addressed
	PM Procedures	16	Reflect on how I have met the commitments that I proposed in the beginning and how it turned out
Ass 3	Production	10	Again to oversee that quality issues have been met and overall requirements have been addressed
	Final Report	32	All information to be collated and put into presentation format ready for submission. Ensure all areas have been addressed.
	PM Procedures	16	A final reflection of how I performed within the group; and how I thought this unit went, what I could have done differently and how we worked as a team.
	Total:	142	

Figure 6.3: Sample student contract

The next section considers the extent to which students engaged with activities in the learning environment, and the extent to which they contributed to the development of learning-to-learn skills.

Activities that Promoted the Development of Learning-to-Learn Skills

From the collected survey and questionnaire data, it was evident that students were engaging in the following forms of activity associated with the development of learning-to-learn skills:

- Determining what to learn;
- Choosing learning strategies; and
- Getting feedback on progress.

Each of these is discussed in the following section, highlighting how they were practised as well as indicators that showed potential for skill development.

Determining what to learn

At the beginning of the semester, all students were required to complete contracts that would define their roles and duties within the team. When determining their duties, students had to be adaptable and flexible, as often the team would be required to construct a web site that required skills not available in the team. For example, Alice discusses how she didn't really know what programming language she was going to use until the client and the team had all agreed on the project's focus. She felt intimidated by the process but recognised it was necessary in order to produce a useful product. At early meetings she would try to determine if client and team demands were outside her capabilities and the effects these demands would have on the final product:

> *When I agreed to be the programmer, I didn't actually know what language I'd be using. We had to talk to the client, and then discuss it as a team. This was a bit of a worry because there was a chance I would end up having to learn something really hard. I was really attentive at these meetings, trying to judge what the best language would be. As it turned out, I only had to polish my Lingo skills which wasn't too bad.* (Interview with Alice)

Many other students made similar decisions based on client needs. For example, Nash the programmer in his team decided he had to implement an online database to meet the requirements of the client who needed a web site that was easy to maintain. Nash had some experience in using an online database from an earlier unit but had never implemented a complete online solution. He needed to update his skills in order to complete this task:

> *The client wanted a web site that was easy to maintain with dynamic data entry through a web page, so that the secretary could easily update the site. This meant I had to revisit FileMaker Pro and learn to integrate it in a complete online solution for the web site.* (Interview with Nash)

In another team, Giff (the graphic designer) implemented a Web based animation package to suit the needs of the client who needed an educational package with animations to demonstrate science concepts. Giff knew it would take much time to learn this new package but felt there was no way around it and also recognised this would be a valuable skill for him in the industry after graduation:

> *We picked a project that needed animations to show science concepts to students. Everybody in the industry uses Flash for web animations, so I decided to learn it as it would be useful to me after graduation. Anyhow, this was really the only way we could have made this site for what the client wanted, so there wasn't a lot of choice.* (Interview with Giff)

As well as developing skills to satisfy client needs students also were required to develop skills for their team roles. For example, Sue the project manager of her team found it necessary to learn how to use a spreadsheet and scheduling package to a sophisticated level in order to meet her responsibilities as a project manager. The role she had agreed to perform in her contract:

> *As the project manager, I really needed to get my head around collating spreadsheet data in Excel, and tracking the team's progress using Microsoft Project, which was one of my agreed duties. At each team meeting I would show the original Gantt, and then were we all at. I spent quite a long time working out how to get Project to take time sheet data and track for me* (Interview with Sue)

Other students found the influence of the team a determining factor in deciding what they needed to learn. Chris, a media developer decided to learn how to incorporate streaming video in his team's site as the team considered this would enhance the quality of their CV after graduation:

> *The team decided that digital video would really enhance the site for the client and for us when we graduated. So, I had to learn how to use a digital video camera, and then i-Movie to edit and create a bunch of streaming video segments. I didn't really mind spending time on this, as I could see it was a valuable skill to have* (Interview with Chris).

At the beginning of the semester students were required to negotiate their responsibilities with their team, client and tutor.

The design of the learning environment required students to negotiate the scope and extent of a web site with real clients. Often this required students to learn new skills to provide features required by the client. Students would discuss the requirements and then commit to responsibilities through contracts at the beginning of the semester. The fact that students negotiated their responsibilities with others, and then made their own decisions about *what new skills they needed to learn* helped promote the development of their learning-to-learn skills.

Choosing learning strategies

The authentic nature of the activities required students to learn new skills, as many of the skills learnt in previous units had become outdated or were not at a sufficient level. This required students to use a variety of learning -to-learn strategies, which included web tutorials, computer based help facilities or asking others for help. For example, Rose learnt to use animation software through the computer based help system found in the application software. She found this to be a quick and effective means of learning what was needed to perform her tasks:

> *I had to learn how to create some animations using Flash. I wasn't sure how to do them, but by going through the Flash tutorials gave me a good start. After doing the tutorial examples, I found useful help screens and read other information I needed. This was a good, quick way of leaning how to use this package to do my jobs and better my skills.* (Interview with Rose)

Other students found reading or following tutorials in textbooks an effective means of learning. They would buy books, obtain them from the library, borrow them from friends and tutors, or download them from the web. For example, Sue purchased a book, and used it to learn how to implement project management software she needed for her team role of project manager. She enjoyed being able to use the book with the computer, and then also being able to refer to it when away from the computer:

> *I learnt how to use MS-Project using a book I bought at Boffins. It was great. I did the computer tutorials at home, and then read it at work to get extra info. This helped me*

learn the package and also helped me understand other PM principles I needed for my role. (Interview with Sue)

Asking others for help was also a common strategy used by many students. Students approached friends, peers and tutors to get help with specific problems they couldn't solve on their own. For example, Bob would ask others for help when he couldn't understand how to complete tasks:

Asking a friend or tutor for help really saved me a lot of time when I got stuck on things. Otherwise it could have taken weeks to find out how to do it. (Interview with Bob)

From these examples, it can be seen that the learning environment encouraged students to use a variety of learning-to-learn strategies that suited their learning style, and were also appropriate to the given context. These included computer-based tutorials/help, web based tutorials, online information, books and also asking others for help. The setting encouraged students to choose learning strategies that best suited their situation, which is a required competency needed to promote the development of learning-to-learn skills.

Getting Feedback on Progress

The design of the learning environment enabled students to get regular feedback from peers, clients and tutors. At weekly team meetings students would report their progress and obtain peer feedback on their progress and performance. For example, Nash would show new features he had learnt and implemented at team meetings and obtain feedback from the team. However, at one meeting the team wasn't impressed with how much work he completed, as they needed to show the client a more complete prototype. Nash reflected that on this occasion he probably should have asked others for help rather than learning how to do it on his own:

As I worked through and programmed new features on the web site I would show them to the team at meetings and they would let me know if I needed to do more or change things. Once they didn't seem that impressed with I had done. But they didn't realise I had spent lots of time learning how to do it before I programmed it. I think they were a bit cranky because we had to show the client a prototype and they wanted the database fields in. Maybe I should have asked someone else for help here rather than learning it all by myself. (Interview with Nash)

Obtaining feedback from tutors was also a key factor in helping students decide how successful they had been with their learning strategies and if they needed to do more. For example, Lex showed her tutor a strategy for planning and scheduling and was advised to add a range of extra features, which required her to learn new material:

I thought a good strategy for tracking the teams' time was to use a spreadsheet and compare it to the original MS-Project Gantt Chart. When I showed the tutor, he

> *wanted to see the actual and predicted times on a weekly basis on the Gantt, and not the spreadsheet. So, I had to work out how to plug in the weekly times in MS-Project to show the teams' progress.* (Interview with Lex).

Students would also meet with their clients regularly and get feedback on their progress. Often clients would request changes or want extra features based on their expectations even if they weren't in the original design specifications. Alice found at one meeting the client was surprised that there wasn't a separate administration section to help maintain the online database. She assumed that this would have automatically been included. Even though this feature hadn't been documented Alex recognised that she probably should have included it and had overlooked it when learning how to develop the site:

> *The client insisted we had agreed to include an administration section, even though it wasn't in the design specification. I could see the logic in it. What he wanted made sense. When I was learning how to do it, I just didn't think about doing it. I suppose I should have talked about it with others and asked them for help.* (Interview with Alice)

These examples provide evidence that students obtained regular feedback on their progress from their team, tutor and client. This enabled students to reflect on their success in learning new material and their resulting performance in delivering required tasks, as perceived by others. Students then used this feedback to reflect on how successful their learning-to-learn strategies had been, and modified them if necessary. This cycle of reflective practice provided opportunities for students to reflect on their experiences, and then make changes if necessary. Through this process, opportunities were provided for students to improve their learning-to-learn strategies.

This section considered ways students undertook tasks that were likely to develop learning-to-learn skills. The following section considers the main factors that appeared to encourage students to undertake activities likely to improve these skills.

Student Motivation to Practice

The primary aim of this unit was to develop students project management skills, which was promoted by placing students in teams to produce web sites for real clients. Within this setting students recognised the importance of developing new multimedia development skills in graphics development, programming languages, database software and other multimedia development application software. For example, Suzie a programmer in her team, decided to implement an online database package for their web site to make it easy to maintain. She recognised that this was an essential skill needed in the industry and felt motivated to learn how to implement this as part of the team's web site in order to develop her skills:

> *I knew that our web site needed to be database driven, otherwise the final product would be pretty boring. Nobody wants to update static HTML pages, it takes too long. I decided to learn how to use Filemaker Pro, and completely integrate it into our web site. It took a long time, though it was definitely worth learning these skills and having a product like this to show industry.* (Interview with Suzie)

Most other student made similar comments about developing industry relevant skills. For example, Liz decided to learn how to use a new animation application package that she considered was valued in the industry. She had no previous experience in using this package and acknowledged that extra effort was needed to learn how to use it. However, she believed that by developing this skill, it would give her greater opportunities in gaining employment:

> *By learning how to use Flash to build the web site helped me develop a valuable skill that is in high demand for jobs. Even though it took a long time to learn how to use it, it was worth it. Lots of jobs want graphic design skills, as well as Flash skills. Expedior was asking specifically for just Flash developers.* (Interview with Liz)

The commitment by students to learn new application packages appeared also to be promoted by the rapid changes in technology that continually brings new, elegant packages to the market. Many students realised that in a rapidly changing industry, they needed to keep their skills current. For example, Nash the programmer, was keen to learn how to develop web-based databases using a newer freeware application that was becoming increasingly popular in the industry and in high demand by employers:

> *The industry changes so fast. There is always something new to learn. I've started learning how to use PHP through a web site so I can code up the database with it. There are lots of jobs going for PHP so I reckon it's worth the trouble.* (Interview with Nash)

The design of the learning environment provided an authentic setting that encouraged students to learn new applications and develop new skills. Working with real clients and building web sites they could use as CV items to promote their skills to industry help motivate students to want to learn new skills. Many of these skills were not a direct requirement of the unit, however students recognised the value of these in industry and wanted to breach gaps in their knowledge in preparation for their careers in the industry.

Summary

The findings from this exploration of student activity suggest that the implemented design of the learning environment was successful in encouraging students to practise learning-to-learn skills. The evidence suggests that each of the learning principles contributed in the following ways:

- Authentic activities –students were required to complete a project for a real client who had real needs. Each student had to select a team role and the associated responsibilities for the given project. Within this setting many students recognised they needed to learn new skills to complete these team tasks, and were motivated to learn new skills to accommodate the requirements. Also students recognised these skills would also be useful beyond the academic setting and enhance their career opportunities for the future;
- Self-regulation – students were given the freedom to make their own decisions about what skills they needed to learn/enhance, and which learning strategies they would use. This was supported with a range of printed and online learning material as well as tutorials and other resources used to scaffold their learning. Within this setting tutors took the role of facilitators and supported the student-centred learning activities; and
- Reflection - through regular meetings students would receive feedback on their progress from peers, clients and tutors. In many cases their success was dependent on how successful their learning strategies had been. This enabled students to consider how well they had implemented learning strategies and what was needed to help make improvements.

The design of the learning environment motivated students to learn new skills that were appropriate for their team role and supported the development of the project. Students engaged with a variety of learning strategies in an attempt to master these new skills, and obtained feedback from peers, tutors and clients on their success. This enabled students to reflect on their performance and if necessary make adjustments to help improve their learning-to-learn skills.

3. Self-Assessment

Self-assessment refers to people being involved in making judgements about their own learning and progress which contributes to the development of autonomous and reflective individuals (Sambell, McDowell, & Brown, 1998; Schon, 1987). This is also supported by Boud (1992) who describes the defining characteristics of self-assessment as: "The involvement of students in identifying standards and/or criteria to apply to their work and making judgements about the extent to which they have met these criteria" (p. 5). Learning environments that promote the development of this skill need to encourage participants to:

- Have a clear understanding of the objectives (Orsmond, Merry, & Reiling, 1996; Stefani, 1994);
- Identify valid criteria for self-evaluation (Falchikov, 1995; Ford, 1997; Klenowski, 1995; Sluijsmans et al., 1999; Sullivan & Hall, 1997; Topping et al., 2000); and

- Accurately and objectively judge the success or failure of their efforts (Oldfield & MacAlpine, 1995; Woolhouse, 1999).

A number of learning activities likely to result in the development of these competencies were integrated in the syllabus of this unit (*IMM 3228 Project Management Methodologies*).

Course Design Features

At the beginning of the semester, students negotiated student contracts in which they agreed to perform a range of duties by certain dates and to a specified quality. These agreements helped provide a basis from which they could self-assess their progress through out the semester. The following activities and supports were provided to encourage this behaviour:

- Students were required to complete three reflective reports over the semester in which they needed to discuss their strong points, weak points and tactics they would use to try and make self improvements;
- Weekly meetings in which students discussed their progress and gave reasons for success or non-success in completing assigned tasks; and
- Online journals in which students were required to assess their success in completing assigned tasks over the week.

As shown in Figure 6.4, students had to consider how successful they had been in completing assigned tasks (using a scale from 1 to 5), the quality they had achieved (using a scale from 1 to 5), how successful they had been in managing their time (using a scale from –2 to +2) and comments justifying their scores. The information collected from this self-assessment instrument was then made available to peers who used this information to help make decisions about peer assessment.

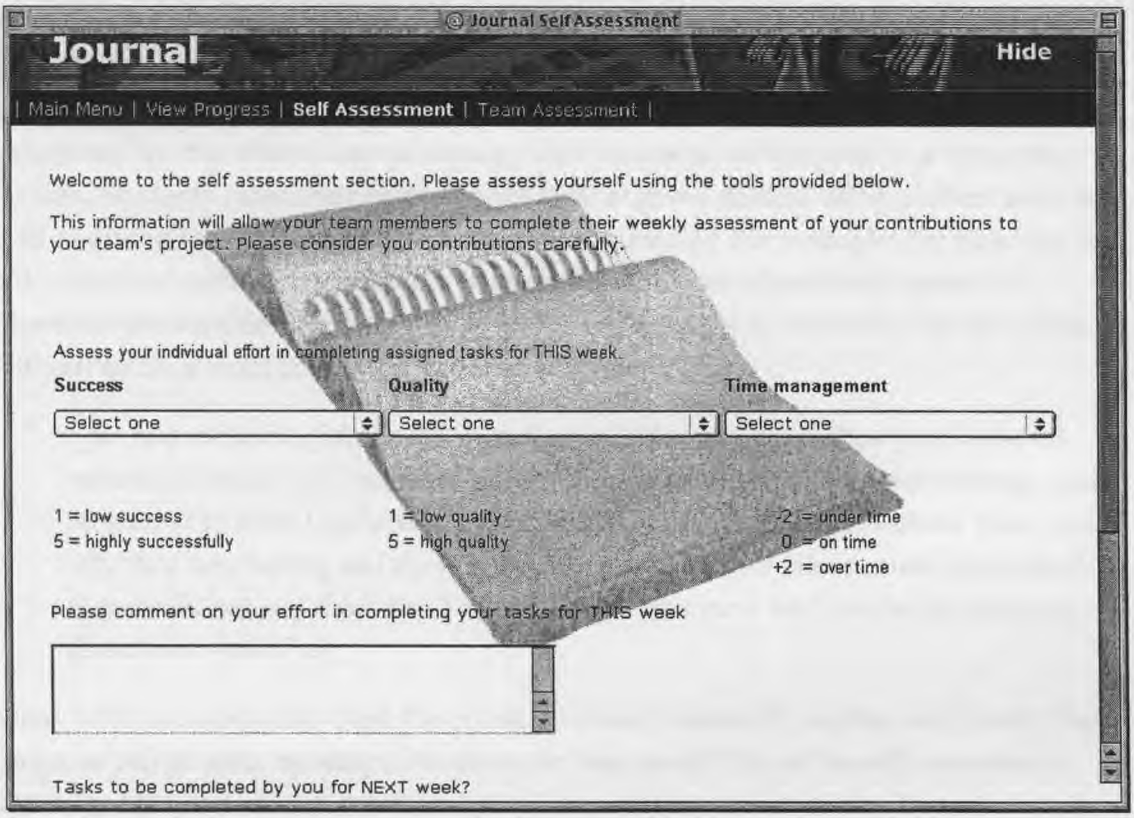


Figure 6.4: Self-assessment journal

The learning environment provided many opportunities for students to self-assess their progress through online journals, weekly meetings and reflective reports. Information collected through these strategies provided reflective data that helped with peer assessment, communication and collaboration.

The next section analyses the extent to which students used self-assessment strategies within the learning environment designed for this course.

Activities that Promoted the Development of Self-Assessment Skills

Data was gathered in a number of forms that provided evidence of student activities that may have improved their self-assessment skills. The following list emerged from the questionnaire data and describes a number of activities used by students to help develop self-assessment skills:

- Completing self-assessment journals;
- Completing reflective reports; and
- Discussing progress at team meetings.

Each of these is discussed below highlighting how they were used as well as indicators that showed improvement.

Completing self-assessment journals

Completing online journals was a recommended activity within the unit but wasn't directly assessed. However, most students completed these on a weekly basis as they recognised the benefits of communicating their progress to their peers in a thoughtful fashion. Students rated their performance against given criteria using a Likert scale as well as giving reasons for their performance (Figure 6.4). For example, Pat filled out his online journal each Friday afternoon and made comments about his progress on promised deliverables. He found this a productive means of explaining his situation, without causing team conflict at team meetings:

> *I got into the habit of doing the journal each Friday afternoon. It only took about 5 minutes. I would think about what I had promised to do from the team meetings, and compare it to what I had actually done. If things had gone wrong, I would think about why they went wrong and try to write it in a way that the others would understand, so they would not just think that I was slack, and give me a hard time at the meetings.* (Interview with Pat)

Many other students also used the online journals to carefully explain and justify their progress before team meetings. For example Sue, would fill out the self-assessment journals at the end of each week outlining her progress and clarifying her actions. At team meetings she would get feedback from the rest of the team on her suggestions:

> *By taking a few minutes and thinking about things that went well or badly was useful. If I hadn't done my jobs, the journals would give me chance to explain what had gone wrong. At meetings, I could then see what everybody else thought about it, and if the action I suggested was ok.* (Interview with Sue)

These examples provide evidence that the learning environment encouraged students to evaluate their self-performance through the use of online journals. This enabled students to compare their perceptions of their self-performance against the opinions of peers and tutors. Based on these different perspectives, students were able to decide if they had self-assessed themselves accurately, and if necessary consider strategies for self-improvement. The fact that students rated themselves against specific performance criteria, and then openly discussed this with peers and tutors is evidence that these students were engaged in activities that were likely to develop their self-assessment skills.

Completing Reflective Reports

All students were required to complete three reflective reports that were worth ten percent of the overall assessment as follows:

> *Discuss what strong and weak points you think you have shown as a team member? How will you try to improve on weaker areas in the coming weeks?* (Excerpt from unit syllabus)

These reports were intended to help students reflect on their effectiveness in carrying out duties within the team, and also to enable them to consider how they could make improvements. For example, Alice shows in her reflective report how she made a rule not to communicate problems haphazardly and choose the right language and context in which to discuss these:

> *Thinking about the conflict we have had in our team, I have made a rule for myself. Never communicate problems haphazardly! You have to be careful how you say things. Make suggestions in a positive way, and try not to blame. I think this is why we had lots of conflict in our team.* (Excerpt from Alice's reflective report)

Many other students also discussed methods of self-improvement through their reflective reports. For example, Bob used strategies to improve time management skills to help him deliver tasks on time:

> *In one instance I was late in giving the programmer some content. The main reason this happened was because I wasn't keeping an eye on the schedule, or Gantt chart. I need to be careful about checking the schedule, and starting my tasks earlier to make sure I that I meet the teams' deadlines.* (Excerpt from Bob's reflective report)

Students were required to reflect on their progress by completing a number of reflective reports during the semester, in which they discussed their strengths and weaknesses and considered strategies for improvement. This cycle of reflective practice encouraged students to implement strategies for improvement, based on an analysis of their performance.

Discussing Progress at Team Meetings

Students were required to attend weekly meetings and report on their progress to the rest of the team. They needed to carefully assess their performance and report how successful they had been in delivering tasks as follows:

- Tasks to be completed for NEXT week?
- Success in completing tasks from LAST week?
- Analysis of Your Time

At team meetings students were required to give an accurate self-evaluation of their progress to their peers. They would then get immediate feedback in judgement of the work they had completed. Students recognised that it was easier to be truthful about their progress rather than trying to exaggerate achievements. For example, Liz decided that if she hadn't completed her tasks she would quickly admit fault and discuss how to improve the situation, rather than try and bluff her way through the meeting. She recognised that there were no advantages in exaggerating her progress at team meetings:

> *Each week we would all go through our TO DO lists and report on what we had done. At the beginning of the semester I sometimes exaggerated a bit, but it just wasn't worth it. Other students picked me up on it, which made it even worse. It's just easier to be honest and explain what happened and where you're at* (Interview with Liz)

Understanding the quality and standard expected by the team is an important aspect in meeting team requirements and consequently accurately assessing self-performance. Many students discussed the importance of understanding the teams' quality expectations. When presenting their work some students were surprised that the peers expected more work from them or wanted the work to be of a higher quality. In the following example, Lex describes the importance of having clear criteria agreed to by the team and how she would negotiate the quality expectations from the other team members to make sure they were within her scope of duties:

> *I think one of the biggest problems we had was doing things to the right standard or quality. Whose quality? I got a bit smarter with this, and made sure I clarified what everybody expected from me before doing it. If somebody was unreasonable, which they could be at times, I would discuss or even argue the point to make sure that what I was supposed to be doing fit the schedule.* (Interview with Lex)

These examples provide evidence that students within this learning environment regularly discussed their self-performance and progress at team meetings. This helped them became more aware of presenting their information in a clear and honest fashion as well as carefully considering the expected quality of work from their peers. Within this setting students would evaluate their performance, discuss their progress and contingencies and then negotiate quality expectations from their peers. The fact that students were reflecting on their own experience, negotiating quality criteria and receiving regular feedback on their performance suggests the activities were likely to help promote the development of their self-assessment skills.

This section has considered ways students practised self-assessment skills. The following section considers the factors that encouraged and motivated students to practise these skills.

Student Motivation to Practice

Seventy-five percent of the unit assessment was based on teamwork in which marks were equitably distributed within the team, unless peer assessment was applied. Within this setting, students recognised they needed to justify their contributions to the rest of the team or suffer the consequences that sometimes resulted in conflict. Using the online journals helped students assess their own work and explain to the rest of the team how they had performed, giving reasons for any discrepancies in a safe forum. For example, Chris used the weekly online journals to give details of his progress in a forum he considered to be non-threatening. He found it easy here to discuss any problems encountered and how they affected his work without interruptions or accusations from others. At team meetings he could then expand on these without having others express dismay or surprise and perhaps avoid arguments by clearly explaining why the problems occurred:

> *I would use the journals to let the rest of the team know how I was going so there was no surprises at the team meetings. If something had gone wrong I could explain what happened without being hassled or interrupted at team meetings. It also let me think about things I could do to help the situation. That way, others wouldn't get all upset all of a sudden and maybe cause a big problem for the team.* (Interview with Chris)

Many other students made reference to the process of self-assessment as a means of letting the team know how successfully their tasks had been completed and what affect these would have on the overall project. Giff, for example assessed his performance each week to give the rest of the team an understanding of how successful or unsuccessful he had been in performing his assigned tasks. When he rated himself low on the self-assessment scales, he knew he was risking negative peer assessment but considered this to be a fair exchange if he had not satisfied responsibilities to the team:

> *I knew in the first few weeks I wasn't doing my bit. I really had to rate myself low on the self-assessment even though I knew it was probably going to cost me marks. If you weren't honest here, then the rest of team would think that you were doing your job. Then after a while they would realise you weren't and there would be a blow up and the progress of the whole team would suffer. You would still loose the marks, maybe even more and some team members might get really cranky.* (Interview with Giff)

These examples provide evidence of students self-assessing their progress in an open and honest fashion. This was promoted through a learning environment in which teamwork represented a major portion of the assessment, and was based on developing a product that would benefit all team members. Within this setting, students were encouraged that honest self-assessment would help promote communication and lead to a more harmonious and effective team environment.

Summary

The findings from this exploration of student activity in areas likely to develop students' self-assessment abilities, suggest that the implemented design of the learning environment was successful. The evidence suggests that the pedagogical design elements contributed to their development in the following planned ways:

- Authentic context – students were part of a development team in which each team member had specific responsibilities, working together to satisfy the needs of a client and also to complete the assessment requirements of the unit. Each team member played a pivotal role in developing the product and when timelines were missed, or quality was compromised, the consequences would influence the whole team. Within this setting students became critically aware of responsibilities as they recognised the impact these had on their team;

- Self-regulation – students had the freedom to choose their team role as well as the activities they would perform within that role. This encouraged students to take full ownership of promised tasks, and to critically analyse how successful they had been in their delivery; and
- Reflection – the design of the learning environment actively encouraged students to engage with reflective activities through the use of journals, reflective reports and team meetings. Students were required to reflect on their progress and assess how effective their contributions had been and also make recommendations for improvement. This cycle of reflective practice encouraged students to continually consider strategies for self-improvement.

The combination of authentic and student-centred activities supported with reflective practice provided an environment that helped students evaluate the true worth of their contributions in a team-based environment.

4. Leadership

Poor leadership skills can cause more problems in teamwork situations than any other single issue (Ovretveit, 1993). In an attempt to help this situation much has been written on the many aspects that leadership encompasses such as decision-making, negotiation, role modelling, managing cultural differences and many other concepts. This has resulted in a wide variety of approaches being adopted by different professional organisations and academic disciplines to leadership development with many different definitions formed about what good leadership represents. Parry (1996) gives a general definition as follows, "Leadership is the presentation by a person of some identifiable goal or vision or future state that people can desire; and the generation of a willingness within those people to follow the leader along a socially responsible and mutually beneficial course of action, toward that goal" (p. vi).

Given the diversity of disciplines that address the needs of leadership skills, many reports have addressed this issue. Effective leadership has been found to comprise of competencies such as:

- Having a firm understanding of role and responsibilities (Ovretveit, 1993; Parry, 1996);
- Focusing on key priorities and key strategies (Jacobson, 2000; Kakabadse & Kakabadse);
- Clearly communicating needs and requirements (Kakabadse & Kakabadse, 1999; Morden);
- Committing/persisting to complete team tasks (Morden, 1997; Parry, 1996); and

- Showing consideration, promoting collaboration and inspiring others (Jacobson, 2000; Kakabadse & Kakabadse, 1999; Morden).

Learning activities likely to result in the development of these competencies were prevalent in the syllabus of this unit, and are discussed in the next section.

Course Design Features

As the main focus of this unit was teaching students about project management, the learning environment was designed with a view that students would develop leadership skills throughout the course of the semester. Student teams were required to develop a multimedia product for a real client, based on agreed contracts and design specifications. A project manager was elected in each team and had responsibility for coordinating the teams' overall efforts which included assigning resources, managing meetings, tracking progress and organising documentation. However, all students were involved in making leadership decisions based on their team role and on the direction the team should take.

To help students meet these commitments, the learning environment was designed to encourage students to perform such activities within their team roles as:

- Outlining their roles and responsibilities through the use of a student contract;
- Setting priorities and milestones for each team member using Gantt charts;
- Defining and communicating weekly tasks through online journals and weekly meetings;
- Reporting progress through online journals and weekly meetings; and
- Participating in team meetings with ideas, contributions and support for others.

The next section analyses the extent to which students used leadership skills within the learning environment and illustrates evidence of skill improvement.

Activities that Promoted the Development of Leadership Skills

The following list of common themes emerged from questionnaire and interview data as the main form of activities used by students to help develop leadership skills:

- Focusing on key priorities and contingency plans;
- Effectively utilising team members strengths and weaknesses; and
- Communicating effectively.

Each of these are discussed below, highlighting how they were used as well as indicators that suggested they helped students develop leadership skills.

Focusing on key priorities and contingency plans

Students were required to identify major milestones for their team and then to schedule their own time to meet these commitments. This required estimating, monitoring and refining priorities as the project evolved. For example, Rose learnt to continually check assignment deadlines, client deadlines, team deadlines and her own task deadlines to ensure that major commitments were catered for. As the semester progressed, she developed a scheme to remember important tasks by recording them on one piece of paper, so that when she went to meetings she could confidently discuss deadlines, and inform the rest of the team of coming commitments:

> *I had to keep reminding myself of all the deadlines, otherwise I would forget something. It was like a pyramid. There were unit deadlines, which led to client and team deadlines, and from these I had all my deadlines to think out. I few times I got absorbed with all my little things, and then forgot about bigger, more important things the whole team had to focus on. I now have a list of major tasks always scheduled on just one piece of paper. This helps at team meetings. It gives me confidence to push priorities, and let everybody else know what important things need doing.* (Interview with Rose)

As well as carefully focusing on key priorities, students also developed contingency plans by considering what alternative action could be taken if critical tasks were not executed as scheduled. For example, Nash's team decided to use a complex database application for their web site, but had a "fall back" position if this strategy didn't work. They considered this important as it was their choice to select a more complex database solution which if didn't work would cost them marks:

> *We decided to use PHP for our online database, even though it was pretty complex and I didn't really know how to use it. But we all knew it was worth trying to get it in as part of the product features. If it didn't come together by week 5, our fall back position would be to go back to using FileMaker Pro, otherwise we would lose lots of marks.* (Interview with Nash)

Many other students made similar comments about scheduling tasks based on team priorities and considering contingencies in case of unforeseen problems. These were discussed at team meetings to consider how viable different approaches were and whether alternative action was needed. In one case the client failed to deliver the content on the required date. The team decided to go on with their design and let the client give them the content two weeks later. When the client again failed to submit the content, the students tried to find another client, which was unsuccessful. They then decided to source their own content. Lex, the project manager knew that without this contingency plan they would have run out of time and not completed the project:

> *We tried everything. Phone calls, email and meetings. Nothing worked. He just wasn't going to give us the content. So we had to make a decision before it was all too late. We tried to find another client, but that didn't work either. So, in week 7, we decided that*

we had to source our own content and leave the client. If we didn't have a contingency plan we probably wouldn't have finished on time. (Interview with Lex)

These examples suggest that the design of the learning environment encouraged students to actively engage with activities that helped them focus on completing priority tasks, as well as developing appropriate contingency plans. Students continually made decisions on a range of issues affecting the development of the project that had a direct impact on their team and client. These decisions were based on their ability to select appropriate priority tasks and act on these with appropriate contingency plans. Students would obtain regular feedback and were able to consider how appropriate their choice of priorities had been and then make adjustments if necessary. The fact that students regularly practised setting priorities and developing contingency plans would have helped the development of this skill, a key competency needed for leadership.

Effectively utilising team members strengths and weaknesses

Most students were unaware of their team members' strengths and weaknesses at the beginning of the semester. However, by completing student contracts at the beginning of semester the team gained some appreciation of others skills and aspirations. It was often difficult for team members to gauge the standard of others work until Week 4 of the semester when they had delivered some products. At this time the students couldn't change their team members and were committed to make the best of each others' skills.

As the semester progressed some students were disappointed with the performance of others and reflected their thoughts through confidential online journals to the tutor. Tutors used this information to discuss team issues at occasional tutor led meetings in which they gave some indication of how they felt the team was performing based on the collective comments gained from the online journals and their own observations. At these meetings tutors asked the team how they felt they could move forward using the team's collective strength and supporting any weaknesses and others' needs. Most students embraced this positive approach and realised that conflict and negative feelings were counter productive to the overall team effort. For example, Sue saw how Chris found it difficult to read journal articles or textbooks and then synthesise this information into summaries. He would often not do it or do it badly which started to cause negative feelings within the team. However, he had strong skills in graphic design and media development so after the tutor-led meeting, the team decided to allocate more duties to him in this area and exempt him from creating summaries. This had a more positive effect on the team's overall dynamics:

Chris would really struggle to do the weekly readings and make sense of them. At team meetings he wouldn't contribute much, and some team members started to get touchy about it. After the meeting with the tutor we decided to let him do more design and

> *media work, and let him off doing the readings. This worked heaps better, as he was happier and produced better work in the design area, and we had less arguments.* (Interview with Sue)

Many students made reference to the importance of considering others' needs in a team situation, some of which were identified at tutor led meetings. If team members were experiencing problems, students realised that these would probably end up affecting the whole team. For example Liz originally ignored others' problems until she realised that these problems affected her work. She concluded that it is necessary to monitor other team members' progress, and to help them when necessary:

> *At the beginning of the semester, I tended to ignore others problems because I had my own problems. But after a while I realised that their problems were my problems. When the graphic designer hadn't done his work then it affected me, and really the whole team. You have to keep an eye on what's going on, and see who needs help, otherwise the whole team suffers.* (Interview with Liz)

The reverse condition was also mentioned by a number of students. Students felt it was important to recognise strengths of others within their team and to capitalise on these. For example, Suzie's team realised that Bob had strong project management skills even though he wasn't the project manager. During the semester the team agreed that he should share some of the project management responsibilities so that the team would gain some value from this strength:

> *Bob didn't want to be the project manager at the beginning of the semester. But at all the team meetings he was always making good suggestions about scheduling, priorities and what the team should be doing. He had a good sense of what should be going on for the team, so he ended up sharing the PM role* (Interview with Suzie)

The learning environment encouraged students to carefully consider how they could best utilize individual strengths within the team, as well as supporting team members with weaknesses. Students recognised that by using the best person for the job helped the whole team become more effective. Also, by helping peers who were having trouble competing their tasks also helped the whole team, as failure by one team member would affect the success of whole team. These examples provide evidence that these students assessed their peers' strengths and weaknesses, and then considered how best to use these within the team, which would support the argument this learning environment was promoting competencies needed for leadership.

Communicating effectively

Communication is a key generic skill considered later in this chapter. However, students repeatedly mentioned this as being an important competency needed for effective leadership. For example, Suzie believed that effective communication was one of the most important leadership attributes needed as a project manager to help avoid incorrect assumptions and perspectives being formed. She developed a system in her team to promote clear communication by asking all team members to repeat their tasks at the end of meeting and also discuss what quality and effort they would put into these. These were based on templates provided in lectures:

> *I noticed that most of the problems we had early in the semester were caused by bad communication. People would make bad assumptions, like assume that someone else would do a job, and then it wouldn't happen. Because I ran the meetings, it was really my job to make sure that everybody knew exactly what they were supposed to be doing. After a few weeks, I used a QA system to run meetings, which I modified from one of the lectures. I made sure everybody had their say and the rest of the team understood them. Also, at the end of the meeting I made everybody repeat their To Do lists to make sure they understood what to do and to what quality, and everybody else agreed.* (Interview with Suzie)

Many other students also perceived effective communication as an important element needed for effective teamwork. Don describes how his team often received wrong messages about a team member's progress, which then caused problems when incorrect assumptions were made by the rest of the team. He contends project managers must have effective communication skills:

> *It was really annoying when team members weren't up front and clear about their progress and what they had to do. They would say 'Oh, it's nearly finished', or 'Yeh, it's pretty good'. This sometimes meant they had done bugger all, or had just started doing it, which caused problems for others if they were waiting for things. The project manager and the team really need to have a system to clarify everybody's tasks so that everybody understands what they have to do. There should be no grey areas about their jobs. Otherwise, team meetings just become attack and defence sessions.* (Interview with Don)

From the above examples it can be seen that students recognised the value of using clear and effective communication. Students experienced the negative effects poor communication, which encouraged them to develop strategies to help promote the development of effective communication protocols. The fact that students were active in developing strategies to enhance communication is likely to help promote the development of key team skill, which is a requirement for effective leadership.

This section has considered ways that students undertook tasks likely to develop their leadership skills. The following section considers factors that encouraged and motivated students to practise these skills.

Student Motivation to Practice

Primarily this unit was focused on developing students' project management skills. Students graduating from the course will be employed in team-based multimedia development environments and be expected to perform specific team duties as well as contributing to the team's management by developing procedures, managing time, developing metrics and so on. These skills form the basis of the project management course with a focus on promoting effective team and business quality assurance processes. The following unit assessment item illustrates some of the student assessment requirements:

> *Document four project management procedures utilised by your team this semester eg team communication issues, collaboration issues, financial management, scheduling, time management, QA etc. Students will be assessed on the clarity and re-useability of procedures and templates. These must be supported with references - 12 marks.* (Excerpt from syllabus – Appendix 2)

Many students recognised the value these skills had in industry and often discussed how job advertisements and guest speakers would refer to these skills as being valuable for employment opportunities. For example, Bob was motivated to develop his leadership skills as he recognised the direct link these had with project management. Also through guest speakers, and job advertisements shown at lectures, he recognised that most employers valued these skills for all potential employees, not just project managers:

> *Leadership skills are really the same as project management skills. In our team, we all had to use these skills to make lots of decisions. Also, all the job adverts wanted these skills, and all the industry speakers kept plugging them as being important for employment. You know things like teamwork, communicating, developing procedures and managing everything properly. It's pretty obvious everybody needs these skills in the industry, not just the project manager.* (Interview with Bob)

Many other students made similar comments about the significance of developing leadership skills and the importance of being able to prove they had these skills to potential employers. For example, Don developed a portfolio of project management/leadership procedures based on current literature to help promote the quality of his CV to prospective employers:

> *I worked on having some good procedures in my portfolio to show employers I knew what leadership and project management was all about. I based them on the readings and how we did things in our team. I did them on teamwork, communication, and managing time. I picked these because most of the guest speakers and job ads always seemed to refer to these things.* (Interview with Don)

The design of the learning environment provided a context that was focused on promoting the development of project management and leadership skills, by placing students in teams to develop web sites for real clients. The importance of leadership skills was promoted through the use of guest speakers, current job advertisements, and a series of videos taken from local employers discussing the value of these skills within their companies. This helped students recognise the value of these skills in industry, and provided motivation for improvement.

Summary

The findings from this exploration of student activity in areas likely to develop leadership skills suggest that the implemented design of the learning environment was quite successful. The evidence suggests that the following pedagogical design elements incorporated in the design of the learning environment contributed to their development:

- Authentic activities – students were actively engaged in performing leadership and project management tasks that were similar to industry standards. Students recognised that these skills were highly valued by employers and would help them secure employment after graduating. This motivated students to develop a portfolio of quality assurance procedures to help prove their capabilities;
- Self-regulation – the design of the learning environment allowed students to set their own goals and interpret given task requirements with their peers. Within this setting, the role of the tutor was that of a facilitator, and students made all decisions related to the direction and scope of project. This encouraged students to take ownership of the tasks and actively engage in developing effective project management and leadership strategies to help produce a successful product; and
- Reflection – at regular team meetings the consequences of students' decisions were reviewed through group discussions. This was complemented with online confidential self/peer assessment journals that were consolidated by tutors and discussed with students. Students were given a variety of feedback the on consequences of leadership decisions made, which helped promote a cycle of continual improvement.

The evidence suggests that the authentic context and commitment to student-centred activities appeared to be strong motivators that helped encourage students to practise using leadership skills. The fact that students continually practised this skill within the learning environment and then received feedback from both peers and tutors was likely to have promoted the development of this skill.

5. Collaboration

Teamwork and collaborating with others forms an important part of most people's working and social lives. Scarnati (2001) explains that effective teamwork relies upon collaborative processes that enable individuals to extend their boundaries and achieve more than as individuals: "The team has synergy. By sharing a common goal or vision, the team can accomplish what individuals cannot do alone" (p. 6).

Collaborating effectively when working with others in teams requires a capacity to interact effectively with both a group of people and also on a one-to-one basis with a view of working towards achieving a sharing goal. Johnson and Johnson (1999) have found that for effective collaboration to occur it requires participants to:

- Communicate effectively, show trust and leadership qualities;
- Help each other with problems and encourage each other to participate;
- Be responsible for their own learning, and help other students to learn;
- Evaluate the worth of their contribution in comparison to the rest of the group; and
- Evaluate how effectively the group is working together.

Learning activities likely to result in the development of these competencies were integrated in the syllabus of this unit and are discussed in the next section.

Course Design Features

Activities in the learning environment were heavily focused on collaborative tasks with seventy five percent of the unit's assessment based on collaborative activities. Students were required to work together in teams to develop a web site for a client that was based on an agreed contract and design specifications negotiated at the beginning of the semester. Collaborating effectively in this setting was essential, as a combined team effort was needed to develop the final product. To help students engage with tasks that would potentially enhance the development of their collaboration skills, the learning environment encouraged students to:

- Take responsibility for their own team role;
- Develop necessary skills needed to complete their team role to a satisfactory level;
- Perform self and peer evaluations each week through the online journals;
- Support others in their team when necessary;
- Communicate effectively through the use of quality assurance procedures; and
- Continually evaluate the team's progress.

The learning environment was designed to help promote the development of these skills. The next section discusses the extent to which students implemented these within the learning environment.

Activities that Promoted the Development of Collaboration Skills

Data was gathered in a number of forms that provided evidence of student activities within the learning environment that may have improved student collaboration skills. The following list describes a number of activities used by students, which may have assisted in the development of this skill:

- Contributing ideas and helping others
- Respecting others needs

- Self evaluation

Each of these is discussed below highlighting how they were used as well as indicators that suggested they helped develop students' collaboration skills.

Contributing Ideas and Helping Others

Students were given information about how to structure effective teams through lectures, online notes, and videos. Students were required to consider how each team member would contribute to developing the project. For example, Jeff found it important to actively contribute ideas at team meetings in support of developing the teams' product. He recognised that by not listening carefully at team meetings he would miss opportunities to contribute ideas that could help the whole team perform better:

> *At the beginning of the semester I was happy to sit back and listen to others say all sort of things. I would only really push a point or say something if nobody else had anything to say. After a few weeks I realised that things I didn't say could have really helped the team. If you have ideas, you've got to get in there and let everybody know.* (Interview with Jeff)

Many other students made comments about helping others whenever possible with a view of improving the quality of the final product. For example, Chris helped one of his team members when they were having trouble using animation software, in which he was proficient. By helping his peer learn to use this software Chris felt that the whole team benefited as the required animation was completed on time and the team didn't have to waste time rescheduling and discussing alternative action:

> *I noticed Pat was having problems using Flash to produce the opening sequence. He kept asking dumb questions that showed a basic lack of understanding. So, I took some time to help him get going with it. It was better to help him do it, rather than have team problems that would cause everything to slow down and cause arguments. Another team had major problems with one team member not doing his jobs because he didn't know how to do it. Nobody helped him out, and in the end the whole team suffered for it.* (Interview with Chris)

As the semester progressed most students gained a greater appreciation for the value of helping others in their team. They saw or experienced the effects of teams in conflict as well as the negative effects of team members not completing their tasks on time and wanted to avoid this whenever possible. For example, Pat explains how one of his friends in another team experienced conflict and stress as a result of not completing his tasks to the teams' expectations. However, Pat maintains that his friend tried hard to complete the required tasks but needed help which wasn't given by the rest of the team:

One of my mates in another team got into all sorts of problems with his team. He was supposed to set up the database, but didn't do it on time. The rest of the team got really shirty with him, and everybody got stressed to the max. The problem was that he didn't really know how to use FileMaker. If someone had helped him out, they could have saved lots of trouble (Interview with Pat)

There were however some exemptions to the rule. In one team, Giff the graphic designer was having trouble reading and synthesising information needed for the team's weekly tasks. Giff maintains that his learning style wasn't conducive to reading on his own and then making summaries. He wanted the team to discuss the articles as a group and then individually be assigned summaries to write. He felt that this would have greatly helped his learning style. However, nobody in the team supported his approach and he became resentful to the team for deducting marks from him when he hadn't completed the required summaries:

I found it really hard to sit by myself, read articles and then make summaries. I wanted to discuss the articles together. But the rest of the team didn't really care about what I wanted. They kept on telling me that I wasn't doing my job, and then moved to have marks subtracted from my score. I wasn't very happy at all about this, and I think this was the start of the rot. (Interview with Giff)

These examples provide evidence that students recognised the value of actively contributing ideas at team meetings, and helping others whenever possible. This was promoted through the design of the learning environment, which allowed students to experience and reflect on the negative consequences of not contributing ideas or helping others. This is an important attribute needed to promote effective collaboration in teamwork.

Respecting Others' Needs

Student teams remained together for the whole semester and relied on each other to develop a web site and solve weekly problems. Within this setting students recognised the value of respecting the needs of peers in order to help sustain a friendly and productive working environment. For example, Rose one of the younger students describes how she had to consider the needs of other team members when they were organising times for team meetings. Rose's strong preference was to have two team meetings during the week after lectures. However, another team member had a full time job and two children. The only time she could meet was on weekends, which didn't suit Rose. However, she realised she had to consider others needs within the team and had to make compromises:

It seemed really easy to have all the team meetings during the week, or after the lecture. But some of the team members didn't want to do that. They wanted to meet on the weekend, which was a pain because I had other things to do on the weekend. But, when we discussed it, Sue had good reasons. After the lecture, she had to go and pick up her

> *son, and most other times during the week she was working. So, we decided to have one meeting on weekends, and another just after the tutorials to try and fit in with everybody's commitments.* (Interview with Rose)

In another team, students had to consider the accessibility and availability of computers and email for their team members. For example, Don didn't have a computer or Internet connection in his apartment so wasn't able to receive emails from the rest of the team in a regular and timely manner. This caused a few problems at first, until the project manager Liz decided that whenever an important email was sent out she would ring Don to make sure he was informed about the issues. This helped avoid potential conflict caused through miscommunication:

> *I was really surprised to find out that Don wasn't connected at home. It caused problems at first, because he would turn up at meetings unprepared and say 'Well nobody told me!' He couldn't afford an Internet connection, so I decided that I would ring him and let him know what was going on every time an important message went. This really helped the situation and stopped the team from arguing.* (Interview with Liz)

The design of the learning environment encouraged students to consider others needs and problems. Students made compromises when they recognised that others in their team had more important requirements and commitments than their own. Making allowances for others needs and then reflecting on the positive effects this had on their teams' progress helped students recognise the value of respecting others needs to enhance team collaboration.

Self Evaluation

The design of the learning environment enabled students to get regular and on-going feedback from peers and tutors. Through online journals and weekly team meetings students obtained regular feedback about their progress that helped them judge how well they were progressing. For example, Pat tried to judge the value of his contributions in relation to the teams' effort. He was concerned that the rest of the team considered he wasn't performing satisfactorily, so he strived to determine his performance by asking others at team meetings:

> *I kept trying to judge if others were working harder than me. There's nothing worse than having others in your team tell you that you're not pulling your weight. After a few misunderstandings, I would sometimes ask for feedback at meetings on what I had done, and if it needed improvement.* (Interview with Pat)

Almost all students were concerned about the nature of the confidential comments made by their peers through the self/peer assessment online journals. This helped them focus on giving accurate self-assessment, as peers would contradict their self-assessment information if it wasn't accurate. For example, Don had some marks subtracted in a tutor-led peer assessment session early in the semester and felt embarrassed by the situation. After this experience he tried to be more analytical about his performance in respect to what the rest of group expected and proactively tried to improve his performance:

> *I was really embarrassed by the first tutor led peer assessment session. The tutor asked me to explain why I hadn't delivered things on time, and I didn't really have a good answer. The others sat quietly while I got drilled. After this session, I made sure I kept track of what I was supposed to be doing, and looked at how it affected the project.* (Interview with Don)

The learning environment encouraged students to continually evaluate their contributions to the team's effort. This was promoted by students receiving regular feedback from peers at team meetings and also from tutors, who would give summarised feedback from online confidential journals. This helped students reflect on the value of their contributions and also identify features that would help them collaborate in a more effective manner.

This section has considered ways students practised using collaboration skills. The following section considers the factors encouraged and motivated students to practise using collaboration skills.

Student Motivation to Practice

Students were told from the outset that it was their responsibility to choose their own team with which they would work collaboratively on a variety of assessment tasks. The dynamics of team formation and composition were wide and varied. In some cases students selected friends or students they believed had complementary skills or similar worth ethics. Others were formed by default, as they were the remaining students and had complementary skills. Some came late in the semester and were placed in teams that needed extra team members or skills.

Student teams were required to complete teamwork activities that represented 75% of their total assessment. These assessment items required students to meet on a regular basis and discuss strategies on a variety of different issues. Within this setting many students recognised the value of developing a positive rapport with their team. For example, Pat expressed a strong desire to effectively collaborate with his team, as he recognised he would be spending many hours together with his team members discussing a variety of issues that would have a direct affect on his working environment and marks:

> *A huge number of hours had to be spent working on group things, which meant it was really important to get on with the rest of the team. We had at least four hours of meetings each week, and then phone, e-mail and chats on top of that. If you didn't get*

> *on with the team it would be really miserable and definitely affect the quality of the project.* (Interview with Pat)

A number of industry guest speakers were invited to lectures and discussed the value of promoting a friendly team environment and the rewards this would generate for the team. These speakers and other case studies discussed at lectures illustrating the benefits of effective collaboration helped encourage students to promote a friendly team culture. Most students were keen to prevent having dysfunctional teams caused by conflict, and strived at achieving team harmony. For example, Sue the project manager of her team strongly supported the comments made by guest speakers about teamwork. She had experienced teamwork in industry and was keen to develop a positive and friendly working team culture. She made a point of having social gatherings and being as friendly as possible to all the team members in order to promote a strong team spirit:

> *The guest speakers and video we saw really made good points about working together as a team. As the project manager I was keen to have a friendly team atmosphere. I've experienced teams that weren't friendly and it's a real pain, just like the speakers said. Problems happen a lot quicker when team members aren't friendly, and it affects the whole project. To help create a friendly team culture I tried to have at least one social meeting a month where we had a few drinks, either at my house or at the tavern. Also, if any other social things we had going, I would try to involve the team.* (Interview with Sue)

Another motivating factor for some students was the desire to develop high quality web sites to help enhance their CV and promote their skills to industry. Students recognised that by successfully collaborating with their teams they would have a greater chance of achieving this objective. For example, Rose strove to collaborate effectively with her team in order to produce a high quality web site from which the whole team would benefit when they finished the course. She recognised that if her team didn't collaborate effectively then the chances of producing a high quality site would diminish. Her perspective was influenced by comments made from guest speakers and also seeing another team stop production and split because of team conflict:

> *One of the most important things in this unit was to have the team working together to produce a great site. There was too much at stake to have arguments. I saw one team having lots of problems, and then it broke up. Of course they ended up with a crappy web site. To get good product you really have to work together and support each other, otherwise it will never happen. The guest speaker we had at the beginning of the semester really pushed that point.* (Interview with Rose)

The above examples provide evidence that students were keen to promote a friendly and harmonious working environment within their team. As well as affecting a direct affect on their overall grade, students also recognised that teamwork activities would affect the quality of the final product, which they considered a valuable CV item to promote their skills in the industry for employment opportunities. This was supported with guest speakers as well as case studies that discussed and highlighted the positive effects of promoting a harmonious team environment.

Summary

The findings from this exploration of student activity in areas likely to develop collaboration skills suggest that the implemented design of the learning environment was successful. The evidence suggests that the pedagogical elements incorporated in the setting contributed to the development of these skills in the following ways:

- Authentic activities – the design of the learning environment required students to work in teams, performing tasks team roles that reflected the complexities of an industry setting. Students were required to develop a product for real clients with real needs and could also be used by the students in their CV to promote themselves in the industry after graduation. Within this setting most students recognised they had to rely on their peers to successfully complete these tasks, and by effectively collaborating with their team they would potentially enhance the chances of developing a high quality product;
- Self-regulation – students were required to manage the development of their own tasks and also liase with peers to develop a team product. Within this setting, students made their own decisions about how they would collaborate with peers. This included contributing ideas at team meetings, helping others in need and communicating efficiently at team meetings; and
- Reflection – students were encouraged to continually reflect on their experiences. Students regularly completed online self and peer assessment journals that were used by tutors to consolidate opinions and lead discussions at tutor led peer assessment sessions. These sessions encouraged students to reflect on their own and others performances as well as helping them consider alternative strategies for effective collaboration.

The evidence suggests that the authentic context appeared to be a strong motivator for students to collaborate in an effective manner. Students recognised that by promoting a friendly and supportive team environment they were less likely to experience confrontations and conflict that could have a detrimental effect on the project. The fact that these students tried to collaborate effectively, and then received feedback from both peers and tutors on their success was likely to have promoted the development of this skill.

6. Communication

There are wide and varied definitions of what communication skills embrace in different environments. The Merriam-Webster dictionary (2001) simply defines communication as "a process by which information is exchanged between individuals through a common system of symbols, signs, or behaviour". This simple definition encapsulates the essence of communication, though much theory and many different models have been developed to elaborate on how communication works. Elder (1995), suggests that communication is any verbal or non-verbal symbol that one person (the sender) transmits to the other (the receiver). Communication problems occur when the message that the sender gives becomes distorted through *noise,* which can be poor language, bad assumptions, prejudices, different frames of reference, distracting mannerisms, inappropriate body language or incorrect interpretations. Any of these aspects can cause individuals to misunderstand each other that can lead to difficulties and conflict in collaborative group environments.

Johnson (2000, p.112) provides a summary of the research on how messages should be sent in order to enhance the quality of communication. Participants should:

- Clearly own messages by using first person singular pronouns such as *I* and *my;*
- Make messages complete and specific;
- Make verbal and nonverbal messages congruent;
- Be redundant;
- Ask for feedback concerning the way messages are being received;
- Make the message appropriate to the receiver's frame of reference;
- Describe feelings by name, action or figure of speech; and
- Describe other people's behaviour without evaluating or interpreting.

The communication cycle is completed when the receiver shows understanding to the sender by paraphrasing the message. This involves thoughtfully considering the sender's frame of reference in regard to the message and communicating a desire to understand the sender's message without evaluating the statements and passing any judgements. This strategy of paraphrasing can have powerful effects and is used by many counsellors and psychotherapists to help their clients by listening to what they have to say, understanding their perspective and rephrasing it (Johnson, 2000).

A number of learning activities likely to result in the development of these competencies were integrated in the syllabus of this unit and are discussed below.

Course Design Features

The learning environment was designed with a view that students would develop communication skills that were relevant in the multimedia industry. Students were required to communicate with their peers and clients through face-to-face meetings, email, written reports and with large group presentations. All teams were required to:

- Develop and implement formal QA communication strategies to be used at team meetings, for email and telephone conversations;
- Interpret client requirements into design specifications needed for the development of the project;
- Create written solutions of no more than four hundred words to a series of weekly problems, and post them to an online forum for marking by peers and tutors;
- Create professional reports for clients, including project proposals, design specifications and final reports; and
- Present the final product to a large audience.

The design of the learning environment gave all students the opportunity to practise these skills within their team roles. The next section analyses the extent to which students used communication skills within the learning environment.

Activities that Promoted the Development of Communication Skills

Data was gathered in a number of forms that provided evidence of learning activities that may have improved the students' communication skills. The following list represents the main form of activities used by students that may have assisted in the development of this skill:

- Communicating effectively at team meetings;
- Creating a variety of reports; and
- Presenting information to large audiences.

Through practise, these forms of activity can help students enhance competencies needed to develop their communication skills. Each of these is discussed below highlighting how they were practised as well as discussing examples of student feedback that showed potential for skill development.

Communicating effectively at team meetings

Most students attended at least four hours of team meetings each week in which they made decisions about schedules, tasks, contracts and many other issues that would affected their project. Students were required to listen carefully in these meetings and clearly understand issues being discussed as it affected not only their tasks, but also the direction of the overall project. For example, Pat quickly came to recognise that by not listening carefully at team meetings it was easy to miss key issues that could influence his work. At one meeting, someone subtly suggested that an alternative design should be presented to the client. Pat did not interpret the comment in this fashion and in the following week was surprised to find that the some of the team members expected him to have created an alternative design:

> *At one meeting I sort of heard someone mention that another design would be useful to have to show the client. I thought it was just a comment, like an idea. But in the following week, everybody wanted to see a new interface. It wasn't a big problem, but it made me realise how important it is to listen carefully to what's going, and make sure everybody agrees.* (Interview with Pat)

In another team, Don always tried to listen carefully at team meetings in order to monitor decisions being made about the project. He concluded that it was easy to miss the opportunity to contribute effectively to decisions being made at meetings, as often they were rushed and these could have far reaching consequences on the development of the project:

> *Usually the meetings were fast and furious. We tried to make them short and efficient, but sometimes this resulted in bad decisions being made. I had to really focus on what was going on and listen carefully, otherwise it was easy to miss important decisions.* (Interview with Don)

Being alert at team meetings and showing interest and understanding of others comments was also mentioned by many students as an important communication skill. For example, Natas quickly became agitated a few times when other team members didn't seem to be listening or spoke between themselves when he was making a point during team meetings. He felt it was important that others should show interest and try to understand everybody's comments:

> *I felt a bit annoyed a few times when I could see others weren't really listening to what I was saying, and sometimes even talking to each other while I was talking. When others spoke, I listened carefully. If you don't, I think it's just rude, and the message obviously doesn't get across.* (Interview with Natas)

All students were required to contribute ideas and discuss their progress at team meetings. This made up a large portion of the team's activity as most teams met for over four hours per week discussing their progress and future directions. A common complaint made by most students was that the team spent too much time on meetings. One method of saving time at meetings that was suggested by many students was to have each team member talk specifically about the issues on the agenda, and not about other peripheral issues that could easy distract the team. This was reflected by Lex, who made a point of trying to keep focused on what needed to be stated, and not get distracted with other issues that weren't important:

> *After the first few weeks it was obvious that we were spending too much time on meetings, and they didn't seem very productive. It was easy to ramble on about things that had nothing, or little to do with the project. Then someone else would say*

something, and before you know it, you've wasted time with nothing to show for it. I tried to keep to the points that needed discussing. (Interview with Lex)

Other students acknowledged the value of speaking clearly at team meetings so as not to be misunderstood or to convey mixed messages. Students recognised that by speaking clearly there was less chance of confusion and conflict arising in subsequent meetings. For example, when Suzie presented her progress or ideas, she often repeated or summarised her comments to make sure everybody had understood. This was because early in the semester one of her comments was misunderstood by peers and ended up causing her extra work:

I've become pretty careful about how I talk at meetings. In the first or second week of semester I made a suggestion that the team should ask some companies in industry how they develop their metrics. It may have been the way I said it, but the following week everybody was asking me what information I got. I didn't mean it that way, but that's the way they heard it. When I make suggestions now, I'm careful to repeat it carefully so there isn't any misunderstanding. (Interview with Suzie)

Students were required to attend regular team meetings and actively participate in negotiating tasks and the direction of the project. At these meetings students recognised the need to listen carefully and speak clearly to ensure they didn't miss vital information and others didn't misunderstand their messages. These meetings were held regularly, so students were able to evaluate how effectively they had communicated in previous meetings as perceived by others. This enabled students to reflect on use of effective communication strategies such as speaking confidently, expressing points clearly, keeping to the topic and avoiding discussions that would waste valuable team time.

Creating a variety of reports

Students were required to prepare three project reports that were representative of industry standard. These included a project proposal, design specification and final summary report showing derived metrics and a formative evaluation. Students were told from the outset that the reports were, "To be written in a professional manner, worthy of industry standard as for a "real" client in a paid job!" (Extract from syllabus), and given samples of the expected quality.

Once completed these reports were presented to real clients and had to convey project objectives, legal issues, cost, deadlines and design specifications that reflected the clients' needs. Within this setting students needed to clearly communicate ideas and specifications as would be required in industry, otherwise complications and inefficiencies would quickly arise. For example, Jeff found that not writing up a clear project proposal caused problems with the client, who had problems in understanding what he was getting, as well as not agreeing with the conditions outlined in the legal contract. After this experience his team planned the next report using a standard template provided by the tutor and discussed and checked it more carefully with the team before presenting it the client:

> *It's important to write reports clearly so that everybody knows what's going on. We didn't do well with the project proposal. Our executive summary wasn't clear and there were typos in it. It was a bit hard to follow. Then the client kept asking questions about different parts, especially the contract. It was a real pain. We were a lot more careful with the design spec. We considered all of the headings first based on a template we got from the tutor, and then discussed what each section should say so that it made sense as a team. We then gave ourselves some time to review and check it before handing it in. Discussing it as a team, and then checking it over made a big difference to the quality of the report.* (Interview with Jeff)

Students were also required to write agendas, notes from meetings, and solutions to weekly problems. This required students to write in an effective manner to communicate with their peers, clients and tutors. If not done properly, students found they quickly experienced problems For example, at the beginning of the semester Don's team wasn't careful in taking notes at meetings and preparing "To Do" lists. This caused their team meetings to become ineffectual and often team members denied being allocated tasks. This experience led them to implement formal agenda's, minute taking, and "To Do" lists at each meeting to clarify decisions as well reducing the time taken to have the meeting:

> *In the first few weeks we got in a bit of a muddle. We would waste time at meetings discussing who was supposed to be doing different things. Somebody would say it wasn't their job, or didn't agree to it, and it would go on from there. You have to really have good protocols at the meetings. Agenda's, chairman, someone takes notes of decisions and To Do lists. We got into it in about week 4, but had wasted a fair bit of time by then.* (Interview with Don)

The above examples show that students were required to use clear and effective writing skills with a range of self-directed activities, which included creating project documentation for clients and tutors, and also providing accurate minutes at team meetings. If not performed satisfactorily students became aware of their shortcomings through negative client/tutor feedback, as well as wasting time at team meetings discussing "who said what", as well as confused team decisions. The fact that students recognised these as being important attributes for effective communication is likely to encourage the use of these again in the future.

Presenting information to large audiences

At the end of semester students were required to present their products to an audience of over one hundred people comprising of peers, tutors and industry representatives, which caused students much consternation! The design of the learning environment helped students recognise the value of presenting to the audience in a clear and professional manner, which encouraged them to carefully plan and rehearse for the occasion. For example, Sue used presentation strategies given at lectures and practised in front of her children with a timer to rehearse her presentation. On the night she tried hard to talk to the audience clearly and with confidence, while maintaining a friendly and interesting atmosphere. She found the presentations performed during the semester for the other assignments was useful practice:

> *As the project manager of the team it ended up being my responsibility to do the presentation. I used the tips we got from the lecture notes and practised in front of kids with a clock to get the timing right. On the night, I was still nervous. I tried to speak clearly and addressed the whole audience. Also, I put some fun graphics on the slides to make it a more interesting. It was handy doing presentations during the semester with the other assignments to get some feedback and practice.* (Interview with Sue)

Many other students made comments about the importance of the presentation night and the extensive preparation they went through. For example, Pat used feedback received from practice sessions performed during the semester as a basis for improvement. He also discusses impressions gained from seeing presentations made from the previous year:

> *Some of the presentations I saw from the previous year weren't very professional. They didn't speak clearly, and didn't sound interesting. Some really boring. In the practice sessions during the semester, I tried to work on these things so I wouldn't make the same mistakes. It was useful getting comments from others and the tutor about how well I did it.* (Interview with Pat)

The design of the learning environment encouraged students to prepare professional presentations for the presentation night. Students used information and perceptions gained from seeing previous student presentations as well as using constructive feedback gained from peers and tutors about their own presentation skills.

This section considered the ways students practised using communication skills. The following section considers what factors helped to motivate and encourage them to practise using these skills.

Motivations to Practice

The learning environment promoted activities that were highly representative of industry practice. Project proposals, design specifications, budgets, progress reports and legal contracts are all needed in commercial jobs. Students were engaged in developing these reports for clients who had real needs within the industry. Within this context students recognised that clear and effective communication protocols were needed to convey messages between the team and the client as well as within the team. This included written documentation, speaking skills, listening skills and presentation skills. For example, Rose considered these reports to be important and was focused on developing a range of quality assurance templates to help promote effective communication in her team. Also, she felt that these templates would give her an advantage in job interviews when asked about communication skills:

> *The reports we were producing were just like industry ones. We had to scope the project, and then develop a contract the client was happy with, as well as giving him an accurate costing. This had to be presented in a way that was professional and easy to read. In industry, if this isn't done well, you just don't get the job. I can see why employers would want new employees to have these skills, that's why I developed templates that I can show people as part of my portfolio.* (Interview with Sue)

Other students discussed the importance of being able to present information in a confident manner to potential clients. For example, Don considered it important to present information in an interesting and professional manner to clients, team members and at the presentation night. He considers this an important business skill needed in the industry:

> *Really you always have to present things. Like at team meetings, with the client, at presentation night, and for interviews. If you can't look people in the eye and talk confidently about you're about, without making them bored, then you may as well forget it. Nobody likes a boring person, particularly in this industry.* (Interview with Don)

Almost all the students made comments about the importance of communicating effectively within their teams to save time. For example, Liz considered that communicating effectively with her team was an essential skill needed in the industry:

> *When we get a job, we'll have to communicate sensibly all the time. We'll always be in a team, and we'll always have to talk to people and write reports. You have to do it properly otherwise you get problems and waste lots of time.* (Interview with Liz)

The motivations expressed by students to develop effective communication skills were drawn from real-life activities. Students were required to create reports, make presentations and actively engage in team activities that required a high level of oral and communication skills, all of which reflected the complexities of real situations in industry. The authentic design of the learning environment helped students recognise the value these skills had in developing effective products, as well as enhancing their opportunities for job opportunities.

Summary

The findings from this exploration of student activity in areas likely to develop communication skills suggest that the implemented design of the learning environment was successful. The evidence suggests that the following pedagogical elements incorporated in the design of the learning environment contributed to their development in the following ways:

- Authentic activities – the setting required students to communicate in an effective manner with their team, tutor and client. Within this setting students recognised the value of writing, listening and speaking clearly so as not to be misunderstood, as they recognised this would have a negative impact on the team's progress and quality of their final product;
- Self-regulation – the design of the learning environment allowed students to choose how they communicated within their team and client. Students had the freedom to experiment with different communication strategies, and then consider how successful they were. These included strategies for listening, speaking, writing reports, chairing meetings, and presenting information to large group audiences; and
- Reflection – students would receive regular feedback on how successful their communication strategies had been. Team meetings, client meetings, peer assessment journals, tutor led peer assessment sessions and presentations were all regular events throughout the duration of the course that provided continual feedback. This allowed students to reflect on their experiences and then make make decisions about implementing new strategies for improvement if necessary.

The evidence suggests that the authentic context motivated students to communicate effectively. Students recognised that effective communication would help them develop a high quality product, as well as reducing conflict and confusion within the team. This was supported through an environment that allowed students to try different communication strategies, and then receive feedback from their peers, clients and tutors on their success. It is likely that this cycle of reflective practice would have contributed to the development of these skills.

7. Peer Assessment

Peer assessment is a form of assessment that involves individuals deciding on what value each of their colleagues has contributed to a process or project. Topping (1998) describes peer assessment as: "an arrangement in which individuals consider the amount, level, value, worth, quality, or successfulness of the products or outcomes of learning of others of similar status" (p. 249). This view is also supported by Falchikov (1995) who defines peer assessment as a process were individuals rate their peers by agreeing on appropriate assessment criteria and then accurately applying assessment.

A review of the literature on peer assessment indicates that in order to promote the development of this skill the learning environment should be designed to encourage participants to:

- Have a clear understanding of the objectives (Orsmond et al., 1996; Stefani, 1994);
- Identify valid assessment criteria (Falchikov, 1995; Ford, 1997; Sluijsmans et al., 1999; Topping et al., 2000); and

- Accurately and objectively assess the work of others (Oldfield & MacAlpine, 1995; Woolhouse, 1999).

Learning activities likely to result in the development of these competencies were integrated in the syllabus of this unit and are discussed in the next section.

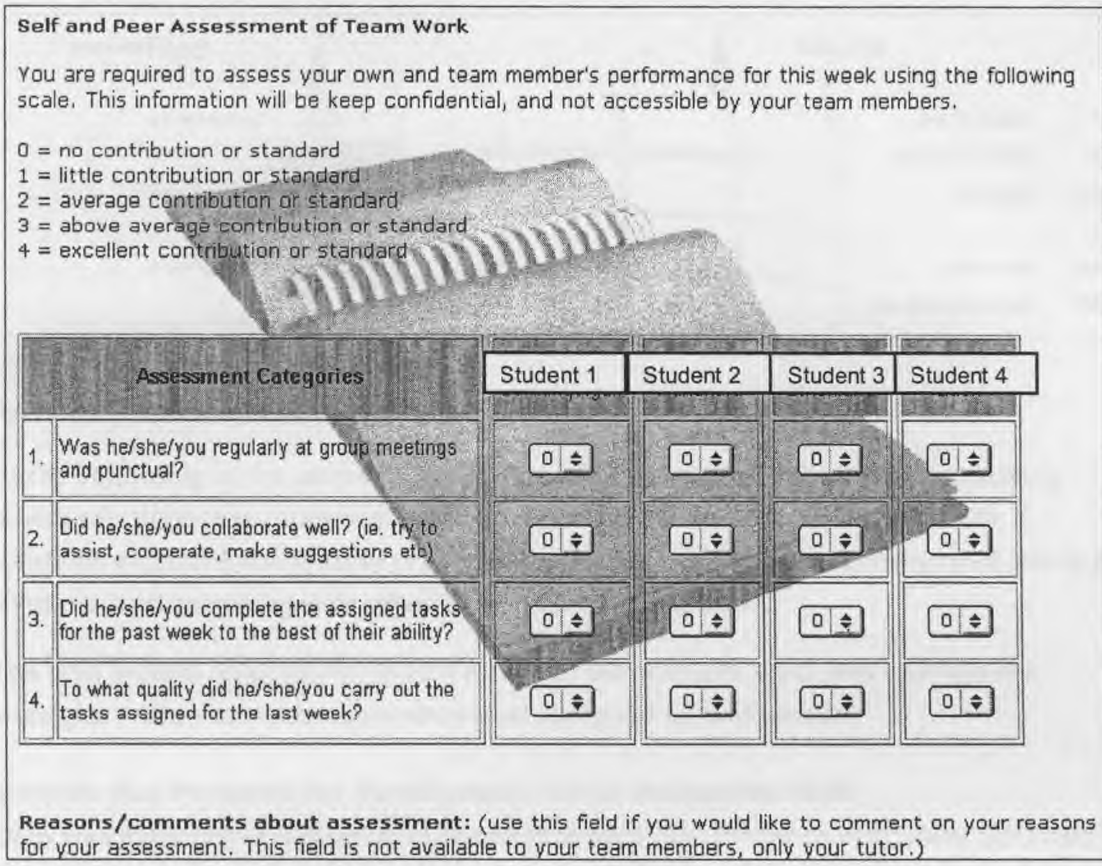
Course Design Features

There were two activities integrated in the design of this unit that provided opportunities for students to develop this skill. Students were required to assess peers within their own team (intra-team assessment), as well as assessing the work of other teams (inter-team assessment). Each of these will be considered below.

Intra-Team Assessment

The learning environment provided opportunities for students to develop their skills in peer assessment by encouraging students to engage in the following activities to help support their learning:

- Student Contracts - at the start of semester all students were required to complete student contracts and commit to performing a range of services for their team. These agreements helped provide a basis from which students could assess the progress of their peers;
- Weekly meetings - each student individually discussed their progress and gave reasons for success or non-success on agreed tasks;
- Online journals - students assessed the work of their peers based on the agreed tasks for that week as outlined in the online journals. As shown in Figure 6.5, students rated their peers on four criteria: team meeting attendance, collaboration, success in completing required tasks and the quality of tasks delivered The allocated scores and comments made by students in the online journals were confidential. Only the tutor would know how students had rated their peers; and
- Tutor led peer assessment sessions - tutors used information collected from students' online journals over a number of weeks to help make decisions about transferring marks between students based on their contributions to the team's project. At these meetings students were not required to openly voice their opinions about their peers, as tutors would already have their opinions and scores in summarised format collected from the online journals and from their own observations.



Self and Peer Assessment of Team Work

You are required to assess your own and team member's performance for this week using the following scale. This information will be keep confidential, and not accessible by your team members.

0 = no contribution or standard
1 = little contribution or standard
2 = average contribution or standard
3 = above average contribution or standard
4 = excellent contribution or standard

	Assessment Categories	Student 1	Student 2	Student 3	Student 4
1.	Was he/she/you regularly at group meetings and punctual?	0	0	0	0
2.	Did he/she/you collaborate well? (ie. try to assist, cooperate, make suggestions etc)	0	0	0	0
3.	Did he/she/you complete the assigned tasks for the past week to the best of their ability?	0	0	0	0
4.	To what quality did he/she/you carry out the tasks assigned for the last week?	0	0	0	0

Reasons/comments about assessment: (use this field if you would like to comment on your reasons for your assessment. This field is not available to your team members, only your tutor.)

Figure 6.5: Online journal for weekly peer assessments

The environment provided many opportunities for students to engage in activities that encouraged them to peer-assess others through the use of online journals, weekly meetings and with tutor led peer assessment sessions.

Inter-Team Peer Assessment

Another learning activity designed to encourage the development of this skill used the *Conference Centre* that required student teams to solve a problem each week that based on key concepts. For example:

> *In order of priority, outline what you consider to be the essential procedures/ needed to effectively track the progress of a project (400 words or less).* (Extract from syllabus)

Solutions for these problems had to be submitted by 4pm each Friday at which time the system was *locked* so no more postings could be made. Student teams were anonymously allocated three other teams to mark by 4pm on the following Monday. Tutors then posted their marks and feedback by 4pm Wednesday, at which time the system showed the overall marks, as well as the best three solutions for that week. As shown in Figure 6.6, participants could then view the solution, self-assessment mark, peer assessment marks and feedback, tutor assessment mark and feedback and overall scaled total mark.

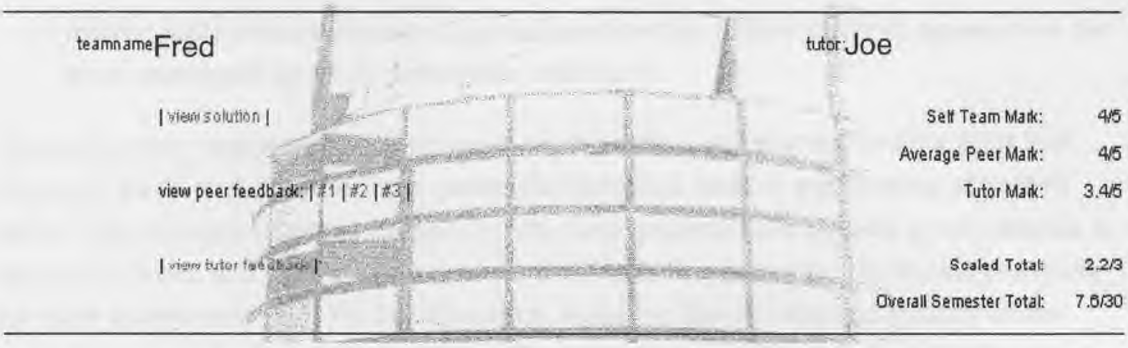


Figure 6.6: Conference Centre results

At the beginning of the semester the system of posting solutions and then assessing others solutions was modelled by the tutors to show students the standard of solutions expected and quality of the feedback required. Students commenced posting solutions and assessing each other in Week 3 of the semester.

The next section analyses the extent to which the students used peer-assessment strategies within the learning environment designed for this course.

Activities that Promoted the Development of Peer Assessment Skills

Data was gathered in a number of forms that provided evidence of student activities that may have improved their peer-assessment skills. The following list emerged from the questionnaire data and describes a number of activities used by students to enhance their peer-assessment skills:

- Reflecting on peer performance;
- Moderating student assessment; and
- Assessing the work of other teams.

Each of these is discussed below highlighting how they were used as well as indicators that showed improvement.

Reflecting on peer performance

Students would regularly reflect on how well their peers were performing through online journals. These were completed on a weekly basis with confidential information sent to the tutor in a consolidated report with all team members' opinions. As reflected by Lex, she quickly realised that by not completing the peer assessments each week she would detract validity from the tutor led peer assessment sessions. Also, as they were confidential she felt relaxed about giving honest feedback about her peers without feeling embarrassed or compromised:

> *You really had to fill out the journals every week. If you didn't, the tutor wouldn't know what was going on, and no peer assessment could happen so slackers could get away with it. And it was easy to do. There was no hassle about saying bad things, or*

feeling guilty about it, because it was all confidential. If other students agreed, then the tutor would pick up on it. (Interview with Lex)

The online peer assessment system gave students the opportunity to view peer task lists each week and consider how successful they had been in performing allocated tasks. This allowed students to quickly rate their performance against given criteria at the end of week and provide anonymous feedback. For example, Liz would complete the peer assessment each Friday afternoon based on the success and quality of the work completed by her team members. She would try and give a balanced viewpoint considering both positive and negative aspects of what they had done against what they had promised to do:

I would fill out the journals on Fridays, so I could consider the whole the week. The online journal would show me what others had promised to do, and then I would consider what they had actually done, and rate them against the scales. It was quick and easy. I would try to be fair about it, and give praise or criticisms when it was deserved. (Interview with Liz)

After the first tutor led peer assessment session students became more particular about how they filled out the assessments. They realised that comments made through the online journals had a powerful impact on peer assessment and by not completing them, or not being carefully about how they completed them, could result in an unbalanced perspective being developed by the tutor, consequently having marks being distributed unfairly. In this example, Giff regrets not completing early peer assessments as he believes the tutor's perspective was prejudiced by others comments that led to an unbalanced viewpoint of the situation:

At one tutor led peer assessment session I was surprised to see the tutor picking on Jeff. I don't think it was right, because he and Alice were having problems and she was filling out the journals and going for it. I should have filled out the journals and given my opinion to balance it all up a bit. (Interview with Giff)

It is evident from the above examples that students actively used the online peer assessment system as they recognised the value of accurately assessing contributions made by peers. The online peer assessment system allowed students to confidentially rate team member performances and form a consensus of opinion, which then allowed the tutor negotiate a transfer of marks.

The design of the learning environment actively encouraged students to consider the objectives stated by peers, compare them to actual results and then rate them against identified criteria justified with appropriate feedback. By repeating this process on a regular basis and observing the effects it had on balancing rewards and penalties against individual effort was likely to help promote the development of their peer assessment skills. This reflective process encouraged students to develop confidence in using peer assessment skills as they recognised the benefits this would bring to team synergy in collaborative teamwork, and then be encouraged to use these strategies again in similar settings.

Moderating student assessment

The design of the learning environment encouraged student assessments to be modified if the tutor and peers perceived students were not contributing at the required standard. This was performed through tutor-led peer assessment sessions that allowed marks to be transferred between students when negotiated with the tutor. This is described in the syllabus as follows:

> *In tutor led peer assessment meetings, tutors use summarised information gained from the online journals to negotiate marks with students. The tutor verbally summarises the feelings of the team, without stating who allocated specific marks or comments. For example, if the team consensus formed from the online journals is that Carol has been working harder than Bill, then the tutor targets Bill in the meeting, and asks for a defence to the allegations. If Bill cannot support his defence, the amount of marks are negotiated and transferred. For example, Carol may be given 5 extra marks and 5 marks are taken from Bill for her extra work (and his lack of work) over the past 3-4 weeks.* (Excerpt from unit syllabus – Appendix 2)

These sessions had a powerful effect on students and often caused much stress and anxiety in situations where team members were not performing at a satisfactory level. For example, Suzie observed Don being interrogated by the tutor at the first tutor led peer assessment session and noted the powerful effect the allegations had on Don as he was greatly embarrassed with the whole situation. However, she was surprised that he had no idea about his deficiencies and felt that the team should have been more explicit earlier in giving him feedback on what was required:

> *It was really high tension when the tutor asked Don why he wasn't doing his jobs properly. Don went all red and kept moving around his chair. He was really uncomfortable. I actually felt sorry for him, even though he deserved it. What amazed me was that he seemed to no idea that he had let the team down. Being late for meetings, not doing the summaries, not handing his work in on time. And still he was surprised. I think that we should have been more honest and direct about things earlier.* (Interview with Suzie)

Other students also recognised the value of including honest and direct comments in the online journals, as these affected the consensus of opinion formed by the team. For example, Lex reflected at length about giving Giff low marks and writing negative comments about his performance in the first few weeks. However, at the tutor-led peer assessment session she was relieved to find that when the tutor summarised the teams' feelings, others had also concluded that Giff wasn't contributing to a satisfactory level and also had requested that his marks be moderated:

> *At first I was really worried about being negative in the journals. I thought it might be just me expecting too much, or being picky. So, when we had the peer assessment meeting, it was fantastic to see the tutor had a team opinion that was the same as mine. It's was worth putting down what you think because it's probably true, and if it isn't true, they should be able to say why it isn't without a lot of fuss.* (Interview with Lex)

The tutor led peer assessment sessions provided a forum in which students could see the results of their peer assessments and how accurate they had been in relation to the team's consensus and the tutor's interpretation.

The design of the learning environment encouraged students to reflect on peer tasks and objectives, carefully considering assessment criteria and then using their judgement to assign appropriate marks and feedback. By continually considering how to assess their peers' strengths and weaknesses and then receiving consolidated feedback through other team members and the tutor would have encouraged students to develop their peer assessment skills.

Assessing the work of other teams

Students were required to develop and submit solutions to weekly problems based on their own research and interpretation. After submitting their solutions, students then marked the work of three other teams, giving comments and feedback to justify allocated marks. These were based specific assessment criteria as shown in Figure 6.7:

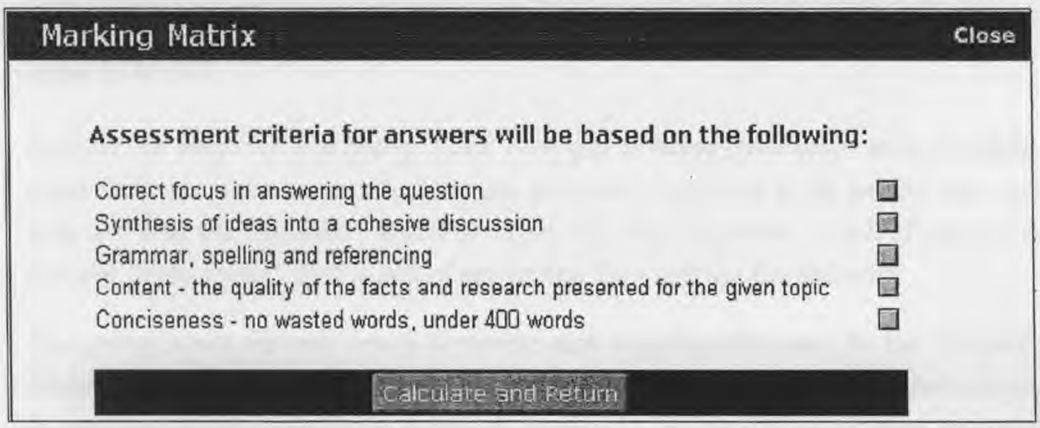


Figure 6.7: Online assessment criteria form for peer assessment

Within this setting some students formed strong opinions about how solutions should be presented and the content they should contain, and often upset other teams with their dogmatic viewpoints. For example, Pat's team came to recognise that their perspective to creating solutions was not always the most correct when creating and marking other solutions. After a few weeks they tried to consider different perspectives as they received some negative comments through the Bulletin Boards about their comments, which helped them moderate the approach they had been using:

You had to be careful marking other teams' solutions. When you give negative feedback, you have to be sure about your facts, and how you say things, even if it is a pile of crap. Some teams used different ways of solving problems, and sometimes thought about different things. One week we got some really negative comments about our marks and feedback. Lucky, they didn't know who made the comments. But the comments were fair enough. When marking their work, you have to keep thinking about the assessment criteria, and how well they had covered the points, and not be too cutting when giving criticisms. (Interview with Pat)

When the final peer and tutor assessments were made available for viewing through the online application, students were then able to comment on these through online bulletin boards. This provided students the opportunity to openly criticise or support others' assessments and ask for clarification or justification for marks and comments made. For example, the following comment taken from the bulletin boards represents the views of a team who were unhappy with the quality of the feedback being received from another team, and used the bulletin board to clearly express their views:

I would like to voice my opinion to use of criticism used in the solutions of the weekly tasks. I am not against it as long as it's constructive and not totally destructive as one group is persistently doing. Actually, its damn right HARSH! The group will know who you are, for those who don't, it's the one who answers the solution with the headings:

POSITIVE:
NEGATIVE:
ASSESSMENT:

Now for the people in this group. I don't see you as being positive, or even remotely constructive in your comments. Sure you provided a solution to the weekly task, but why is it that the "positive" is full of negativity, the "negative" is full of negativity and the "assessment" well is full of negativity. Can you see the pattern!!

Our group is not the only group to receive such negative solutions. To the "Project Manager", use the skills you should be using, praise on a good point but then reference it with the bad and tone down the harsh comments. We're all here to learn, who made your group god.

That's all I have to say, please bare in mind to this group, comments are good as long as they are constructive.... (Comment taken from Bulletin Board – Week 3)

Many other students found the process of comparing their assessments to the tutors' assessment a valuable process in helping to develop this skill. For example, Sue discusses how each week she would check the solutions and compare her marks and comments with tutor comments and other teams. This enabled her to quickly see what issues she had missed and how close her marks were to the tutors:

> *I liked checking the marks and comments when they were posted. It was interesting to look at the tutors' solutions to see how close they were to ours. Also, seeing the best three solutions was good. You could see the angle they had taken and things we'd forgotten in ours.* (Interview with Sue)

The examples above provide evidence that the learning environment encouraged students to evaluate the performance of other students' work on a regular basis. The online system then allowed them to compare how their assessment compared with the assessment given by three other teams as well as the tutor. This allowed students to compare their judgements against others, and reflect on how accurate their judgement had been. This cycle of peer assessment was performed on a regular basis during the semester, which would have helped students refine and adjust their peer assessment skills through this process of reflective practise.

This section has considered ways students practised using their peer-assessment skills. The following section considers factors that encouraged and motivated students to practise these skills.

Motivating Factors

Most students recognised that balancing contributions against rewards or penalties would help promote team effectiveness and harmony. This included the amount of time spent, the quality of the tasks produced, the timing of completion as well as contributions made at team meetings and how they helped others. Students who weren't contributing satisfactorily were likely to have a negative influence on other team members, and cause inefficiencies within the team. For example, Liz was feeling resentful toward another team member early in the semester, when she noticed that he wasn't contributing to overall team effort as much as she was. She felt irritated by the situation as not only was she working harder than him but he was also affecting the progress of her tasks. She was keen to reflect these feelings through the confidential weekly journals in order to help balance the situation:

> *Don wasn't doing his jobs. When he said he had done them it was always a weak effort. I found this really frustrating, as it was wasting everybody's time, especially when I had been putting in lots of hours and then had to wait for him to get around to doing his things. So it was good to mark him each week, and tell the tutor what was going on.* (Interview with Liz)

Many other students made similar comments about feeling angry and frustrated about team members who weren't contributing satisfactorily and resented the fact that they also slowed the team down, with the prospect of being awarded the same marks. For example, Alice felt quite annoyed with Giff when she realised that she was putting in many more hours of effort than he was. At the end of the semester he would end up with the same marks as her if peer assessment wasn't applied. Also, his lack of contribution was actually slowing down the whole team's effort:

> *I was putting in a huge amount of hours to get an excellent product made, which had an influence on some of my other subjects. Yet Giff kept coming to meetings unprepared and many times hadn't done his work. I found this really annoying and could feel the anger in me rising as the weeks rolled on. He was actually making the team less effective by being there, because we were all waiting for his work, and when it came it wasn't any good. The peer assessment system let me explain what was going, and helped get marks transferred which made me feel a bit better.* (Interview with Alice)

A similar situation is described by Bob who felt annoyed that Don was becoming an unreliable team member and not contributing to the team's effort as much as the others. This encouraged him to complete the peer assessment journals in order to try and balance effort against rewards/penalties without having direct conflict:

> *It was really annoying to see Don come in week after week and not have his work done, and miss meetings. It was difficult to be blunt and honest, as we were all working as friends. So the peer assessment journals were really good in helping to get the truth out, and letting the tutor say it at the tutor led peer assessment meetings.* (Interview with Bob)

The examples above show that the design of the learning environment encouraged students to assess the progress of their peers in an honest and considered fashion. Students wanted a fair and equitable distribution of marks that reflected each team members' contributions to the overall product in order to maintain a harmonious and effective team environment.

Summary

The findings from this exploration of student activity in areas likely to develop peer-assessment skills suggest that the implemented design of the learning environment was quite successful. The evidence suggests that the following pedagogical elements incorporated in the design of the learning environment contributed to the development of peer assessment skills:

- Authentic activities – students were involved in activities that reflected the complexities of an industry-based project. Team members had clear responsibilities as outlined in their contracts that needed to be completed on quality and time for the benefit of the whole team. Within this setting most students recognised the value of balancing contributions against rewards to help promote a harmoniou, and effective team environment through peer assessment;
- Self-regulation – the design of the learning environment allowed students to choose their own team roles and responsibilities. Peers would then expect these tasks to be completed at the specified times at the correct quality, which required students to make many decisions in order to meet these requirements; and

- Reflection – students would receive weekly reports on how their peers perceived the quality and timeliness of their own work. This provided students with a range of perspectives on how successful they had been in completing prescribed activities to their peers' satisfaction, and allowed students to reflect on how successful they had been in assessing their own and others performance.

The evidence suggests that the authentic context and commitment to student-centred activities appeared to be strong motivators for students to practise using peer-assessment strategies. Most students recognised the value of implementing these strategies with a view of promoting team harmony and an effective team environment.

8. Research Skills

Research skills represent an individual's capacity to know when information is needed, what sort is needed, where to find it, how to evaluate its' appropriateness and how to organise it (Lane, 1996). These basic skills are essential in the research lifecycle, as "no matter how well people analyse or synthesise information, if they do not start with an adequate, accurate, and up-to-date body of information, they will not come up with an good answer" (p. 226).

Varying definitions have been adopted as to what constitutes research skills. Some interpret these as skills that enable *access to information*, whereas others interpret it as *ways of working with information* (Bruce & Candy, 2000). In this study research skills are considered as the ability to access, retrieve and evaluate information. Analysing and synthesising information are considered as a different generic skill and considered in the next section (Analysing and Synthesising Information).

An environment designed to support the development of research skills needs to provide activities that encourage participants to:

- Clearly understand the purpose of the required information and the nature of the intended audience (Hepworth, 2000; Limberg, 2000; Mayer, 1992);
- Identify potentially relevant sources of information from a range of media sources including journals, books, people, organisations, libraries, statistics, online sources, and electronic newsgroups [Candy, 1994 #28; Hepworth, 2000 #256; and
- Locate, retrieve, organise and evaluate the information [Candy, 1994 #28; Mayer, 1992 #24; Whitson, 1997 #258]

Learning activities likely to result in the development of these competencies were integrated in the syllabus of this unit and are discussed in the following section.

Course Design Features

As part of the unit requirements students were required to interact with the subject content by solving a range of ill-defined problems, as well as creating a web site with copyright free content. These activities required students to continually reflect on which sources of information were most appropriate to satisfy these requirements. A range of information sources was provided to help students as follows:

- Two volumes of readers with current journal articles relating to the given topics (Luca, 1999);
- Textbook written for the course (Luca, 1997);
- References to a number of recommended textbooks available in library closed reserve;
- Relevant industry contacts;
- Projects created by previous students; and
- An online repository of information related to each of the topics, which included text, reader and library sources, PowerPoint slides, downloadable files, useful links, as well as online videos of industry representatives (Figure 6.8).

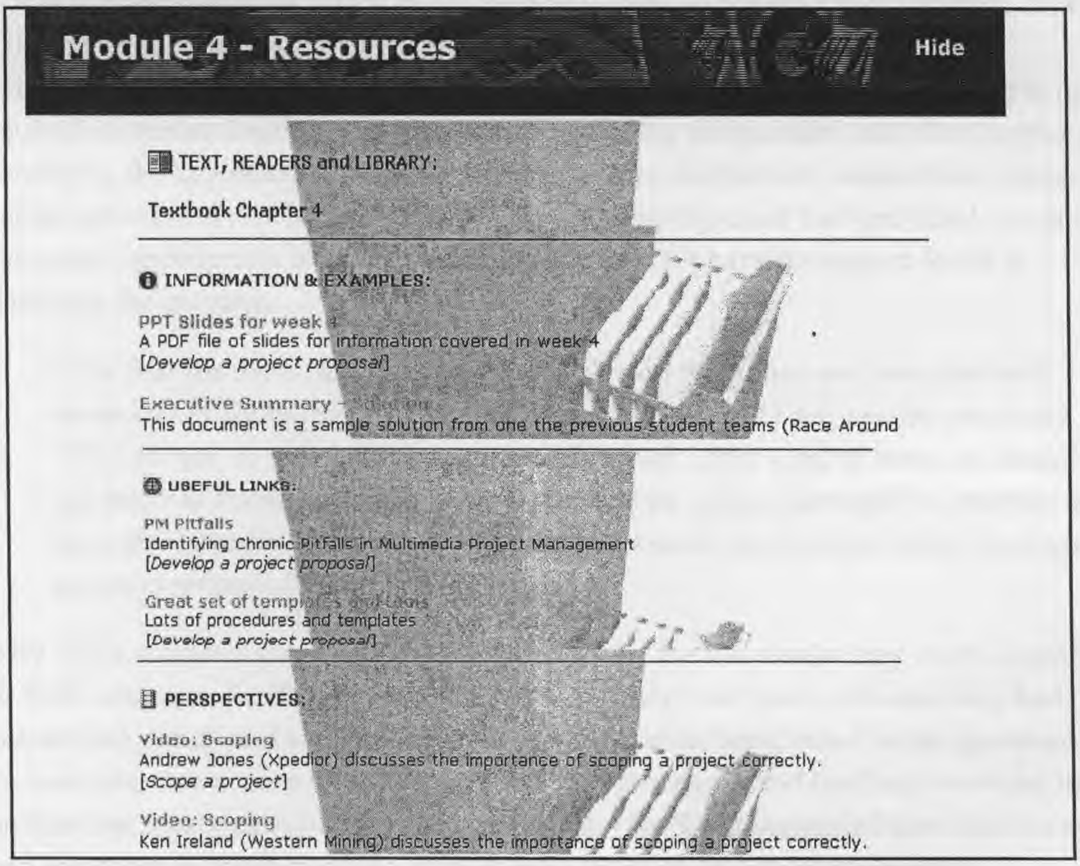


Figure 6.8: Online resources

The next section analyses the extent to which students used their research strategies within the learning environment designed for this course.

Activities that Promoted the Development of Research Skills

Based on responses gained from questionnaire data, students considered the following activities as the most likely that would have contributed to the development of their research skills:

- Clearly understanding the question and identifying key research areas; and
- Identifying appropriate sources of information.

Each of these is discussed below highlighting how they were used, as well as illustrating indicators that showed improvement.

Clearly understanding the question and identifying key research areas

Each week students were required to solve problems and then post their solutions to *Conference Centre*. Various approaches were taken to solve these problems as well as different interpretations of the question being asked. This resulted in teams posting widely varying solutions, which receiving a wide spread of marks and feedback. This cycle of reflective practice helped students realise that it was better to clearly understand the problem before locating information sources. The nature and depth of required resources depended on clearly understanding the question, and then carefully identifying the key research areas. For example, after the first few weeks Nash realised that he had wasted much time researching the wrong topic and had provided content that wasn't appropriate for the given topic, as he didn't have the correct focus in answering the question:

> *In the first few weeks, we would all go off and research the topic and come back with summaries at the meetings. This would take ages to do, and then someone would say 'What did you do that for? We don't need that stuff!' After a few of these, we decided it was better to brainstorm the problem first so that we really understood the priorities and focus of the question being asked. From there we would then decide on which key areas we would research.* (Interview with Nash)

Early in the semester some teams were surprised by the low marks they were awarded for their solutions. Feedback received from both tutors and peers reflected they had "missed the point" and were not presenting information being asked in the question. For example, Bob's team was disappointed with the marks and feedback received for the first few solutions in which peer and the tutor feedback suggested that they should read the question more carefully. Even though his team had spent much time researching the question they hadn't been successful in identifying the correct areas to research:

> *It was a bit depressing at first. We had put a lot of effort in doing the research and creating a nice solution. Or, so we thought! When the tutor and the other teams marked it, they said we missed the point. What a pain! From then on we read the question really carefully and discussed it for a longer time so we wouldn't' miss the focus. The*

problem was if you misread it, then all the research is wasted, even if you spent lots of time doing it. (Interview with Bob)

Problem solving learning activities required students to clearly understand given questions, interpret requirements, decide on information sources, gather information and then create solutions. These solutions were then posted to a public forum for peer and tutor review, which provided a variety of different perspectives on how solutions could be improved. This enabled students to reflect on their research strategies and refine their approach in the following weeks. From these examples it can be seen that students became increasingly aware of their inefficiencies caused by not carefully reading and understanding questions, and used a variety of strategies to improve their research approach.

Identifying appropriate sources of information

Students had access to a variety of information sources i.e. Web references and URL's, online information databases from the library, bulletin boards, books, readers, streaming video, samples of past student work, on-campus multimedia developers, guest speakers, local multimedia developers and other industry contacts.

Students had to identify which combination of these information sources would be most suitable for the given problem. For example, Sue's team considered alternative sources of information as the semester progressed. At first they only used the textbook, Readers and Web references, though as the semester progressed they started to use online databases made available through the library and found a range of current and useful journal references. This was promoted by observing techniques used by other teams to develop solutions:

> *We mostly used the book, readers and online materials given on JoePM for the information. Though after a while I noticed some of the other teams were referencing current journals, which looked impressive. So, I got onto the library page and used Wilson Web, which had lots of full text articles. It was easy to reference these, and they had a lot of current information and new ideas we could use.* (Interview with Sue)

Many other teams enhanced their pool of information sources by interviewing industry representatives and collecting corporate information that supported their solutions. For example, Suzie supplemented information collected from books and the web, with industry viewpoints that greatly supported her argument and promoted its validity. She also found it satisfying to correlate information gained from the web and books to opinions gained from industry experts and past students:

> *Finding information for the weekly tasks was hard work and a bit boring at first. You had to hunt around and find things that made sense and you could use for the solution. What really helped me was using some of the industry contacts to support the collected information. It was fantastic to ask industry people and ex-students questions and hear*

> *them say things like I got out of books, but saying them more clearly.* (Interview with Suzie)

The above examples provide evidence that the design of the learning environment allowed students to compare and contrast their information collection strategies with other teams and then reflect on the results. The setting helped many students realise that using alternative information sources could result in more effective and interesting solutions. The fact that these students actively participated in selecting a variety of information sources and reflecting on their success is likely to encourage the development of these skills.

This section has considered ways students practised using their research skills. The following section considers factors that encouraged and motivated students to undertake activities likely to improve these skills.

Student Motivation to Practice

In this unit, students were required to develop a Web site with the complementary documentation that could be used as a CV to promote their skills in industry. To develop quality documentation and procedures, students required contemporary information that would contribute to the overall quality of their final products. For example, Rose's team recognised the value of having a high quality web site they could use as part of their CV item that would exhibit the team's skills to potential employers:

> *We wanted to have a good product on the ECU server that would show employers and friends that we could produce a great web site with quality content and procedures. It's no good having a glitzy web site with old and boring content. You need to put information up that's useful and interesting.* (Interview with Rose)

On presentation night, all the student teams were required to demonstrate their product to a large group audience, many of which were industry representatives. Students recognised that by showing a good quality product, backed up with clear documentation, procedures and templates would give them a better chance of impressing potential employers. For example, Liz's team considered it important to develop a web site that not only looked good, but was also backed up with well-researched metrics and procedures:

> *I went to the presentation night last year, and there were heaps of people and employers asking different questions. They were all checking out the graphic and technical things, as well as procedures and metrics. You can't just have a good looking web site, you also need to have well researched metrics and PM procedures to impress these people.* (Interview with Liz)

As part of the unit requirements students were also required to develop a portfolio of project management procedures based on strategies used during the semester. This included procedures for team communication, collaboration, financial management, project proposal, scheduling, design specification, evaluation, testing, production aspects, QA, legal or hand-over. Students were required to develop these in a clear format that enabled re-useability and were supported with proper referencing. Many students recognised that this portfolio would greatly enhance their job opportunities, as it would enable them to show prospective employers a range of effective procedures they could easy implement if employed. For example, Chris was keen to develop procedures and templates that were based on contemporary information and would impress prospective employers. He was motivated to actively research this information, as he was aware that these requirements were always asked for in job advertisements:

> *Different job ads wanted different developer skills, but they almost all wanted you to show skills like QA, team skills and communication. That's why I wanted to make a good portfolio that showed I knew what these were, with procedures to use in production teams. But you need to have good info for them that was referenced and logical, otherwise it's not worth even showing it.* (Interview with Chris)

These examples show that many students actively used research skills to locate current and appropriate information. They recognised that well researched information would enhance the quality of their projects and portfolios and be influential elements on their CV's to show potential employers their skills, in an effort to gain employment.

Summary

The findings from this exploration of student activity in areas likely to develop research skills suggest that the implemented design of the learning environment was successful. The evidence suggests that the following pedagogical elements incorporated in the design of the learning environment contributed to their development:

- Authentic activities – having assessment tasks that were based on real problems encouraged students to use a variety of research skills through their own volition. Students recognised the value that portfolios with well researched documentation would bring to their career outside the university setting, and in most cases were motivated to spend extra time in researching and preparing good quality project management procedures and templates;
- Self-regulation – a variety of different information sources were made available. Students were able to interpret the parameters of the given task or problem, and then identify and locate the most appropriate information sources for the given task; and
- Reflection – within this setting students would receive regular and varied feedback on how successful their research strategies had been. This allowed students to reflect on their implemented strategies and if appropriate consider alternative methods of researching and locating information.

The evidence suggests that the authentic context and commitment to student-centred activities appeared to be strong motivators for students to practise their research skills. Most students recognised the value of enhancing their research skills with a view of developing quality content and procedures for their CV and portfolios.

9. Analysing and Synthesising Information

Data are facts and figures based on observations, surveys or research that have been collected and are available for use. *Information* consists of data that have been organised and communicated for the potential benefit of individuals. *Knowledge* is information that individuals recognise as relevant and think about, interpret or use for a purpose (Lane, 1996). Within this context, analysing and synthesising information can be considered as the process used to create knowledge that is relevant for the given task that requires thinking directed toward a specific purpose (Chaffee, 1991). The following list represents the views of a number of authors as the required abilities needed to successfully perform this skill:

- Evaluate information for evidence of facts, points of view and claims made for and against (Australian Council for Educational Research, 1999; Chaffee, 1991; Vockell & Deusen, 1989);
- Locate relationships and patterns (Chaffee, 1991; Oke & Cameron, 1999; Vockell & Deusen, 1989);
- Combine ideas to make inferences and propose solutions (Australian Council for Educational Research, 1999; Chaffee, 1991; Oke & Cameron, 1999); and
- Evaluate the results (Australian Council for Educational Research, 1999; Oke & Cameron, 1999; Vockell & Deusen, 1989).

Learning activities likely to result in the development of these competencies were integrated in the syllabus of this unit and are discussed in the next section.

Course Design Features

Each week students were required to submit solutions to given problems. After collecting data from a variety of sources and determining its validity, student teams were then required to synthesise a coherent solution and post it to the *Conference Centre*. The process involved:

- Interpreting and understanding the problem with the team;
- Deciding what information was needed, who collects it and who is responsible for writing the solution;
- Locating required information and developing individual summaries;
- Meeting with the team and analysing the team's ideas and summaries;
- Writing and posting solutions with a self-assessment mark; and

- Reflecting on feedback given by peers and tutors.

Within this setting individual students took turns in collating information collected by the team and synthesising it into a final solution. Each team member was required to coordinate the development of three solutions over the duration of the semester. They would negotiate with the rest of team topics they had a preference for, based on their background and team role. Also, as part of the unit's assessment requirements, students were required to design a unique web site that conformed to legal copyright laws. This required students to carefully consider how to consolidate and synthesise collected information into a interesting and legally compliant web site.

The next section analyses the extent to which students engaged with activities that would have contributed to the development of skills in analysing and synthesising information.

Activities that Promoted the Development of Analysis/Synthesis Skills

Data was gathered in a number of forms that provided evidence of student activities chosen, which may have improved their analysis and synthesis skills. The following list emerged from the questionnaire data, and represents the main form of activities used by students to enhance these skills:

- Analysing collected information for appropriateness; and
- Synthesising collected information into coherent summaries.

Each of these is discussed below highlighting how they were used as well as presenting indicators that showed improvement.

Analysing collected information for appropriateness

Students were given a wide variety of information sources to help them solve problems and develop their web sites. These ranged from textbooks, readers, online references, online files, work from previous students, online library databases, videos and comments made by industry experts. Students had to firstly determine which of these sources were most appropriate for the given task before analysing the content for appropriateness. For example, Rose explains how a few times during the semester she spent much time reviewing articles that weren't appropriate, and consequentially ended up with summaries that "missed the point". From these experiences, she tried to analyse the sources of information more carefully before creating summaries:

> *After printing heaps of pages from the web, and finding articles on the topic, you had to try and work out which ones were best for the problem. Some weeks we wasted a lot of time going through information that wasn't needed. You have to try and work out how valuable it is before spending time reading and summarising it, otherwise you feel committed to put in the solution even if it's not relevant.* (Interview with Rose)

Many other students also concluded that it was important to fully understand the problem at hand, in order to make appropriate decisions about the best information sources, which was often determined by team consensus. For example, Liz's team found it productive to interpret the meaning of problems as a group and clarify their understandings before trying to locate and review information. At the beginning of the semester, some team members had produced summaries of information that were conceptually different to what other team members had done, which made it difficult to agree on a final solution:

> *You have to read the problem carefully and understand what you're supposed to be doing, so you can pull out the right information. Sometimes the summaries made by different team members were on completely different things. Then at the team meetings there would long discussions about everybody's point of view, and what they should have been looking for. If everybody had the same understanding of the problem, then this wouldn't happen and you'd save heaps of time. It really depends on how you understand the problem you're working on, as to what information you choose to summarise. That's why after a few weeks, our team decided it was better to talk about the problem first, and make sure everybody understood what we wanted, before doing the summaries.* (Interview with Liz)

Students were required to complete problems that required information to be located from a variety of sources. Students recognised it was important to carefully analyse collected data for appropriateness before summarising and synthesising into solutions. Regular feedback obtained from both peers and tutors allowed students to reflect on how appropriate their selection and analysis of information sources had been. From these examples it can be seen that students became increasingly aware of inefficiencies caused by not carefully analysing the appropriateness of collected data before including it in their solutions.

Synthesising collected information into coherent summaries

Once all the information, ideas and opinions had been collected and analysed for appropriateness, students then summarised and synthesised this information into solutions. They were given the following assessment criteria to consider:

- Correct focus in answering the question, that is evident throughout the solution;
- Well argued and supported with relevant information;
- Clear introductory and summarising paragraphs;
- Written in an easy to understand, non-verbose format which flows from paragraph to paragraph; and
- Use of correct grammar, spelling and referencing. (Excerpt from Syllabus)

From the outset students were encouraged to implement these criteria and early in the semester tutors modelled the process of compiling solutions to help students get started. Many students made comments about the extra effort needed to present the information in a simple and easy to understand format. For example, Sue found that when creating summaries it was important to develop a clear structure with easy to understand paragraphs. Also, she found that by carefully revising her work, and getting others to review it helped develop better quality summaries:

> *We had heaps of information to use for the web site. The hard bit was putting it all together so that it made sense. We had to keep re-doing this, as often when we made summaries and put them on the web site, the client or others would say it didn't make sense. In the end it seemed that the simpler it was presented the better. It had to really be easy to understand, almost at a baby level. To do this properly you had to really consider the structure of the solution and how all the paragraphs tied together, and then re-read it a few times, and ask others to have a read as well. That way you have a chance of getting it nice and easy to understand.* (Interview with Sue)

Many other students also made comments about strategies developed to formulate coherent solutions. They recognised the need to carefully consider how summaries would be written and structured, based on collected information and ideas. For example, Pat developed a procedure for writing summaries after getting negative feedback from his peers and tutor, and also by observing how successful teams presented their work. He would write all the concepts on one page and then think about how to combine these to present a coherent summary to argue the point:

> *We didn't do very well in summarising the information the first time. We only got 1.5 out of 3 for the answer, but some of the other teams got 2.5 and their solutions looked good. The feedback from the tutor and other teams was that we missed the point. I realised that our team actually had the information, but didn't write it up properly in the summary. The trap we fell into was not thinking about all the bits and pieces and how they all fitted together to answer the question. I worked out it was better to write all the points on one page and then think about how these could be combined together to answer the question properly. I noticed that all the best solutions had good structure and were easy to follow.* (Interview with Pat)

In both these examples it can be seen that the learning environment encouraged students to consider the structure of their solutions and organise summaries that were based on a range of information sources. Students recognised that by consolidating concepts and combining related ideas into logical sequences, helped them create solutions that were more acceptable to peers and tutors. Based on regular feedback and having the opportunity to view a range of other solutions, the evidence suggests that these students refined their approaches and used more structured techniques when synthesising information and creating summaries.

This section considered ways students undertook tasks that were likely to develop their skills in analysing and synthesising information. The following section considers factors that helped encourage and motivate students to practise these skills.

Motivating Factors

The main motivation expressed by many students to undertake and improve their analysis and synthesis skills was based on their desire to enhance the quality of the final product. The feedback obtained suggested that students strongly recognised the value of developing these skills in their quest to develop good quality portfolios and CV items that would enhance their job opportunities. For example, Lex's team was keen to develop a web site that would impress potential employers by its clear and simple design. They worked on collecting ideas and information and placing them into logical categories to provide a simple and concise navigational system for their final web site:

> *It's no good chucking up heaps of information. Nobody wants to read lots of things that don't follow or make sense. There's too many web sites out there that just have lots of text stuck together, and you can't be bothered even looking through it all. We wanted our web site to be easy to read and show a variety of summarised information through a simple menu. We collected all the ideas and files we had into a concept map, and then thought about how this would present, and if it would be easy to follow.* (Interview with Lex)

The same attitude was reflected by Don, who was keen to develop a portfolio with clear and concise procedures and templates that would impress potential employers. He recognised the value in having procedures that were easy to follow, well laid out and developed using a range of information sources:

> *There was lots of information we could put into our portfolios. Though we had to be careful it didn't become a dogs breakfast. You need to make sure that all the same sort of information was collected together and summarised to make good points that would be attractive to the reader.* (Interview with Don)

It is evident from these examples that the setting provided a context that encouraged students to undertake tasks that were supportive of developing skills to analyse and synthesise information into coherent summaries. This was promoted through a learning environment that motivated students to create knowledge that would have value for them in the world of business outside the academic environment.

Summary

The findings from this exploration of student activity in areas likely to develop skills in analysing and synthesising information suggest that the implemented design of the learning environment was successful. The evidence suggests that the following pedagogical elements incorporated in the design of the learning environment contributed to their development:

- Authentic activities – learning tasks were based on meaningful activities that required students to develop artefacts that would impress potential employers outside the university setting. This was a compelling factor for most students and helped encourage them to undertake activities that were likely to develop their skills in this area;
- Self-regulation – the design of the learning environment enabled students to freely choose information from a variety of sources with a view of developing coherent solutions. Students developed strategies to interpret problems, analyse information sources and make decisions on how best to synthesise these into coherent summaries; and
- Reflection – students would receive regular feedback from a variety of sources on how successful their strategies had been in analysing and synthesising information into coherent solutions. This allowed students to reflect on their implemented strategies and consider alternative methods collecting, analysing and synthesising information.

The fact that students were actively involved in creating summaries, viewing others solutions, and obtaining immediate feedback on their success, demonstrates that students in this setting were performing activities that were likely to improve their skills in formulating information in coherent summaries.

10. Problem Solving

Increasing the effectiveness of problem solving skills is recognised as a key objective for enhancing productivity in almost every industry. Problem solving skills can be described as the capacity to anticipate problems and actively respond by solving them through framing questions, identifying resources, interpreting the context and then working through the dilemmas in a coherent way (Mayer, 1992).

The following list represents the views of a number of authors of the required abilities needed to successfully perform this skill:

- Understand the nature of the problem. What is the unknown? What are the data? What is the condition? Consider different perspectives and interpretations (Corrent-Agostinho, Hedberg, & Lefoe, 1998; Hayes, 1989; Mayer, 1992; Polya, 1945);
- Frame and plan an approach to solve the problem. What information needs gathering? How will information be collected? How much time is available? What is the scope? Who can help? (Hayes, 1989; Mayer, 1992; Polya, 1945);

- Collect information and formulate opinions and ideas (Corrent-Agostinho et al., 1998; Mayer, 1992; Polya, 1945);
- Synthesise a solution based on previous and newly acquired knowledge (Hayes, 1989; Mayer, 1992; Polya, 1945); and
- Reflect on the solution and the problem solving process and evaluate how successful it has been (Corrent-Agostinho et al., 1998; Hayes, 1989; Mayer, 1992; Polya, 1945).

The following section elaborates on strategies needed to help develop problem-solving skills and then analyses how the design of the learning environment contributed to their development.

Course Design Features

The learning environment was designed with a view that students would develop problem-solving skills throughout the semester by confronting them with a series of problems that were representative of industry settings. Students were required to interpret the problems and consider how best to arrive at a solution through self-directed activities. There was no single correct solution to these problems, which enabled a range of interpretations and approaches to be taken by different teams. The following assessment criteria was given:

> When assessing students' solutions, the following criteria will be considered:
>
> - Correct focus in answering the question;
> - Use of relevant facts and research supporting your argument;
> - Synthesis of ideas into a cohesive summary;
> - Correct grammar and spelling;
> - Proper referencing of information sources; and
> - Under 400 words, excluding references. (Excerpt from Syllabus)

Each problem was based on essential concepts from the weekly topic and was supported with a range of media resources and tutorial exercises that helped develop students' perceptions and understanding. Students were required to solve problems that typically occurred in professional practice, which adhered to basic problem-based learning principles (Barrows & Tamblyn, 1980). For example in Week 3 the topic being covered was Quality Assurance and given problem reflected industry was:

> *Assume you are the project manager of a large multimedia production job with 6 staff, and during the production phase the budget starts to creep, and also the job starts to fall behind schedule. What procedures and strategies would you implement to try and circumvent this from getting worse? (400 words or less)*

A series of student-centred tutorial activities were developed to help scaffold the students' knowledge needed to solve the given problems. These included team-based activities, individual activities and *Tips and Tricks* (see Figure 6.9). Students were able to use these resources to develop their understanding of the topic before solving the weekly problems. It was up to the students to decide how much time and effort they put into working through the tutorial activities.

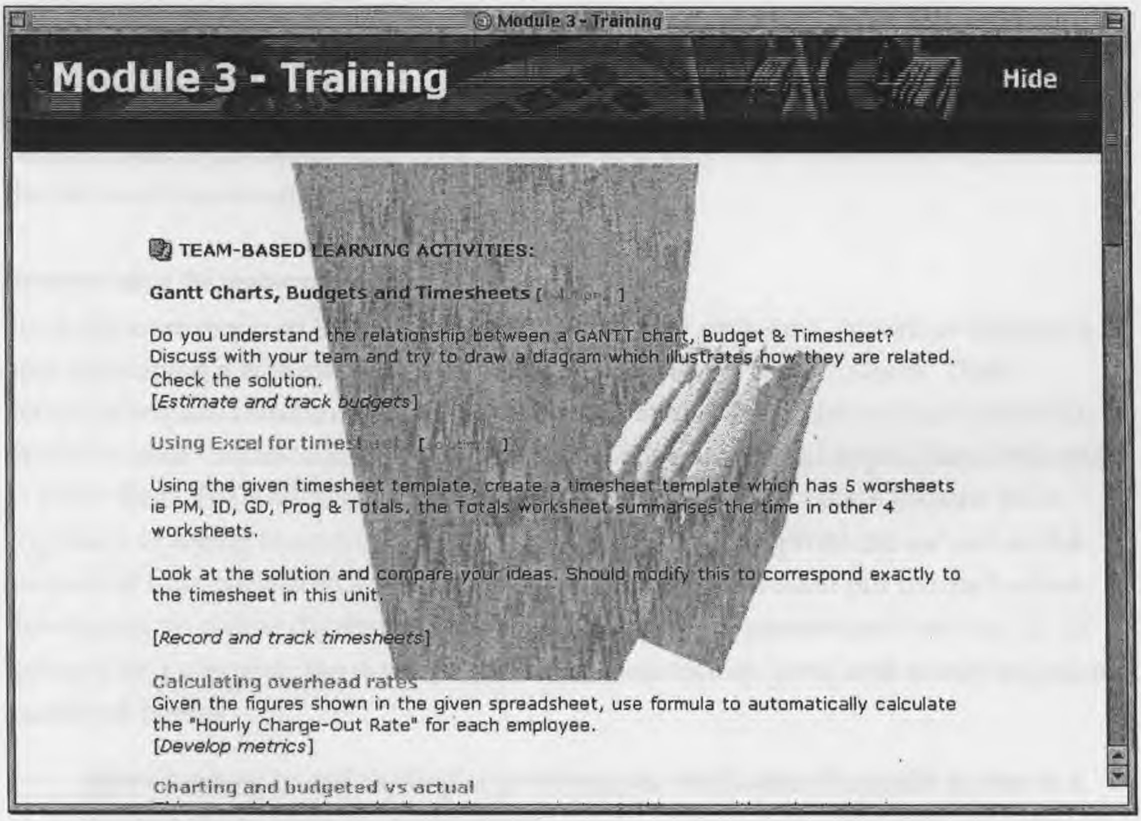


Figure 6.9: Tutorial activities

Also, student teams were required to develop a web site using their skills as multimedia developers for a real client. As part of this process students were confronted with solving a range of problems that are inherit in the development process such as formulating objectives with clients, outlining responsibilities with peers, setting standards, producing documentation identifying gaps in their own skills. Within this setting students became responsible for what they needed to learn based on the nature of the project topic selected, the client's needs as well as the range of other skills that existed within the team. This presented a range of authentic problems for students to contend with, which required careful consideration and planning. The design of the learning environment provided scaffolding through a variety of resources to support these students.

The next section analyses the extent to which students engaged with activities that would have contributed to the development of problem solving skills.

Activities that Promoted the Development of Problem Solving Skills

Data was gathered in a number of forms that provided evidence of student activities within the learning environment that may have improved their problem solving skills. The following list represents the main form of activities used by students that may have contributed to the development of this skill:

- Understanding the problem and its scope;
- Identifying appropriate sources of information; and
- Synthesising collected information into coherent summaries.

Each of these is discussed below highlighting how they were used as well as indicators that showed improvement.

Understanding the problem and its scope

Students were required to create solutions for weekly problems, as well as designing and developing a web site for a real client with a team of four students. These activities required students to make a variety of important decisions each week that needed a clear understanding of each problem, their scope and appropriate strategies to solve them. For example, as the semester progressed Alice's team became more cognisant of trying to understand the scope and priority of problems as well as the amount of time needed to solve these. On one occasion the team put in much effort developing an online database that wasn't an important assessment item and in so doing didn't complete the documentation to a satisfactory level, and as consequence sacrificed marks:

> *Before jumping in and working on problems, you really should consider if there is a problem. If you make the wrong decision here you can waste lots of time doing things that aren't important, and sacrifice doing other important things. At the beginning of the semester we spent heaps of time on technical things, especially developing the online database. But when we had a good look at the marks, we realised that we were spending lots of time on something that wasn't worth much. The actual web site was only worth about 8% of the total marks. Most of the marks were on the reports, procedures and metrics, which we didn't put enough energy into doing properly and lost marks for.* (Interview with Alice)

Other students made similar comments about being careful to clearly understand problems and their scope. For example, when Jeff's team was planning the summative evaluation they discussed the fact that locating a suitable user group and computer room may be problem, but considered that it was readily achievable and Jeff would be able to complete this task in a short time. However, as the task unfolded Jeff realised that the problem of finding a suitable user group and locating a testing room was a bigger problem than everybody considered. The end users had to sourced from industry, and getting access to them at the same time, as well as booking a computer room from the university was problematic. Other problems also arose, such as collecting observational data for each user at the same time, analysing the data and then writing a summary report. On reflection, he believed that the scope of the evaluation should have been more carefully considered and scaled down, or two team members should have allocated to the task:

> *When we discussed doing the evaluation it seemed that it wouldn't be a problem. The team gave me a week to do it. What we didn't figure on was the huge amount work needed. I had to find info on how to do it, find end users from industry, book a computer lab, record how they used the software, analyse the information and then write up a report. There was too much work, and coordinating the end users from industry and computer lab was a real hassle. We should have just used uni students to evaluate it and someone else in the team should have been helping me do it. It just wasn't worth the time and effort I put into it.* (Interview with Jeff)

Nash also concluded it was important to discuss the required scope of problems before implementing action plans. His experience was that team members would often spend much time creating solutions to perceived problems only to realise that they weren't important, or that their focus was incorrect. He explains a situation where the graphic designer spent two weeks building a 3D animation that he considered was needed by the client, only to find that he had misunderstood the client's needs, and as a result had wasted much of his own time. Nash came to the conclusion that at each team meeting all perceived problems and important tasks should be reviewed and clarified:

> *It's really easy to go off and do things that aren't important. This happened a couple of times in our team. I remember having a heated discussion with the graphic designer about a misunderstanding early in the semester. He went off for about two weeks and did lots of research and work developing a 3D animating logo for a splash screen he thought would help solve an interface problem we had with the client. But the client didn't want to use 3D. The problem we had with the interface was a navigational thing, and building a sexy 3D spinning logo on the introduction screen wasn't the answer. We could have saved lots of time and trouble if we had discussed this a bit better and made sure that everybody agreed and understood what the problem was and what needed doing. I think it's a good idea to make sure everybody has the right idea at the end of each meeting, by going through at the end of the meeting and quickly reviewing everybody's jobs.* (Interview with Pat)

These examples show that the design of the learning environment provided a context that encouraged students to carefully consider the nature and scope of problems before committing time and effort towards solving them. Students recognised that by accurately determining the scope of problems, the team would make better judgements in allocating appropriate time and effort to their resolution, which would promote the quality of the final product.

Identifying appropriate sources of information

Same activity cited by students in *Research Skills* section.

Synthesising collected information into coherent summaries

Same activity cited by students in *Analysing and Synthesising Information* section.

This section considered ways students undertook tasks that were likely to develop their problem solving skills. The following section considers factors that encouraged and motivated students to practise these skills.

Motivating Factors

Many students considered the need for the team to work harmoniously and effectively an important issue as they recognised that team conflict could affect the team spirit, overall quality of the project, as well as causing stress and embarrassment. For example, as the semester progressed Lex tried to use problem-solving skills to help solve difficult situations. Her team had a problem with two team members who had conflicting perspectives on how to prepare and document the design specification, a major assessment item. Alice (the programmer) wanted very detailed templates and storyboards whereas Giff (the graphic designer) only wanted to produce a variety of electronic prototypes that would be checked and signed by the client. The issue caused a serious altercation between them until Lex approached the problem in a structured manner. She went back to the specifications in the syllabus and where she wasn't sure asked the tutor and other teams for advice. She then presented these formally at a team meeting asking the team to vote on a resolution after the facts were presented. She regrets not having done this earlier as it would have avoided arguments and time wasted in heated discussions:

> *Alice and Giff had a huge quarrel about how the design specification should be done. Alice wanted lots of detail but Giff insisted that wasn't practical and not the way it was done in industry. He believed we would get a better product by just ripping out a few rapid prototypes, getting the client to sign the one he wanted, and then go on from there. But Alice strongly disagreed with this approach and wanted lots of detail in the design. To help the situation I went back to what was expected from the unit. I read the syllabus, asked the tutor and other teams what they thought, and then presented these as facts in the next meeting. We then all voted on it. I tried not to make it personal and focused on what was necessary for the team. If I had done this a few week earlier it would have saved lots of time, arguments and bad feelings. (Interview with Lex)*

Many other students discussed the value of using problem solving techniques to help the team function more effectively. For example, as the semester progressed Sue's team started using problem-solving strategies when there appeared to be conflict or disagreement. They would always go back to the team's original objectives and consider what strategies would be most suitable to satisfy these. Sue considered that this approach made it less personal. The team was keen to produce an excellent product and considered this an effective means of not wasting time with team conflict:

> *After a while we realised that lots of time was wasted on trying to solve problems. So, when problems occurred we would go back to basics, and work from the objectives. We would always ask the question 'What's best for the project?' That way, we could try and work around the problem with a common purpose and not be too personal about it. You have to recognise problems, and work them for the benefit of the team.* (Interview with Sue)

The above examples show that the design of the learning environment provided a context that encouraged students to actively use problem-solving skills to help support team harmony and effectiveness. Within this setting many students recognised the importance of following a logical problem-solving process to avoid team conflict and time wasting that could be detrimental to the whole team.

Summary

The findings from this exploration of student activity in areas likely to develop problem-solving skills suggest that the implemented design of the learning environment was successful. The evidence suggests that the following pedagogical elements incorporated in the design of the learning environment contributed to their development:

- Authentic activities – learning activities in this unit were almost entirely based on teamwork tasks that reflected industry practice. This resulted in a learning environment that required students to actively use problem-solving strategies to help solve a wide range of different issues. Students recognised that using problem-solving strategies was an effective means of supporting teamwork activities, and promoting the quality of their work;
- Self-regulation – the design of the learning environment enabled students to freely make their own decisions on how to solve problems. Students made their own judgements and interpretations, set priorities, allocated resources and defined what they considered to be an appropriate scope and priority for problems encountered by the team; and
- Reflection – the design of the learning environment allowed students to receive regular and varied feedback on the quality of their work. This allowed students to consider how successful their problem solving strategies had been, and what changes could be made to improve the process.

The evidence suggests that the authentic and student-centred activities appeared to have been strong motivators for students to focus on developing effective problem solving strategies. Students recognised that by using problem-solving strategies they were able to promote a friendly and harmonious working environment with their team, as well as improving the quality of their work.

11. Task Management

All organizations rely on staff to carry out to carry out a variety of tasks and projects, which involves initiating the task, setting objectives, planning, monitoring its progress and then evaluating success. Employees are expected to accept responsibility for managing this process and ensure that they are keeping within the given guidelines or instructions. Not only is this competency valuable in the business world, but is it also particularly applicable for students in higher education: "Being able to plan and organise one's own study, undertake tasks independently, and maintain the integrity of one's own work among competing demands are likely to lead to enriched and satisfying learning experiences" (Mayer, 1992, p. 27).

A review of the literature on task management indicates that in order to manage tasks effectively, students must be able to:

- Identify and set objectives and priorities (Bennett et al., 1999; Johns, 1995; Mayer, 1992; Peters & Homer, 1996; Posner, 1987);
- Organise sub-tasks and allocate appropriate resources (Mayer, 1992; Peters & Homer, 1996; Pettersen, 1991; Posner, 1987);
- Schedule a suitable course of action (Johns, 1995; Mayer, 1992; Pettersen, 1991; Posner, 1987);
- Monitor progress and take appropriate action when necessary (Johns, 1995; Peters & Homer, 1996; Pettersen, 1991; Posner, 1987); and
- Evaluate the overall success in respect to the original objectives (Bennett et al., 1999; Johns, 1995; Mayer, 1992; Peters & Homer, 1996).

The following section elaborates on strategies used to help develop task management skills and then analyses how the design of the learning environment contributed to their development.

Course Design Features

The learning environment was designed with a view that students would develop task management skills for both team-based and individual activities. A range of student-centred activities were implemented to encourage students to take ownership of the planning and organization process. To help scaffold this process students were given time management tools, scheduling tools, and templates for scoping and managing the development of a project.

At the beginning of the semester students were required to scope out the development of a multimedia web site for a real client. They were required to develop a industry standard project proposal that included a needs analysis, feasibility study, scope, schedule, budget and implementation strategy (see Figure 6.10). Also, at the end of the semester students were required to evaluate the success of the implementation and reflect on how they could improve the process (see Figure 6.11). Within this setting students were required to manage their responsibilities through scaffolded activities in which they had to organise their time and tasks through online journals. Students would then self assess their progress and also receive feedback on from both peers and tutors on how well they were managing their tasks.

Project Proposal (Team - 15%)

To be written in a professional manner, worthy of industry standard as for a real client in a paid job!

- Executive Summary - includes client objectives, team members and roles, why you are the best for the job, etc..
- Needs analysis, purpose/rationale and major objectives ie client's needs?
- Feasibility issues - perceived problems, risk analysis, company support, maintenance, client resources (SME's, end users), technical difficulty given the available resources, etc.
- Scope
- Content overview - collection issues, concept map, perceived problems in collecting, sources, cost in collecting, legal issues, time needed to collect, tracking sources etc..
- Schedule and milestones (GANTT, PM Model and categories)
- Budget - estimated cost and resources needed
- Legal and contract issues (Copyright of content, IP of code and graphics, educational software issues, rights to have name in credits, scope creep, acceptance criteria etc
- Implementation and maintenance issues
- Client sign-off and evaluation form

Figure 6.10: Project proposal requirement at the beginning of semester

Final Report (Team - 10%)

Students are required to submit the following:

- A "Post-Mortem". Were you satisfied the team met the original objectives? If your team had to do this project again, what changes would you make for improvement? What aspects worked well?
- Evaluation study. Show key issues considered, evaluation instruments used, samples of feedback, summary of key findings and *recommendations made to client based on the results of the evaluation study*
- Metrics developed and critical analysis of all timesheet data. Cost per screen, cost per graphic, different quality of graphics and other forms of costing are required. Also, provide an analysis of the hours input by each team member and how this compared to original estimates i.e. actual versus estimated time? Were there any surprises or discrepancies? If so, why?

Figure 6.11: Final report, asking students to evaluate their success

The next section analyses the extent to which students engaged with activities that were likely to contribute to the development of their task management skills.

Activities that Promoted the Development of Task Management Skills

Data was gathered in a number of forms that provided evidence of student activities within the learning environment that may have improved their task management skills. The following list represents the main form of activities used by students that may have contributed to the development of this skill:

- Setting priorities;
- Planning and scheduling; and

- Evaluating success.

Each of these is discussed below highlighting how they were used as well as presenting indicators that showed improvement.

Setting priorities

Same activity cited by students in *Time Management* section.

Planning and scheduling

Same activity cited by students in *Time Management* section.

Evaluating success

Students were required to manage the development of variety of tasks. These included creating a web site with the necessary documentation, developing weekly solutions, and creating individual portfolios as well as a number of reflective reports. Within this setting students received feedback in a number of forms. These included self, peer, tutor and client assessments, which enabled students to consider a number of different perspectives on how well they had managed and performed their tasks.

At a team level students would present their completed tasks at team meetings and get feedback on the quality and completeness of their work. Often, students would be surprised by critical or negative feedback received from peers. For example, Giff felt disappointed with his team's comments when he showed the first draft of his design specifications for the interface design. The team wanted much more detail and information than he had considered necessary. After debating the issue and re-reading the syllabus he admitted that more detail would enhance the quality of the specification:

> *I was a bit surprised by the teams response when I showed them the first draft of the design specs. They all said it needed more work, and that I didn't show enough detail. I thought it was pretty good, but after discussing it with everybody and checking back on the syllabus, I could see their point. I needed to add more templates and alternative designs.* (Interview with Giff)

At the presentation night all students were required to show their products and discuss positive and negative aspects they had experienced. They would be asked questions by the audience and assessed by a panel of judges who allocated marks for the quality of product and also gave feedback. At these sessions students could compare and contrast their product to that of other teams and also reflect on comments and marks given by judges. For example, Jeff was impressed with the work done by some of the other teams. Though he felt they were justified, he was also surprised by negative comments made about the navigational system in his product:

> *I was really impressed with some of the web sites built by other students. Really professional and well designed. They also had some really good systems for developing their metrics. The main criticism we got on ours was that the navigation system was confusing. I suppose I could see the point. It was really clear to us, as we had been working with it all semester.* (Interview with Jeff)

Students were also required to evaluate the overall project development process used by the team (see Figure 6.11). This required students to formally evaluate development processes and make reflective comments on how it could be improved. This process encouraged students to carefully consider how they might improve their approach in managing a similar task in the future. The following extract from Sue's "Post-Mortem" illustrates how her team evaluated their process, and made suggestions for improvement:

> *One thing up front for us as a team is that we need to be more collectively organised. Our meetings need to have more structure and with more definite goals and outcomes. We also need to track the time/cost factor much better and make sure that all the team members are fully aware of their roles and responsibilities, timeframes and budget constraints. This comes back to constantly revisiting the initial proposal, which we didn't do often enough. Another area we need to stay focused on is the milestones that we outline in our proposal. These need to be met and receive client sign off before the site progresses further.* (Extract from Post-Mortem)

These examples provide evidence that students were actively engaged in activities that helped them evaluate how successful they had been in managing a variety of different tasks. These included large group tasks, sub-tasks and individual tasks. Reflection and feedback was provided through the use of journals, reflective reports, evaluation studies, "Post-Mortems" and team meetings. These included self, peer, tutor and client feedback that resulted in students receiving regular feedback from a variety of different perspectives on how successful they had been.

This section considered ways students undertook tasks that were likely to develop their task management skills. The following section considers factors that helped motivate and encourage students to practise these skills.

Motivating Factors

Most students recognised the importance of effectively managing their tasks in order promote an effective and harmonious team environment, as well as developing a quality product. Team conflict often occurred when other team members hadn't performed their tasks on time or to the required quality, which generally resulted from poor task management. For example, Jeff's team experienced conflict early in the semester when one of the team members kept failing to submit his tasks on time. The team member was peer assessed which caused much bad feeling and conflict. Jeff felt that if Giff had better managed his time and tasks the problem might not have happened:

> *Giff was late for a few meetings, and didn't submit the design templates on time which were needed by the programmer. This caused a lot of problems in the team and we ended up having arguments which were quite heated. Giff ended up being peer assessed for not doing his work. If he had managed his time and planned out how to do his tasks, I don't think the problem would have happened.* (Interview with Jeff)

This attitude is also reflected by Don, who expressed a need to manage his time carefully so as not to let the team down and be responsible for having a negative affect on the team's work:

> *You can't leave your team tasks until the last minute, as others are depending on them. You need to plan them in your diary, because if you don't get them done on time the whole project suffers and it's your fault* (Interview with Don)

Many other students made similar comments about the need to carefully manage their tasks so as not to compromise other team members. For example, at the beginning of the semester Alice was very embarrassed at a team meeting when she had to admit that she hadn't completed her tasks on time, which affected the work of one her peers. This negative experience caused Rose to develop a more robust approach in managing her tasks:

> *The project manager always kept us honest at meetings by making us all go through our TO DO list and telling everyone what we had done. A few times early in the semester I had to make excuses for not doing things that the Pat was waiting for. It was really yucky and embarrassing, as I had obviously let the team down. After this I tried hard to make sure that I managed my tasks better, because team tasks really can't wait* (Interview with Rose)

In another situation, Jeff admitted to not submitting his individual assessment due to exerting all his efforts on team tasks in order to complete them on time. He preferred to sacrifice his individual marks, which affected his overall assessment by fifteen percent, rather than letting down the team down by just a few percent. He recognised that he needed to improve his task management skills to avoid this situation in the future:

> *I always made sure that I completed my team tasks first and then did my personal things. Once I didn't end up submitting my individual assessments because I was too busy doing the team stuff and ran out of time. I need to plan the tasks better, and keep an eye on time needed to finish them.* (Interview with Jeff)

The design of the learning environment encouraged students to deliver a range of products to meet team commitments. Students were keen not to "let the team down" or be responsible for causing conflict and inefficiencies within the team. This helped motivate students to implement task management strategies that would help assure the timely and effective delivery of their tasks.

Summary

The findings from this exploration of student activity in areas likely to develop students' task management skills suggest that the implemented design of the learning environment was successful. The evidence suggests that the following pedagogical design elements contributed to their development:

- Authentic activity – the real-world relevance and collaborative nature of the learning activities helped encourage students to carefully plan and monitor their tasks to meet deadlines. Also, the goals and objectives of these tasks had personal meaning to these students, which helped encourage continual improvement strategies;
- Self-regulation – the design of the learning environment allowed students to make their own decisions about priorities, schedules and quality of work. This allowed students to take full ownership of the implemented processes and strategies used and critically analyse how successful they had been in their delivery as specified in their student contracts and through commitments made in the team's schedule; and
- Reflection – through regular and varied feedback from peers, tutors and clients, students were able to reflect on positive and negative approaches they had used in managing their tasks, and consolidate strategies that were most likely to be successful in the future.

The evidence suggests that the authentic context and commitment to student-centred activities appeared to be strong motivators for students to practise their task management skills. Most students recognised the value of enhancing these skills with a view of developing quality product for their CV to help enhance their employment opportunities.

6.3 Summary

This research question considered the effectiveness of the learning environment in helping students practise and develop their generic skills. Data collected through questionnaires and student interviews helped to identify how and why students were practising these skills.

The design of the learning environment presented a range of authentic activities that required students to use a variety of generic skills such as problem solving, collaboration, communication, self/peer assessment and time management. Students were motivated to complete given activities as they could see the relevance and applicability to real world tasks and employment opportunities, and as a result actively practised using these generic skills to complete the set activities. Within this context, the self-regulated nature of the learning environment freely allowed students to experiment using these generic skills with different strategies and in different situations. Through reflective practise, as well as receiving feedback from a variety of different perspectives, students were then able to consider how successful these strategies had been and were able to consider enhancements and improvements in using these generic skills for the following weeks.

It would appear that the design of the learning environment supported the development of students' generic skills by providing motivation (authenticity), freedom of choice (self-regulation) and reflective practice (reflection).

Chapter 7

Assessing Skill Development and Critical Overview

The learning environment developed for this study was based on a conceptual framework underpinned by the learning principles of authenticity, self-regulation and reflection in an attempt to promote the development of students' generic skills. A range of learning activities were designed to support these principles and integrated into the learning environment, which was complemented with an online web site.

The research question targeted in this chapter is focused on determining the level of skill development as a result of implemented the learning environment i.e.:

> *To what extent do students develop generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?*

An analysis and discussion about changes that occurred in students' generic skills throughout the course of the semester is provided using quantitative research techniques. The chapter begins with reference to the framework used for analysis, and then discusses the findings. A critical overview is given of the implemented learning environment with recommended strategies for improvement.

7.1 Assessing Skill Development

As outlined in Chapter 5, pre and post-test data was collected using two quantitative test instruments. An externally administered Workplace Competencies Questionnaire was given to the whole student group, and a Generic Skills Perceptions Questionnaire was given to three focus teams. Both questionnaires were based on student perceptions, and sought to measure skill differences through pre and post-tests. Each of these is discussed below.

Workplace Competencies Questionnaire (WCQ)

Data collected from the pre-test and post-test for the WCQ were analysed using parametric statistical methods. Significant differences between pre-test and post-test scores were calculated using Student's t-test (Pearson, 1967). This is one of the most commonly used of all statistical tests and can be applied as a paired t-test or unpaired t-test. Both types are used to test the hypothesis that some variable differs between two groups, but the paired test is specifically used when each data point in one group corresponds to a matching data point in the other group, as is the case here.

A limitation to using Student's t-test is that data being tested should be continuous, interval data, normally distributed and have equal variance in the two groups. In this case, the data was tested for normal distribution using tests for Skewness and Kurtosis, which are statistical measures that compare the data's shape and symmetry to that of a normal distribution. These tests help determine whether the data can be analysed using parametric statistical tests. The sample size of 51 students in this case also promotes the use of parametric statistical analysis.

Skewness is a measure of the asymmetry of the distribution. The normal distribution is perfectly symmetric, and has a skewness value of zero. A large positive value for skewness indicates a long right tail; an extreme negative value, a long left tail. As outlined in the help section of the SPSS manual (SPSS Inc., 2000), the ratio of skewness to its standard error can be used as a test of normality, that is, you can reject normality if the ratio is less than -2 or greater than +2. All scales measured for Skewness in this study were within these boundaries.

Kurtosis was measured to determine the extent to which observations clustered around a central point, which compares the relative peaked-ness or flatness of a distribution compared to a normal distribution. For a normal distribution, the value of the kurtosis is zero. A positive kurtosis signifies a more peaked distribution, whereas a negative kurtosis signifies a flatter distribution with less scores clustered around the central tendency of the data. As outlined in the help section of the SPSS manual (SPSS Inc., 2000), the ratio of kurtosis to its standard error can be used as a test of normality, that is, you can reject normality if the ratio is less than -2 or greater than +2. All scales measured for Kurtosis in this study were within these boundaries, indicating that parametric statistical testing methods would be suitable for this data (Table 7.1).

Table 7.1: Skewness and Kurtosis scores for WCQ

Workplace Skill	Pre Score		Post Score	
	Skewness	Kurtosis	Skewness	Kurtosis
Taking Responsibility	-0.08	-0.87	-0.83	-0.28
Working in Teams	-0.36	-0.99	-1.01	0.11
Persisting	0.39	-0.97	-0.75	-0.28
A Sense of Quality	-0.01	-1.17	-0.67	-0.65
Life-Long Learning	-0.29	-1.22	-0.85	-0.54
Adapting to Change	-0.12	-1.47	-0.47	-0.69
Problem Solving	0.11	-1.32	-1.23	1.29
Information Processing	-0.14	-0.87	-1.26	1.19
Systems Thinking	-0.57	-1.00	-1.46	1.40

In the following section, the results of the WCQ are considered in two parts. An analysis of the pre-score, post-score and difference in averages will firstly be considered, followed by a statistical analysis to determine significant differences.

Pre-test and Post-test Analysis

Over the semester, 51 students completed both pre-test and post-test WCQ. Table 7.2 shows the calculated scores across each of the nine skills tested.

Table 7.2: Pre-test and Post-test differences for WCQ

Workplace Skill	Pre Score	Post Score	Sample Size	% Difference in Means
Taking Responsibility	52	67	51	15
Working in Teams	49	69	51	20
Persisting	44	68	51	24
A Sense of Quality	48	64	51	16
Life-Long Learning	51	66	51	15
Adapting to Change	56	65	51	9
Problem Solving	49	74	51	25
Information Processing	52	77	51	25
Systems Thinking	59	76	51	17

Pre-scores averages were grouped around the 40s and 50s, out of a maximum score of 100. *Systems Thinking* scored the highest pre-score average of 59, which assessed students' perceptions of their understanding about parts in a system and the effects of their actions within the system. *Persisting* obtained the lowest pre-score average of 44, which assessed students' perceptions about how well they persist with a task to make sure that it is completed satisfactorily. Graphical comparisons between pre-test and post-test scores are shown in Figure 7.1 and for each of the nine competencies.

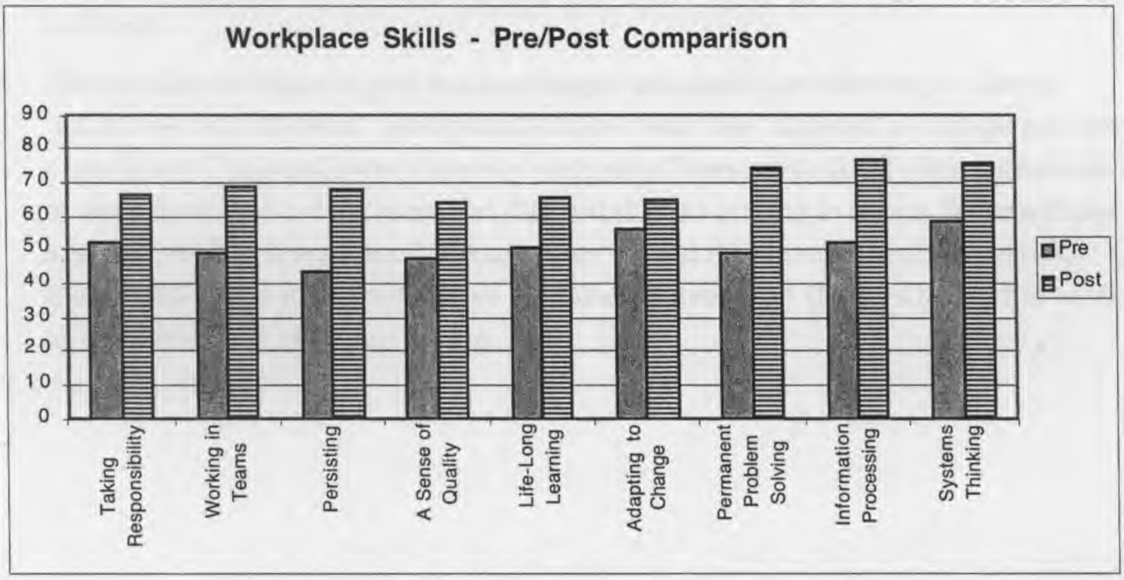


Figure 7.1: Workplace skills - pre-test/post-test comparison

Post score averages were higher and grouped around the high 60s and 70s. The overall increase in means between pre-test and post-test scores was 18%. Table 7.3 is used to rank the pre-test/post-test differences to highlight some interesting points:

- The two largest increases in post scores were gained for *Problem Solving* and *Information Processing*. This was probably a result of a range of student activities encouraging self-regulated learning for both project work and weekly problems. Each week student teams were required to solve weekly problems ("in-tray" on JoePM), as well as regulating individual commitments for the project work. This required collating and synthesising information from a variety of sources, which often required problem-solving skills. So these results would be consistent with the amount of practice performed by the students in these two areas.
- *Systems Thinking* showed a high post score average of 76, though the difference between pre and post scores was only 17, as it started with a high pre score. On average, students perceived that their skills in this area improved, even though they rated them highly in the pre-test. This is probably due to the content of the unit being focused on project management, as well as many learning activities being based on developing a project, which requires students to practice systems thinking.
- *Working in Teams* and *Persisting* also showed a high post score increases. This was probably a result of the unit being highly geared towards teamwork and collaborative activities, that is, 75% of the overall assessment were group based. Through reflective reports and interviews, many students commented that they often worked harder or persisted more in completing tasks when teamwork was involved.
- The smallest increase in post score averages was made for *Adapting to Change*, which assessed students' perceptions of how well they adjusted to change and new experiences. Perhaps lower increases were noted here as students often commented in interviews on how different and difficult it was working in teams "Your actions affect more than one person". Though they valued the experience of teamwork, they realised that it was not simple to make the necessary changes needed to work as an individual, as within a team.

Table 7.3: Ranking of pre-test/post-test differences

Workplace Skill	% Difference in Means
Problem Solving	25
Information Processing	25
Persisting	24
Working in Teams	20
Systems Thinking	17
A Sense of Quality	16
Taking Responsibility	15
Life-Long Learning	15
Adapting to Change	9

t-test Analysis

A number of t-tests were used to compare the pre and post-test scores for each of the nine-workplace skills (Table 7.4). For each scale tested, the t-test showed a significant difference at the 0.01 confidence level, which statistically indicates that the difference in means obtained for each of the nine-workplace skills tested was not due to chance alone. In fact, out of the nine pairs tested, eight of the t-tests showed a significant difference at the 0.001 confidence level ($z<-4.2$, $df=51$, $p<0.001$), except for *Adapting to Change*. However, this was still statistically significant at a 0.01 confidence level ($z=-2.6$, $df=51$, $p=0.009$).

From these results, it can be concluded that the average scores for each of the nine workplace skills, compared from a pre-test at the beginning of semester to post-test at the end of semester, were all significantly different. Statistically, this indicates that the student group perceived an improvement across all skills during the course of the semester.

Table 7.4: t-test results

Workplace Skills	Pair	z score	df	t-test (2-tailed)
Taking Responsibility	1	-4.6	51	p<0.001
Working In Teams	2	-4.9	51	p<0.001
Persisting	3	-6.6	51	p<0.001
A Sense of Quality	4	-4.4	51	p<0.001
Life-Long Learning	5	-4.2	51	p<0.001
Adapting to Change	6	-2.6	51	p<0.01
Problem Solving	7	-5.8	51	p<0.001
Information Processing	8	-7.2	51	p<0.001
Systems Thinking	9	-6.0	51	p<0.001

Generic Skills Perceptions Questionnaire (GSCQ)

The GSCQ is based on an ordinal attitude scale and used a small sample of 13 students, so parametric statistical testing techniques such as Student's t-test could not be used. The five-point attitude scale fell "between an ordinal and interval scale" (Harris, 1995, p.16) with responses ranging from 1 to 5 as shown in Table 7.5.

As reflected by (Harris, 1995), although we cannot be sure that the distance between *Poor* to *Fair* is the same as the distance between *Good* and *Very Good*, it would be reasonable to assume that there is a close relationship between the spacing of possible responses and attitudes being measured. Therefore, by averaging responses, we get results that give a reasonably accurate measure of central tendency.

Table 7.5: Likert scale for GSCQ

Number Scale	Ordinal Scale	Description
1	Poor	Not very good, needs to show improvement
2	Fair	Adequate in some respects but could be improved
3	Good	Has an acceptable skill level in this area
4	Very Good	Always performs well in this skill area
5	Excellent	Excellent in all aspects related to this skill

Data analysis was performed with SPSS (SPSS Inc., 2000) and the resulting graphs were drawn using the charting feature of Microsoft Excel®.

The aim of collecting empirical data collected with this instrument was to track students' perceived changes in generic skill development for self and peers, within their teams. Tests were conducted at the beginning and end of the semester, and based on 12 generic skills deemed appropriate for this unit of study (see Chapter 4). The questionnaire used a five point Likert scale (Table 7.5), and was administered to 13 students, made up of three teams.

This section discusses the results of the GSCQ in two parts. An analysis of pre-score and post-scores will firstly be considered for all thirteen students, followed by an intra-team analysis for each of the three groups.

Overall Focus Group Scores

A comparison of the average pre-test and post-test scores for self and peer assessment is shown in Table 7.6 for the focus group of thirteen students. There were not enough students to use nonparametric statistical tests of significance, so only measures of central tendency were considered for each of the twelve generic skills.

Table 7.6: Pre-test and Post-test differences for GSCQ

Workplace Skills	Pre-test Scores		Post-test Scores		% Difference in Means		Difference in Peer & Self
	Peer	Self	Peer	Self	Peer	Self	
Managing Time	3.3	3.0	3.7	4.0	13	33	20
Taking Responsibility	3.7	3.7	3.5	4.2	-3	12	15
Self-Assessment	3.3	3.5	3.7	4.0	12	16	4
Leadership Skills	3.3	3.3	3.5	3.9	6	19	13
Collaborating	3.7	3.7	3.6	4.2	-4	14	18
Communicating	3.5	3.7	3.5	4.1	3	11	8
Peer-Assessment	3.2	3.4	3.6	4.0	14	18	4
Research Skills	3.3	3.4	3.5	3.8	5	11	6
Synthesising Information	3.6	3.3	3.5	4.0	-3	21	24
Task Management	3.4	3.4	3.4	3.8	1	14	13
Problem Solving	3.5	3.6	3.7	4.1	7	13	6
Task Evaluation	3.2	3.2	3.5	3.8	11	22	11
Averages:	*3.4*	*3.4*	*3.6*	*4.0*	*5*	*17*	*12*

At the beginning of the semester, the students perceived that their self and peers' generic skills were very similar, as reflected by the overall pre-score averages for self and peer assessment being identical at 3.4. In some cases, as for *Synthesising Information* students perceived that their peers had better skills (μ_{Peer}=3.6, μ_{Self}=3.3). The highest average pre-scores for both self and peer assessment was for *Collaborating* (μ_{Peer}=3.7, μ_{Self}=3.7), *Taking Responsibility* (μ_{Peer}=3.7, μ_{Self}=3.7) and *Communicating* (μ_{Peer}=3.5, μ_{Self}=3.7), with almost no difference between self and peer scored shown.

However, the overall average post-scores for self and peers, showed a 12% difference (from 3.6 to 4.0). Over the semester, students' perceptions changed, and they considered their own skills improved to a greater degree than that of their peers. The highest self-scores were obtained for *Collaborating* (μ_{Self}=4.2), *Taking Responsibility*

(μ_{Self}=4.2), *Communicating* (μ_{Self}=4.1) and *Problem Solving* (μ_{Self}=4.1). Peers were perceived as having strengths in different areas, and not to the same degree, which high peer scores obtained in *Managing Time* (μ_{Peer}=3.7), *Self-Assessment* (μ_{Peer}=3.7) and *Problem Solving* (μ_{Peer}=3.7).

A clear trend that emerged was the students' greater perceived improvement in self-skills, compared to their peers' skills. This is consistent for each of the twelve generic skills that showed an overall average increase of 17% for self-improvement, as compared to only 5% perceived improvement for their peers. These results are shown graphically in Figures 7.2 and 7.3. As shown in Table 7.6, the greatest variations in self and peer assessment differences occurred in the following areas:

- *Synthesising Information*, a 24% difference
- *Managing Time*, a 20% difference
- *Collaborating*, a 18% difference

These three generic skills were probably the most heavily practised during the semester by all students than others. The course demanded students continually collaborated, managed their time and collected/synthesised information to produce solutions for weekly tasks and content for their team web sites. Consequently, students continually discussed how team task were affected by these skills (both self and peers) in reflective reports, which may have promoted a perception that their self skills improved for these more than for others.

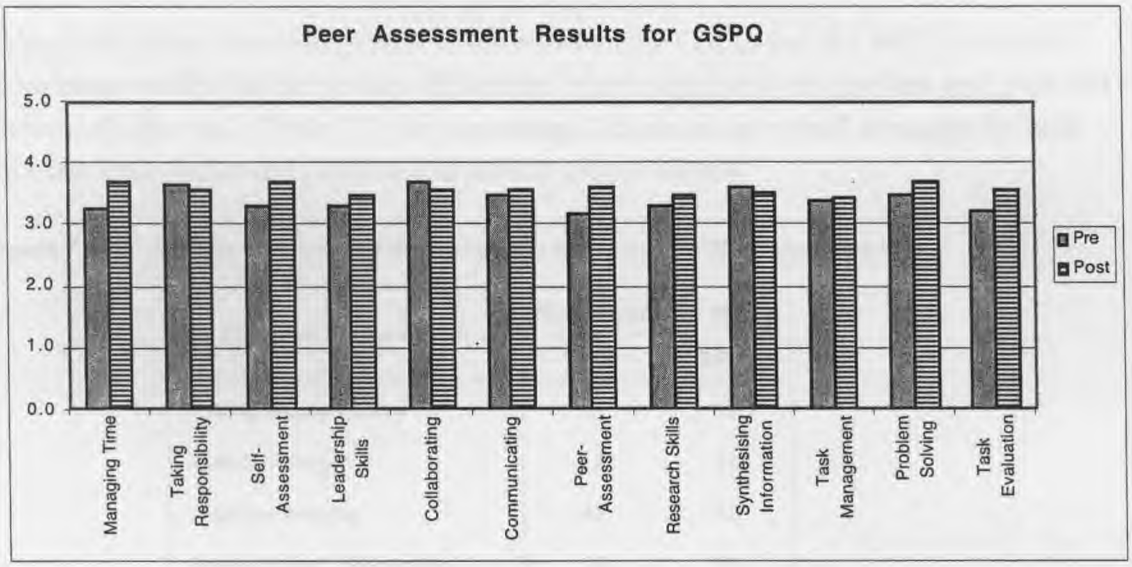


Figure 7.2: Pre-test and Post-test differences for peer assessments

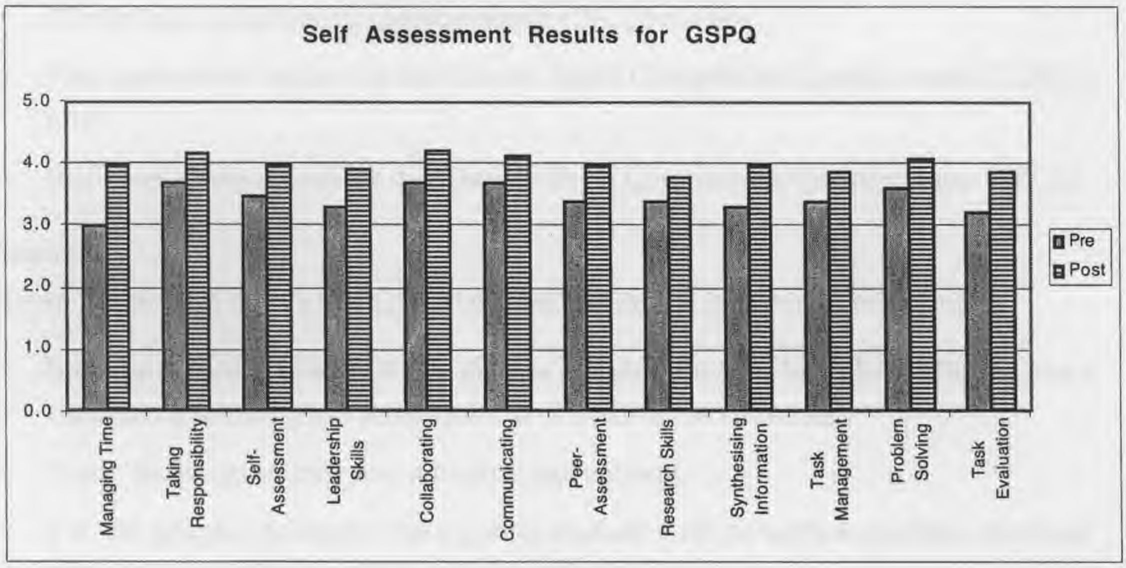


Figure 7.3: Pre-test and Post-test differences for self-assessments

Overall, the results indicate that on average, the students in this focus group perceived that their self-skills improved more than those of their peers. This may have been a result of exposing students to a learning environment that was authentic and self-regulated in nature. Students were required to adapt to this new type of learning through carefully managing their time, synthesising information and collaborating. As they were immersed in practising these skills, most students felt that their self-improvement was greater than peer improvement.

Also, comparing common generic skills between the GSCQ and the WCQ produced consistent results for percentage difference in averages between pre-test and post-test scores. As shown in Table 7.7, the percentage difference in overall averages for both questionnaires showed positive and similar improvement.

Table 7.7: Pre-test and Post-test differences for WCQ and GSCQ on common skills

Common Generic Skills	% Difference in Means	
	WCQ	GSCQ
Taking Responsibility	15	12
Collaborating	12	14
Problem Solving	25	13
Synthesising Information	25	21

Intra-team Focus Group Scores

This section compares intra-team, pre-test and post-test scores for the three teams that made up the focus group. For each team, percentage differences were compared for each team member against:

- Workplace Competency Questionnaire (WCQ) scores;
- Peer assessment scores for the Generic Skills Comparison Questionnaire (GSCQ); and
- Self-assessment scores for the Generic Skills Comparison Questionnaire (GSCQ).

Team 1

Team 1 consisted of five team members, each with the following backgrounds:

- Sue, the project manager was a mature age student who had almost fifteen years experience working in various jobs, and in different countries;
- Nash, the programmer was a mature age student;
- Pat, the graphic designer was a young student with no work experience and had come to university directly from high school;
- Chris, the media developer was a young student with no work experience and had come to university directly from high school; and
- Rose, the instructional designer was a young student with no work experience and had come to university directly from high school.

This team proved to be highly successful in developing quality work, without any team problems. Their journal entries continually reflected positive comments about other team members, and at no stage during the semester was there a request or requirement to peer assess each other, that is, transfer marks from one team member to another due to lack of contribution. This team was always goal focused and continually explored tutor and the unit requirements to enhance their chances of improving grades. At no stage did this team experience any team conflict that they couldn't resolve without tutor moderation.

The average pre-test and post-test scores for self, peer and workplace skills for this team are shown in Table 7.8. This team showed an average increase of 20% for peer scores and an average increase of 30% for self-scores based on the GSCQ. This is complemented with an overall increase in the team's performance of 43% in the WCQ. Figure 7.4 show the percentage differences from pre-test/post-test scores and indicate a clear improvement for all team members across each of the three different tests.

Table 7.8: Average pre-test/post-test differences for team 1

Team Members	Pre Scores			Post Scores			% Pre-test Post-test Differences		
	WCQ	Peer GSCQ	Self GSCQ	WCQ	Peer GSCQ	Self GSCQ	WCQ	Peer GSCQ	Self GSCQ
Sue	66	3.9	3.8	86	4.3	4.5	32%	10%	18%
Nash	73	3.5	3.7	81	4.4	4.1	10%	26%	11%
Pat	51	3.8	2.8	66	4.4	4.8	31%	16%	71%
Chris	53	3.5	3.8	55	4.4	4.2	3%	26%	10%
Rose	31	3.6	3.5	75	4.4	4.8	141%	22%	37%
Averages	*55*	*3.7*	*3.5*	*73*	*4.4*	*4.5*	*43%*	*20%*	*30%*

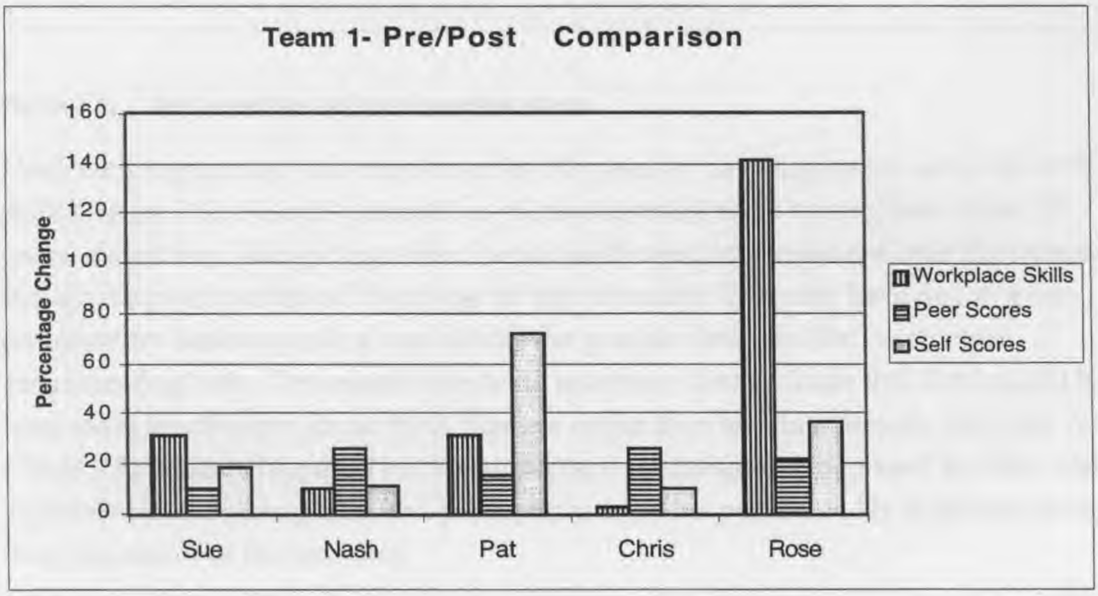


Figure 7.4: Average pre-test/post-test differences for team 1

Sue, the project manager was well accepted by the team in this position, and experienced very few problems in this role. As shown in Figure 7.5, the difference in Sue's pre-test and post-test scores show improvement in both self and peer assessment across most skills. Peer scores show a small decrease for both *Taking Responsibility* and *Collaborating*. However, her own perceptions were that she improved for both of these.

An interesting result is *Task Management,* in which Sue perceived her skills decreased during the semester. This may have been a result of managing a project that involved many tasks, and at the end of the semester coming to the conclusion that: "I can do this a lot better next time!"(interview with Sue). The results from the WCQ (Table 7.8) indicate she perceived her workplace competencies increased by 32%, which was well above the overall average of 18%. This supports her self-perception that her skills did improve over the semester, and shows new confidence to perform better next time.

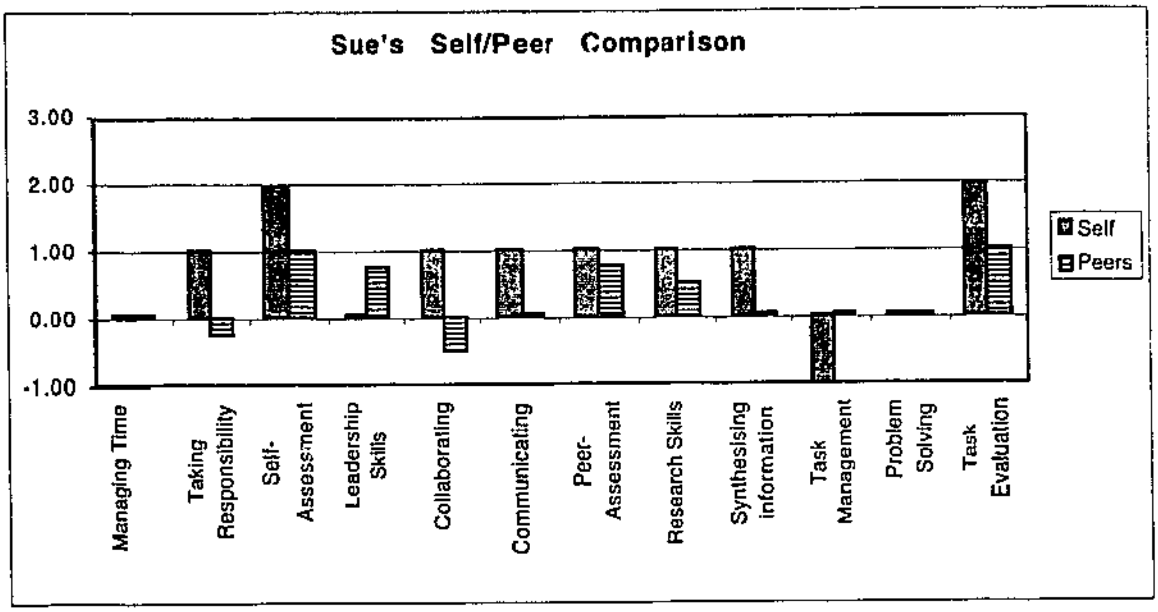


Figure 7.5: Sue's average pre-test/post-test scores

Nash the programmer was considered by his peers to have improved across all of the skills (Figure 7.6). His self-perceptions of improvement were never greater than his peers, except for *Collaborating* where he felt he showed improvement over the semester, though his peers perceived there was no improvement. This may have due to a few outbursts by Nash regarding requests by the graphic designer (Pat) to change programming code. Comments from team interview data indicate that Nash could have been more conciliatory about these changes rather than arguing. Results from the WCQ (Table 7.8) indicate he perceived his workplace competencies increased by 10%, which supports his self-perception, and perceptions from his peers that his skills improved over the course of the semester.

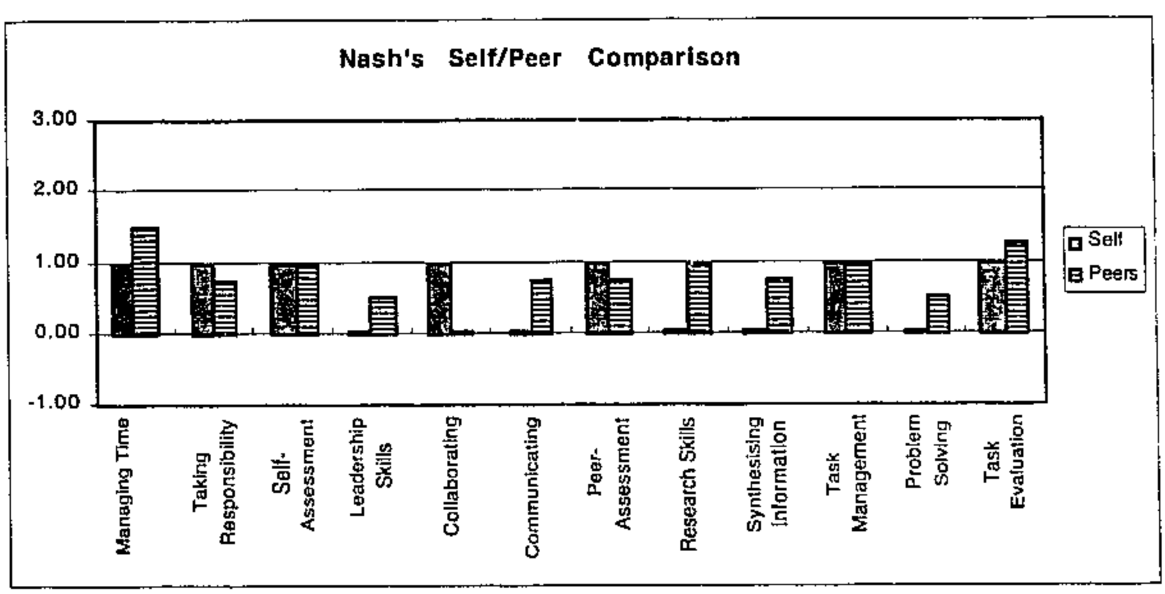


Figure 7.6: Nash's average pre-test/post-test scores

Pat, the graphic designer showed improvement across each generic skill as rated by his peers (except for *Collaborating*), though his own self-assessments were considerably higher in *Self-Assessment, Leadership Skills* and *Task Evaluation* (Figure 7.7). His reflective reports indicate, "I now feel much more confident to take the role of a graphic designer in a multimedia development team", which is reflected in his self-assessment scores. The negative peer score for *Collaborating* was probably the result of an altercation with Nash, the programmer, in which Pat asked for graphic design changes, which caused some problems within the team.

Results from the WCQ (Table 7.8) indicate that Pat perceived his competencies increased by 31%, which was well above the overall pre-test/post-test class average increase of 18%.

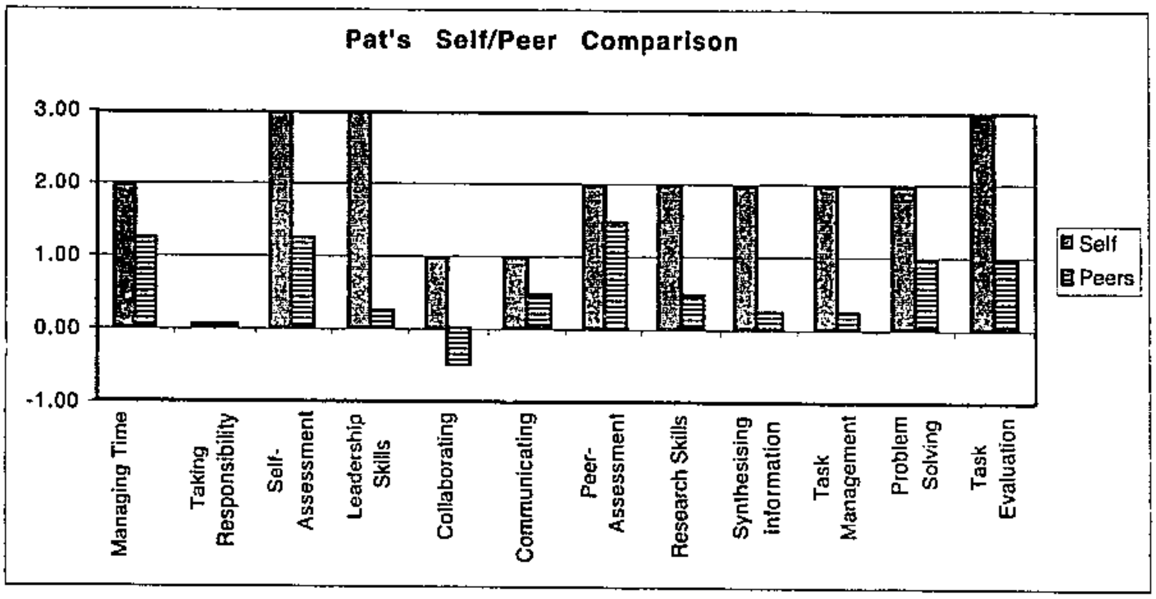


Figure 7.7: Pat's average pre-test/post-test scores

Chris the Media Designer did not show confidence that he developed new skills throughout the semester, though his peers perceived him as having improved in all generic skill areas, except for a small decrease in *Taking Responsibility* (Figure 7.8). This student proved to be very collaborative and sensitive to other team members' needs, and.was very popular with all team members (as reflected in journal entries and interview data).

The results from the WCQ (Table 7.8) indicate that Chris perceived his workplace competencies increased by 3%, which was under the overall pre-test/post-test class average increase of 18%. This small increase in perceived skill improvement is supported by his self-perception that his skills did improve much over the semester. Though a well respected team member, Chris seemed to lack confidence in his abilities as reflected by his self and peer assessment for *Taking Responsibility*.

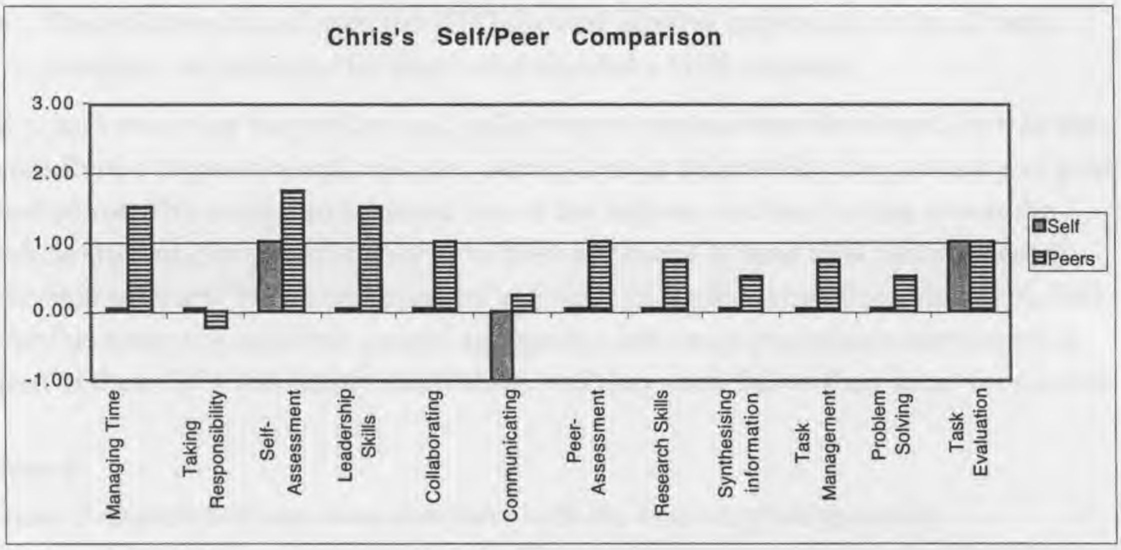


Figure 7.8: Chris's average pre-test/post-test scores

Rose's results show a strong self-perception of improvement (Figure 7.9). Also, her peers marked her positively in all but one skill (*Collaborating*), but only to a minor degree. As shown in Table 7.8, her workplace competencies as assessed by the WCQ increased 141%, which was well above the overall class average of 18%. This strongly supports her self and peers' perception that her skills improved over the semester.

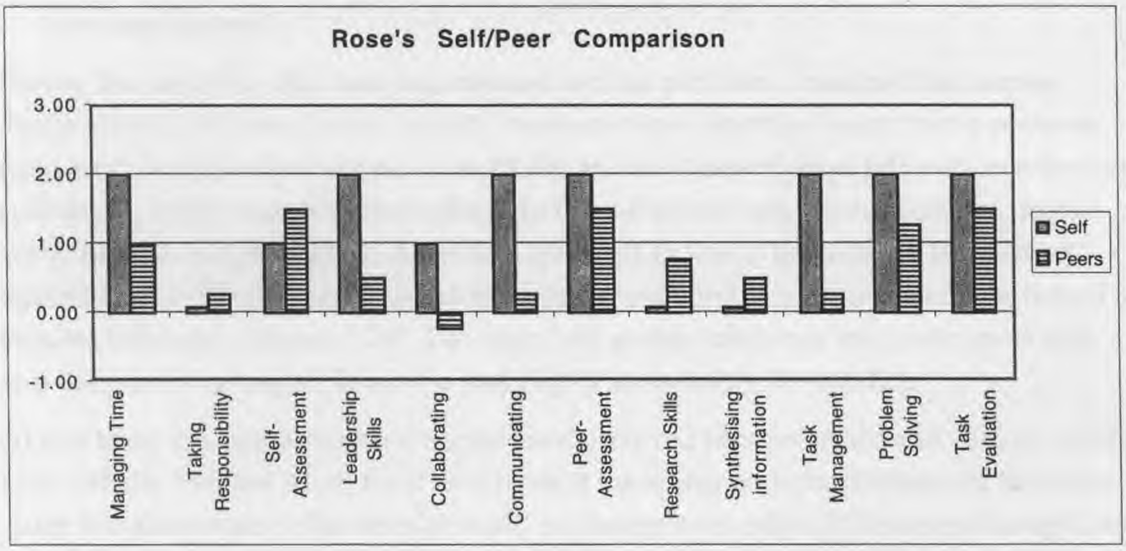


Figure 7.9: Rose's average pre-test/post-test scores

In summary, the following points can be made about Team 1's efforts:

- This team worked well together, with no major disputes or marks transferred between team members during the semester;
- They all perceived that their own and their peers' skills improved during the course of the semester, as measured by the GSCQ; and

- The results returned from the WSQ showed positive improvement for all team members, in particular for Rose, who showed a 141% increase.

It would seem that the positive and collaborative environment developed by this team contributed to positive self and peer perceptions as reflected by the pre-test and post-test scores. This team also achieved one of the highest academic scores across the whole student group, which may have been attributed to their total commitment to develop product "which will promote our skills to the industry" (interview with Pat). For this team, the authentic project and quality assurance procedures developed as part of their CV's was highly motivating, and they used this as their focus for success.

Team 2

Team 2 consisted of four team members with the following backgrounds:

- Lex, the project manager was a young student with no work experience and had come to university directly from high school;
- Alice, the programmer was a mature age female student who had about ten years work experience;
- Jeff, the instructional designer, was a mature age male student who had about seven years work experience; and
- Giff, the graphic designer was also a mature age student who had just gained full time employment.

During the semester, this team experienced serious problems, causing it to become dysfunctional and was forced to split. Problems were identified early in the semester from confidential online journals about Giff, and to a lesser degree Jeff, not contributing sufficiently to the team's overall effort. In tutor-led peer assessment sessions, marks were transferred from Giff to Alice, and from Jeff to Lex to balance the team effort against marks. Even though this resolved some team problems, resentment continued to escalate between Alice and Giff. The tutor had several meetings with team members, and the project manager, Lex, who was highly stressed by the conflict.

At one team meeting a serious disagreement occurred between Alice and Giff, in which Giff verbally berated Alice, from which point there was no reconciliation for the team. After this altercation, Alice felt she could no longer work with Giff, so even though they would all have a heavier workload, the team unanimously agreed to split and form two separate teams, with three in one team and Giff forming a team on his own.

The average pre-test post-test scores for self, peer and workplace skills for this team are shown in Table 7.9. This team showed an average decrease of -19% for peer scores and an average increase of 10% for self-scores based on the GSCQ, which clearly demonstrate pessimistic team attitudes. Also, this team went against the class trend for the WCQ average improvement of 18% with a score of –1%. From the three tests, only self-scores showed improvement of +10%. The pre-test post-test differences are shown graphically in Figure 7.10.

Table 7.9: Average pre-test/post-test differences for Team 2

Students	Pre-test Scores			Post-test Scores			Pre-test/Post -test Differences		
	WCQ	Peer GSCQ	Self GSCQ	WCQ	Peer GSCQ	Self GSCQ	WCQ	Peer GSCQ	Self GSCQ
Lex	62	3.2	3.5	35	2.8	3.3	-43%	-13%	-6%
Alice	68	3.5	3.1	76	2.8	3.8	11%	-20%	23%
Jeff	57	3.0	3.7	59	3.4	3.9	4%	13%	5%
Giff	34	2.9	3.0	44	1.3	3.2	25%	-55%	7%
Averages	*55*	*3.2*	*3.3*	*53*	*2.6*	*3.6*	*-19%*	*10%*	*-1%*

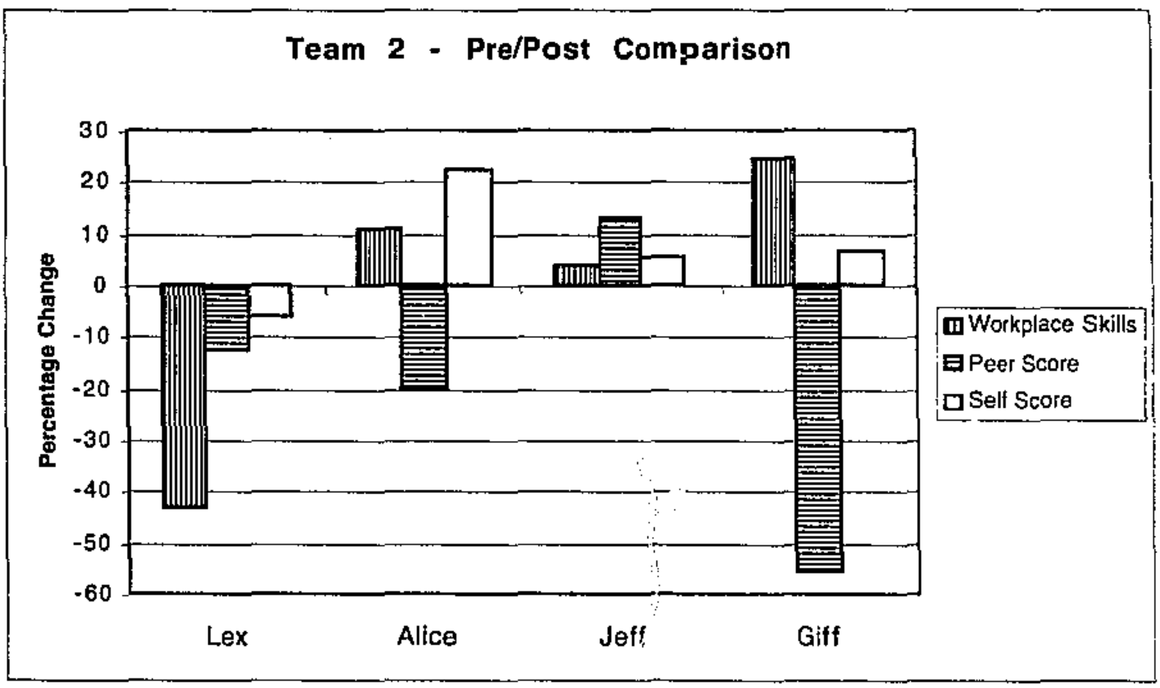


Figure 7.10: Average pre-test/post-test differences for Team 2

As shown above, the comparative pre-test/post-test results for this team were more negative than positive, which was an unexpected result. All team members, except for Jeff (who was not involved in the team's dispute) obtained negative pre-test/post-test peer scores. This team split up half way through the semester, with one team member, Alice, wanting to take legal action against Giff. It was only due to much counselling from the tutor that legal action was eventually avoided. However, the situation caused much stress and anxiety for the whole team, including the tutor!

Lex, the Project Manager was a young female student (straight from school) who had no previous work experience and was managing three others who were older than her.

However, it was her preferred choice to take this role, and she strongly committed to the required project manager responsibilities in the *Team Contract*. Alice and Jeff were mature age full time students, who had previously worked in industry, as was Giff, though he was a part-time student, with a full time job in the multimedia industry.

A comparison of Lex's pre-test and post-test scores, illustrated in Figure 7.11, shows that her own and her peers' perceptions about her performance dropped in almost every skill. The only two skills that she perceived to improve, where her *Time Management* and *Task Management*. Also, from the whole student cohort of 51 students who participated with the WCQ, Lex obtained the greatest overall decrease in pre-test/post-test scores of 43% (Table 7.9). It would seem that the trauma of managing a team that experienced major conflict had quite a negative effect on her perceptions about her skills.

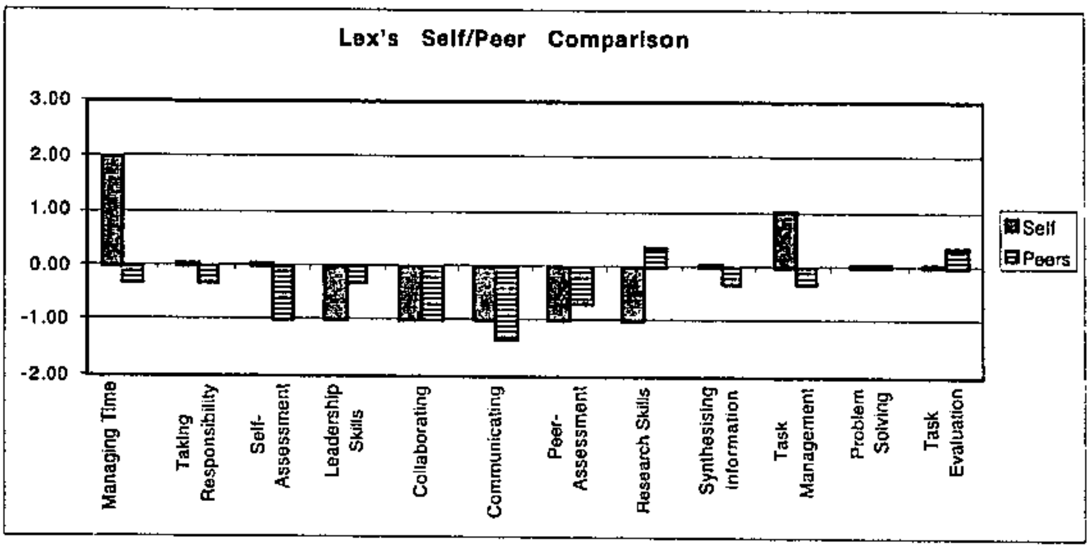


Figure 7.11: Lex's average pre-test/post-test scores

A more detailed look at Lex's self and peer assessment scores without averaging is shown in Figure 7.12, as in this case some data sensitivity is lost by averaging the team scores. It shows mainly positive scores from Alice, but negative from both Jeff and in particular, from Giff. This is a result of Lex and Alice remaining close friends during the semester, and supporting each other during team conflict that erupted with Giff. So, to some degree team members "taking sides" in conflict situations may have biased this data a little. However, in this case, perhaps the opposite opinions of Alice and Giff may have balanced the overall average.

Clearly, Giff perceived that Lex's overall performance deteriorated across all generic skills during the semester, though his judgement may have been clouded by the conflict and arguments he was involved with.

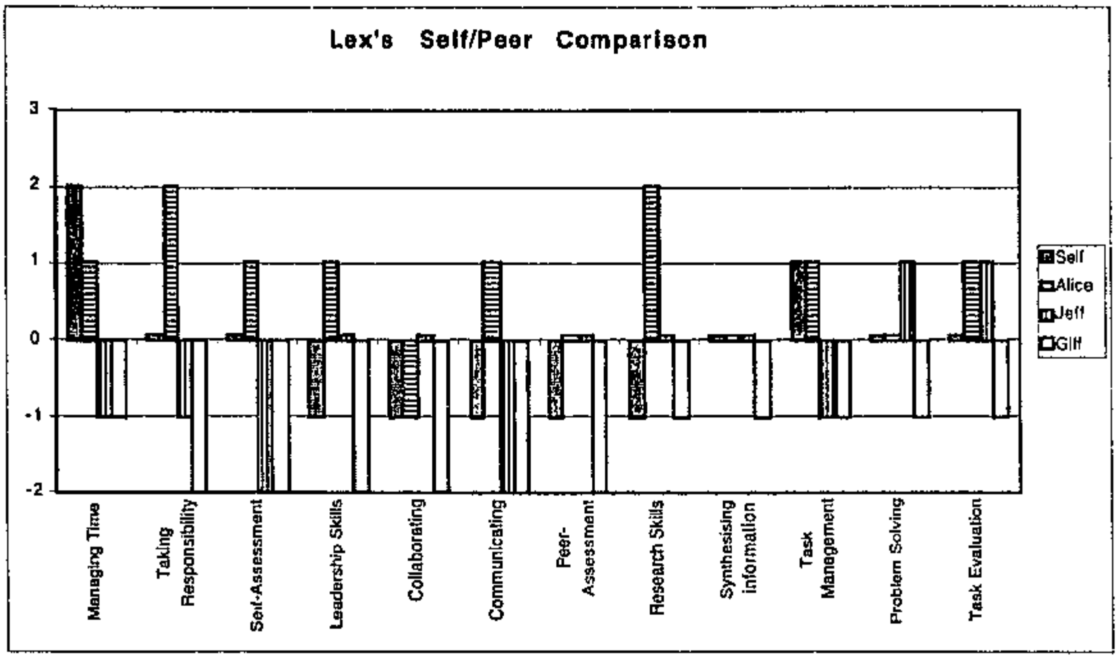


Figure 7.12: Lex's self and individual peer scores

Jeff, the instructional designer showed improvement across each of the skills rated by his peers (except for a small decrease in *Peer Assessment*), though he perceived his skills deceased for both *Taking Responsibility* and *Self-Assessment* (Figure 7.13).

As shown in Table 7.9, his workplace competencies as assessed by the WCQ increased 4%, which was below the overall class average of 18%. This team member kept a very low profile when conflict occurred and was always very diplomatic and non-committal when asked for opinion on team conflict issues.

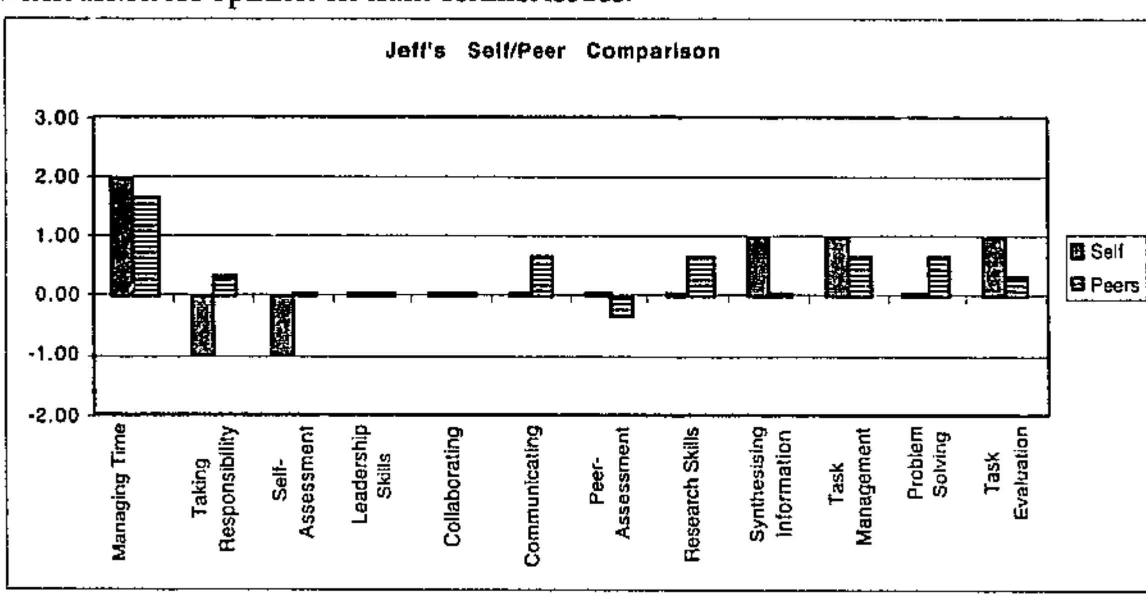


Figure 7.13: Jeff's average pre-test/post-test scores

Comparisons of Alice's pre-test and post-test scores are shown in Figure 7.14. These illustrate a wide disparity on skill improvement between self and peer perceptions. In the first part of the semester, Alice was thoroughly enjoying this unit, however after having a major disagreement with Giff she almost dropped out of the unit. However, a few weeks after the team split (and Giff was removed from the team) she showed new confidence. She enjoyed the principles learnt for developing project management quality assurance procedures, and "could really see the benefit in using these in a productive manner in many aspects of day to day living" (interview with Alice). So, even though she experienced major problems early in the semester, she felt that the skills she developed were valuable for the future.

As shown in Table 7.9, her workplace competencies as assessed by the WCQ increased 11% over the semester, which is consistent with her self-perceptions that most of her skills improved.

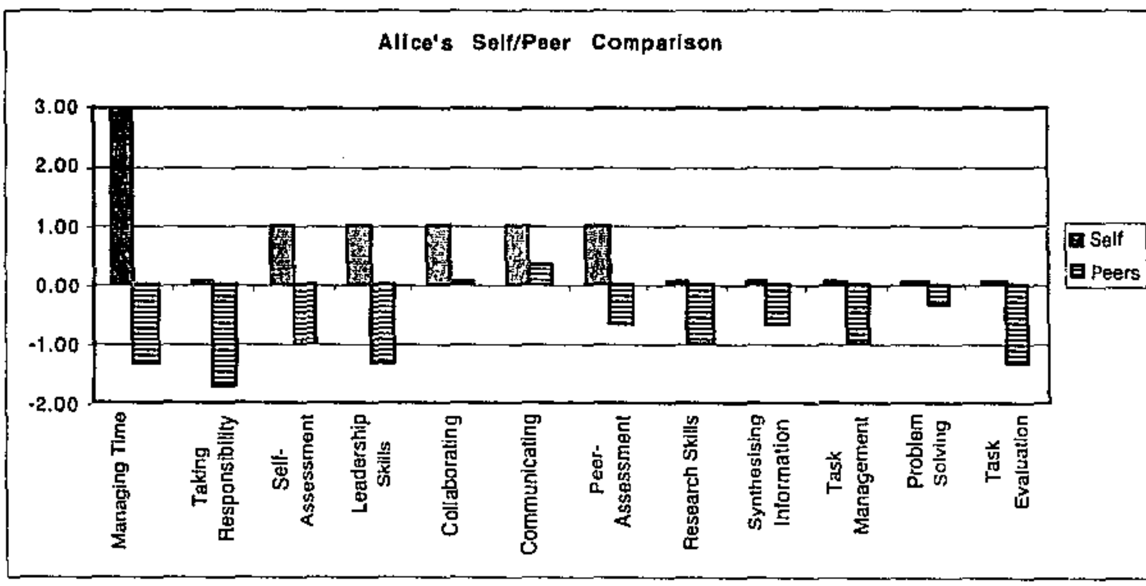


Figure 7.14: Alice's average pre-test/post-test scores

Comparisons of Giff's pre-test and post-test results are illustrated in Figure 7.15. These show unanimous opinion by peers that his skills decreased over the semester, which are directly attributable to the conflict that erupted with Giff and Alice, and had a strong influence on the rest of the team. Also, early in the semester, marks were transferred from Giff to other team members for his lack of contributions toward weekly tasks and project development. Giff was of the opinion that the team put too much effort into meetings, and also didn't like the style used to collect and synthesise information. However, the rest of the team simply perceived him as not wanting to contribute to the team effort.

The results from the WCQ (Table 7.9) indicate that Giff perceived his workplace competencies increased by 25%, which was well above the overall pre-test/post-test class average increase of 18%. This may have been a result of having to manage all the team tasks by himself and obtaining a satisfactory pass in the unit, after the stressful situation he experienced when the team split. From interview comments, it was clear that he considered that approach he had taken after the team was split was more effective and highly efficient on time utilisation. Also, he produced many reflective reports discussing the conflict and how this may have been prevented.

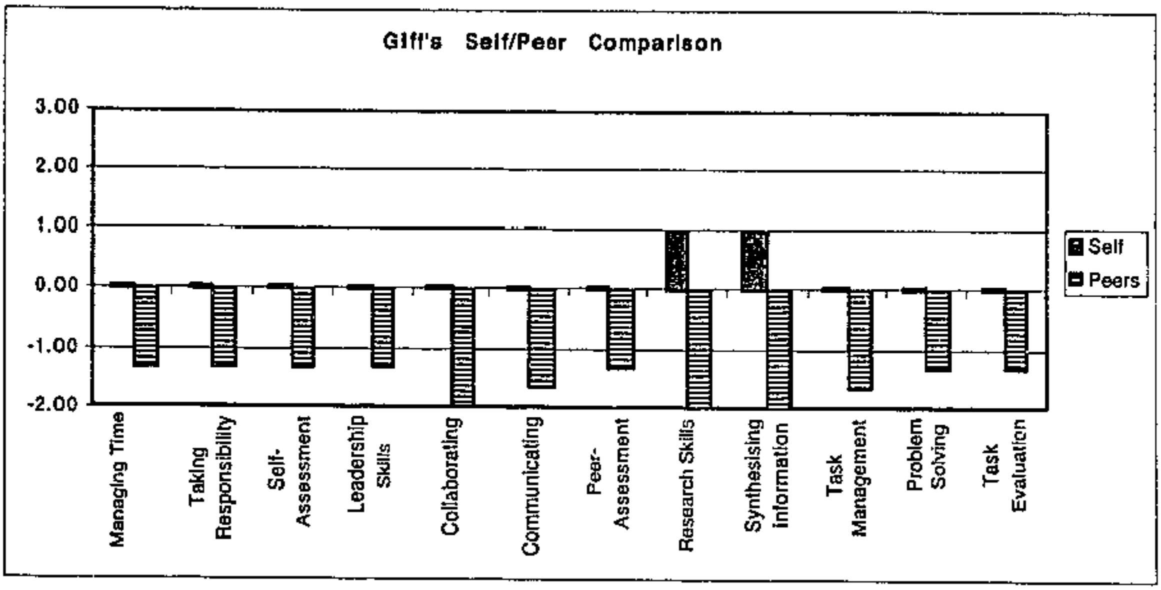


Figure 7.15: Giff's average pre-test/post-test scores

In summary, the following points can be made about Team 2's efforts:

- This team experienced major conflict during the semester, which caused much stress, and forced the team to split;
- They all mainly perceived their peers' skills decreased during the course of the semester, and their self skills showed only slight improvement, as measured by the GSCQ; and
- The results from the WSQ pre/post test (Table 7.9) showed only slight improvement all team members, except for Lex, who showed a significant decrease of 43%.

It would seem that the stress caused by this team's major disagreement between Alice and Giff, led to an overall negative perception about self and peer skills within this team. However these results would have been coloured by team conflict, and possibly does not represent a true indication of how skills changed. For example, Giff's WCQ score and self-GSCQ score increased, but the GSCQ score as rated by his peers dramatically decreased over the semester.

Team 3

Tea; n 3 consisted of four team members with the following backgrounds:

- Liz, the project manager was a young student with no work experience and had come to university directly from high school;
- Suzie, the programmer was a young student with no work experience and had come to university directly from high school;
- Bob, the instructional designer, was a young student with no work experience and had come to university directly from high school; and
- Don, the graphic designer was a mature age student and had a few years work experience.

This team also experienced some team problems, though not as serious as team 2. One team member (Don), did not contribute to the overall team effort as much as the others, which resulted in a number of tutor-led peer assessment sessions to transfer marks from him to other team members. His lack of effort became evident early in the semester through the online weekly journal entries entered by his peers, which reflected his lack of effort and commitment to team effort and team meetings.

The average pre-test/post-test scores for self, peer and workplace skills for this team are shown in Table 7.10. The overall pre-test/post-test averages for this team are all positive, with an average increase of 5% for peer scores and an average increase of 10% for self-scores. This is complemented with an overall increase in the team's performance of 39% in the workplace skills survey. Figure 7.16 shows the percentage differences from pre-tests/post-tests for each team member.

Table 7.10: Average pre-test/post-test differences for Team 3

Students	Pre-test Scores			Post-test Scores			Pre-test/Post –test Differences		
	WCQ	Peer GSCQ	Self GSCQ	WCQ	Peer GSCQ	Self GSCQ	WCQ	Peer GSCQ	Self GSCQ
Bob	47.0	3.5	3.2	58.0	3.5	3.4	24	5	6
Liz	33.0	3.2	3.5	57.0	3.5	4.0	73	9	14
Suzie	40.0	3.1	3.3	62.0	3.8	3.8	55	23	15
Don	74.0	2.4	3.8	78.0	2.1	4.0	5	-16	5
Averages	*48*	*3.1*	*3.5*	*64*	*3.2*	*3.8*	*+39%*	*5%*	*10%*

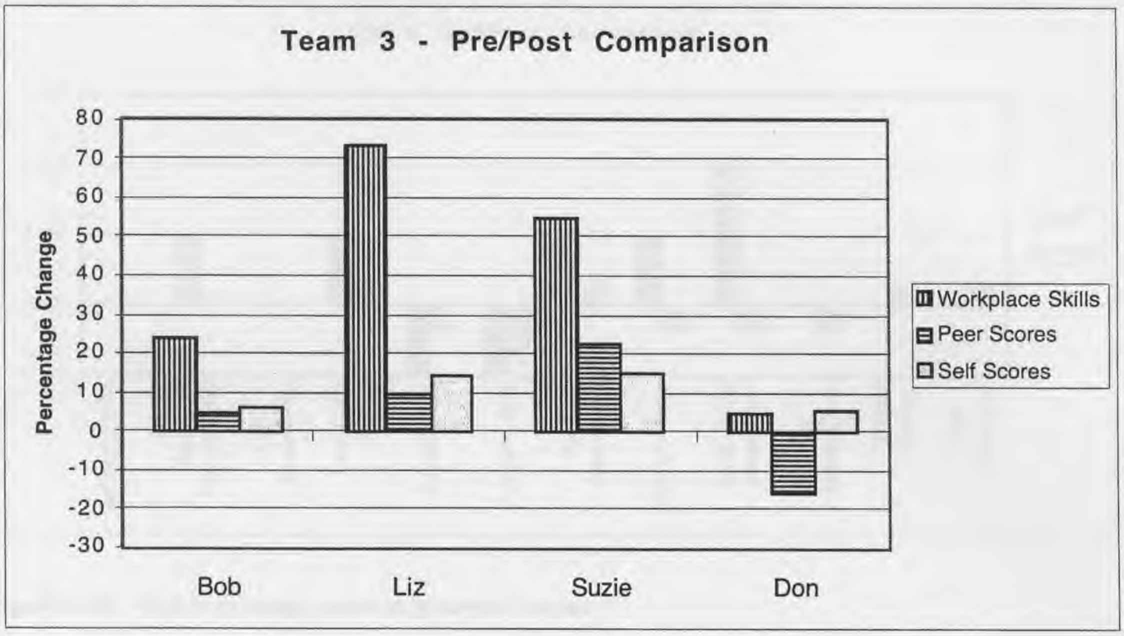


Figure 7.16: Average pre-test/post-test differences for Team 3

The comparative pre-test/post-test results for this team were all positive, except for Don, who obtained a negative peer assessment. This was a predictable result as the rest of the team made many comments about Don's lack of commitment to the team through their weekly journals entries, and enforced team peer assessment during the semester, which resulted in marks being transferred.

Bob, the instructional designer did not show much improvement across his skills as perceived by his peers (Figure 7.17), though his self-perception was that his skills increased for *Synthesising Information, Research Skills, Taking Responsibility* and *Leadership Skills.*

The results from the WCQ (Table 7.10) indicate that Bob perceived his workplace competencies increased by 24%, which was above the overall pre-test/post-test class average increase of 18%. Though not the project manager, this team member displayed leadership skills, and from interviews, regretted the fact that he had not taken on the role of project manager. He wrote many reflective reports discussing how improvements could be made and provided a balanced viewpoint on team member contributions through his online journals.

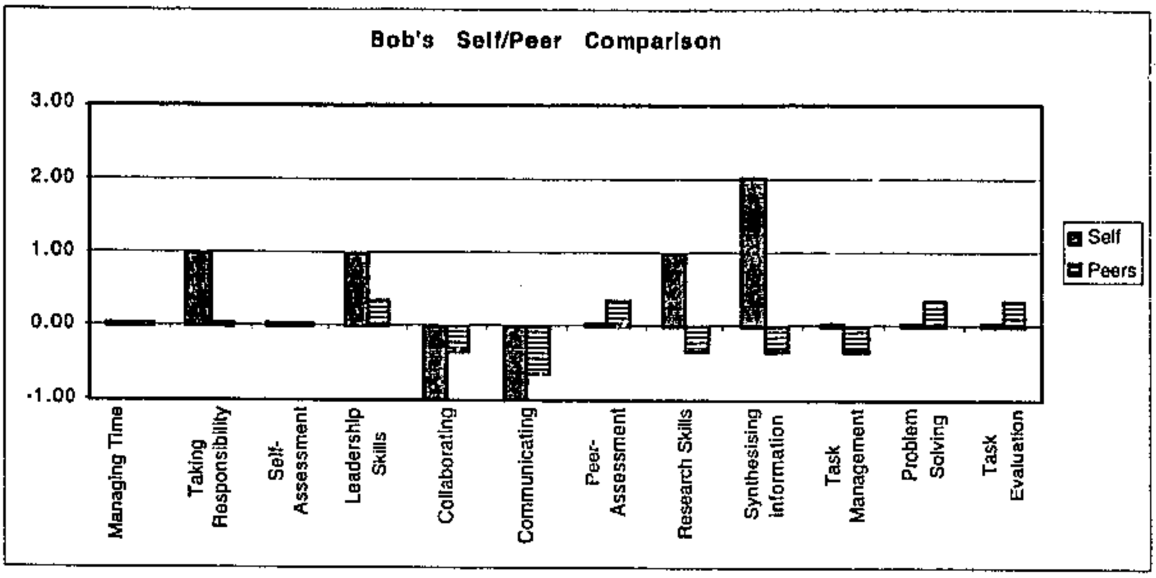


Figure 7.17: Bob's average pre-test/post-test scores

Liz, the project manager showed improvement across all skills as rated by her peers and her own self-assessment (Figure 7.18). The results from the WCQ (Table 7.10) indicate that Liz perceived her workplace competencies increased by 73%, which was well above the overall pre-test/post-test class average increase of 18%. This may have been a result of initially not wanting to be the project manager of the team, and then having her confidence increase throughout the semester, as she managed to solve problems, as reflected in her online journals.

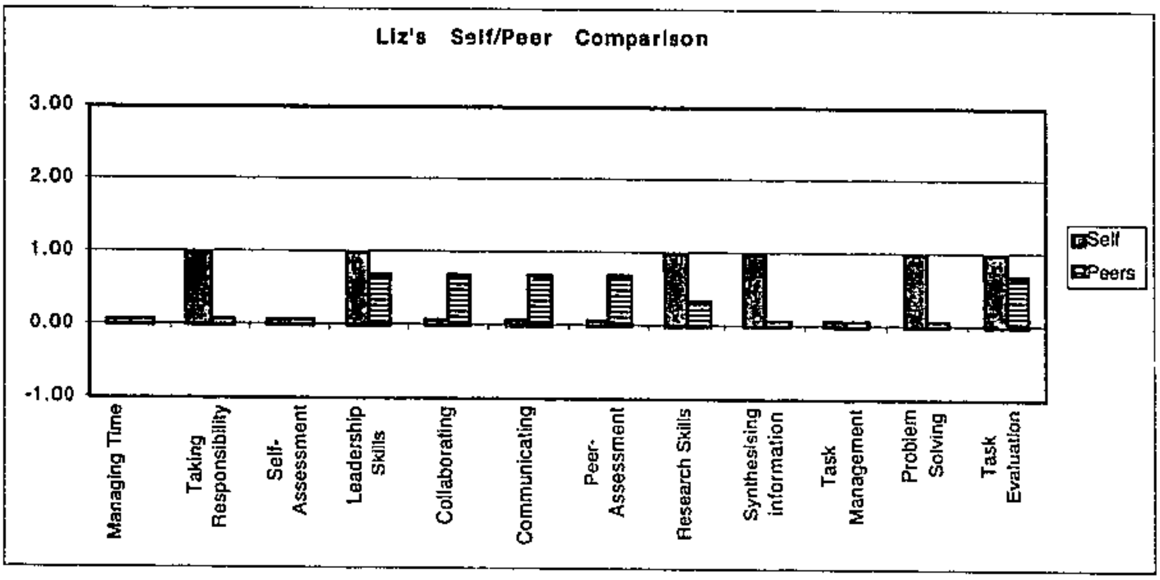


Figure 7.18: Liz's average pre-test/post-test scores

Suzie, the programmer showed improvement across all skills as rated by her peers and her own self-assessment (Figure 7.19). The only skill that she perceived to be less effective in was her research skills, which may have been caused by her team achieving only average grades for weekly problem solving activities, for which she took a lead role in organising.

The results from the WCQ (Table 7.10) indicate that Suzie perceived her workplace competencies increased by 55%, which was well above the overall pre-test/post-test class average increase of 18%. This may have been a result of her increased confidence in her ability to take the role of programmer in a multimedia development team. As reflected in interviews, the team member was initially unsure about what team role she most suited to. Having had success during the semester in this role increased her confidence and perceptions about her skills are reflected in the WCQ results.

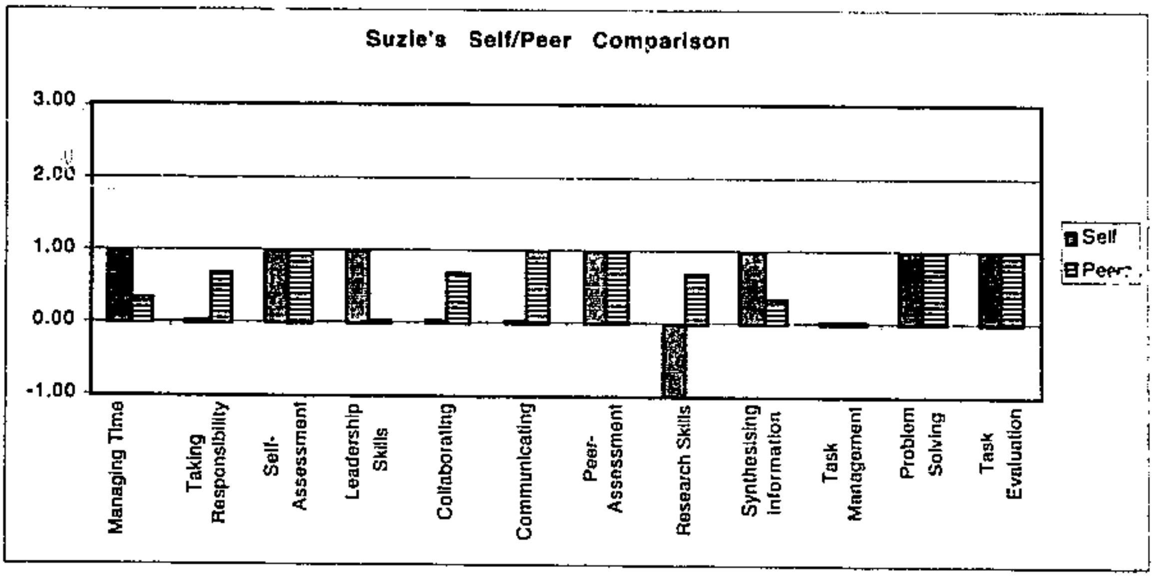


Figure 7.19: Suzie's average pre-test/post-test scores

A comparison of Don's pre-test and post-test scores, illustrated in Figure 7.20, shows almost unanimous peer perception that the skills being tested for Don decreased over the semester. This was directly attributable to Don not performing to the team's expectations, and having marks taken and re-distributed to other team members for lack of effort. However, even though this occurred early in the semester, he continued to not contribute to the team's expectations, and was continually criticised for his performance throughout the semester.

The results from the WCQ (Table 7.10) indicate that Don perceived his workplace competencies increased by 5%, which was below the overall class average of 18%. This may have been a result of the negative peer assessment he obtained throughout the semester.

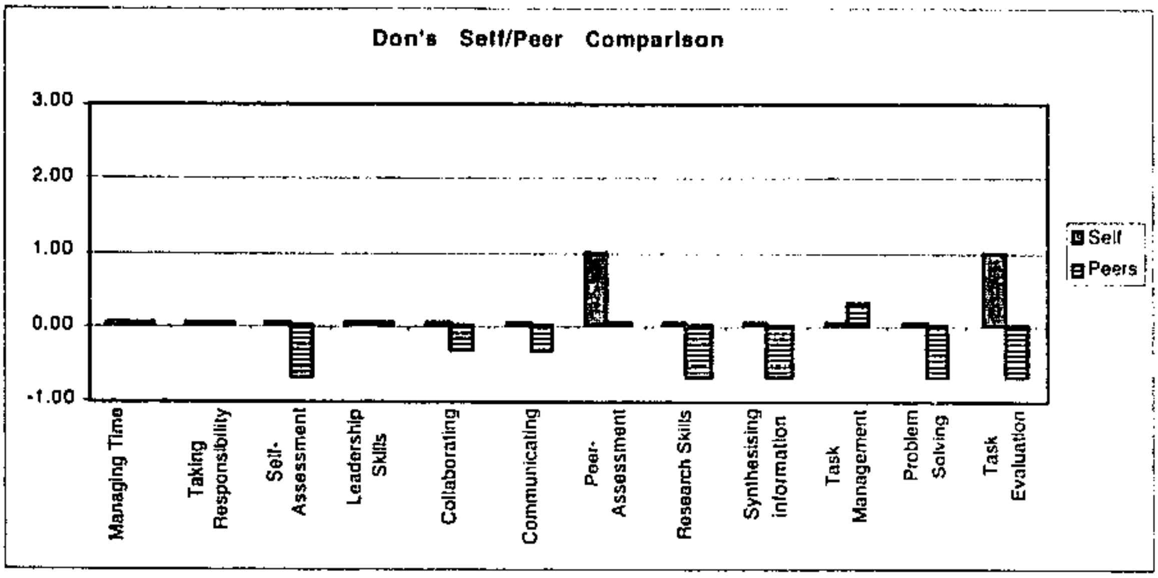


Figure 7.20: Don's average pre-test/post-test scores

In summary, the following points can be made about the efforts of Team 3:

- This team experienced some problems during the semester with one team member who was peer assessed, but continued not to contribute during the semester;
- As measured by the GSCQ, they all perceived their peers' skills and the self skills increased during the semester, except for Don; and
- The results from the WSQ showed much improvement across most team members.

Except for Don, this team showed an increase in perceived skills across each of the three tests.

Summary

This chapter analysed pre-test/post-test scores from two different questionnaires in considering what generic skills changes may have occurred during the semester.

The whole student group was asked to participate in the Workplace Competencies Questionnaire, which resulted in 51 students completing a pre-test and post-test during semester 1, 2001. This instrument assessed students' generic skills across nine scales, with six test items in each scale. This data was analysed for significant differences using SPSS (Paired-Samples t-test). The results produced a significant difference increase across each of the nine-workplace competencies. Statistically, the WCQ clearly illustrated that students exposed to the learning environment, showed a significant increase in each of the nine generic skills over the duration of the semester.

Also, a Generic Skills Comparison Questionnaire was given to three focus teams (thirteen students) at the beginning and end of the semester. The instrument was based on a five-point Likert scale designed to measure differences in student opinions about their self and peers' generic skills over the duration of the semester. An increase of 14%

was obtained in pre-test/post-test scores across all focus team members. However, no tests of significance were used with this data, as the sample size was too small and ordinal in nature. However, it was interesting to note that teams which experienced little or no conflict, scored higher for all tests. One team that experienced major conflict performed badly, particularly with peer assessment.

From the above results it can be concluded that the learning environment used to teach students project management, was effective in promoting the development of students' generic skills. Burns (1994) points out that quantitative research methods incorporate objectivity, reliability, generality, and reductionism. He contends that "Truth" within this paradigm tends to be "fixed and singular, reflective of a casual and factual view of society" (p.3). The reasonable conclusion presented from the quantitative research and analysis conducted in this study reflects that over the duration of the semester, students within this course perceived that their generic skills significantly improved.

7.2 Critical Overview and Strategies for Improvement

An analysis of collected data helped identify overheads incurred in implementing the learning environment, and how it could be modified for mainstream usage. Based on feedback collected from a variety of sources, it was evident that students and tutors considered the learning environment was highly successful in promoting student motivation and learning. However, some issues were identified through the analysis that would help make the learning environment more sustainable for both students and tutors. These were related to:

- Reducing the effort requirement for both students and tutors;
- Self and peer assessment strategies; and
- Technology issues.

The rest of the chapter considers each of these and discusses strategies on how modifications could be made to make the learning environment more acceptable and usable.

Reducing Effort Required by Students

Students were required to track time spent on each activity and record times in an online timesheet database within pre-defined categories. This enabled students to carefully track time to help develop metrics for costing future jobs. Table 7.11 shows a consolidation of timesheet data for the three focus groups, which is summarised across six headings, showing time spent on: weekly problems, R&D for team role, meetings, PM activities, development tasks and reflective activities.

Using this information the following observations were made:

- Development tasks took the most time at 48%;

- Team meetings took 12% of the time;
- Weekly problem solving took 12% of the overall effort;
- Project management activities took 8% of the overall effort; and
- Reflective activities took 9% of the overall effort (intra and inter-team self/peer assessment).

Table 7.11: Analysis of student time utilisation

	Team 1		Team 2		Team 3		Average
	Hours	%	Hours	%	Hours	%	%
Weekly Problems	34	5	156	19	59	11	12
R&D for Team Role	81	12	86	11	62	12	11
Meetings	77	11	106	13	69	11	12
Project Management Activities	68	10	59	7	38	6	8
Development Tasks	378	55	321	40	313	49	48
Reflective Activities	52	8	79	10	52	10	9
Total for Team	690	100	807	100	593	100	100
Hours per Student (Average)	172		202		148		

There were great variations in the amount of time used by each team. On average, each team member of Team 2 used 54 hours more than Team 3, and 30 hours more than Team 1. Though, this team achieved grades ranging from 80% through to 91%, whereas, Team 3 achieved grades ranging from 62% through to 72%. So in this case the amount of effort put into the unit directly influenced the grades of the team.

However, it is worth considering how much time these students should be spending in a 3 hour unit? These students have 13 weeks of contact time. At 3 hours per week, this equates to 39 hours of lecture and tutorial time across the full semester. Edith Cowan University policy dictates that students are expected to put in twice as much as this of their own time. So, in this case students would be expected to put in approximately 78 hours extra above their contact time of 39 hours.

However, in this unit all three teams put in much more than 78 hours. Team 2 almost trebled the course expectation with 202 hours, and Team 3, which put in the least amount of time almost doubled this figure with 148 hours. These figures support comments made by many students that the unit was too time intensive. For example, Sue considers that this unit may have been responsible for some students dropping out of other units when they realised the enormity of the commitment needed to complete this requirements:

> *It's like if you're working part-time or something you might schedule some other units to go along with this one. But when you get into this unit and realise how much work is needed, I think that lots of students withdrew from other units, or just really slacked of in them to make ends meet in this unit.* (Interview with Sue)

Many other students made similar comments about the time intensive nature of this unit. For example, Pat discusses how he found it difficult to combine work commitments, family life and two other units with this unit. Even though he enjoyed doing the unit and recognised it as being highly relevant, he found it caused him much stress due the high time commitment needed:

> *One of the things about learning is that if it's relevant to your life and getting a job, then you are going to want to spend time on it, and learn a lot more from it. That's exactly what happened in this unit, though the extra time needed caused a fair amount of stress in trying to get all the other things done.* (Interview with Pat)

Even though students generally appreciated the unit helped improve their skills, most of the students resented the fact that it required a heavy time commitment. The two main criticisms were focused on the weekly problems and using the online timesheet system. These are discussed below with suggestions for possible improvements that would reduce student time.

Weekly Problems

Weekly problems were implemented to help students engage with unit content to help them learn required concepts needed for managing the development of their project. However, the amount of time needed to solve these weekly tasks was often cited by students as excessive and annoying. For example, Bob discusses how these tasks often distracted him and his team from the main project task of building a web site.

> *The weekly problems were a bit of a pain. They would often interfere with the main project task of doing building the web site. Our team would sometimes have to stop what it was doing on the project and work on the problems. It made it messy and very time consuming.* (Interview with Bob)

So, the paradox becomes how to get students to engage with this content, and still integrate into with the project work. One possible solution would be to integrate the weekly problems with the three assignments. For example, Assignment 1 would consist of three separate submissions:

- Quality assurance procedures (Week 5 – 10 marks)
- Executive summary, schedule, cost and legal issues (Week 6 – 15 marks)
- Design specification (Week 7 – 10 marks)

Assignment 2 would contain:

- Evaluation (Week 13 – 10 marks)
- Post Mortem and metrics developed (Week 14 – 10 marks)
- Presentation of rapid prototype (Week 15 – 15 marks)

In this scenario, students would still be required to post submissions to the online *Conference Centre*, view and assess others solutions. However, these would replace the weekly problems, which would save much time. This would save each team approximately 6-7 hours of time each week (Table 7.11)

Online Timesheet System

The online timesheet system was developed with a view of providing team members with access to a central timesheet application that would consolidate timesheet entries for project managers. However, this system proved to be ineffective and caused students to spend much time in entering, managing and then printing the consolidated timesheets.

Most students presented a negative view of the online timesheet application, and weren't enthusiastic to use it. For example, Scott the project manager of his team discusses how each week all of the team members would enter their time sheets into the online application, by collating totals in sub-categories, and then individually each of these. The project manager had to then view these by making a series of database calls, which was time consuming. Even worse, it was difficult to export this data into a spreadsheet to produce graphics and develop metrics:

> *I found it a really ineffective system. Everybody had to collect their times during the week in the set sub-categories and then enter it into the database at the end of the week. The problem was it you needed to make a entry for each of the sub-categories. This was pretty time consuming. Then the project manager had to access each sub-category to see exactly were the time was spent. Again this was time consuming. But the worst thing was getting the stupid thing to export the data in CSV format. That was really hard and not really worth the trouble in trying to get all the sub-categories. It would have been easier just collating it all in Excel from the very start.* (Interview with Scott)

A simpler, more effective method would be for students to use a Spreadsheet. This would allow them to enter and consolidate their times, and at the same time practice using spreadsheets, which is a valuable skill needed in the industry. Based on the collected data, this change would save each team about 2 hours of time each week.

Reducing Effort Required by Tutors

Five tutors were involved with the delivery of the unit. They all considered the learning environment was highly stimulating for the students, though found it very time intensive, particularly with the assessment requirements. These tutors were paid for two hours of work each week over 14 weeks - a total of 28 hours. The pay rate is $65 per hour which includes loading for extra time needed for marking. So, any extra marking or assessment is performed in their own time.

All of the tutors made comments made about the unit taking more time than they were paid for. For example, comments made by this tutor are reflective of comments made by the others. He discusses the lack of remuneration given the large amounts of assessment performed in the unit. However, he also compliments the design of the learning environment as being effective for engaging the students:

> *Pay tutors more for assignment marking! Because of the nature of the assessment used in this unit, which includes marking project management procedures, problems, presentations, documentation and also web sites there are huge amounts of material that require comparatively longer marking time than in other units. Otherwise, I really loved doing this unit, and it's great. When it's tweaked and massaged to perfection it will be a great tool. It's easy, fun and effective and engages students in learning.*
> (Extract from tutor questionnaire)

Clearly, the design of the learning environment resulted in tutors working too many hours. The following strategies could be implemented to help reduce the tutors' workload:

- Remove the weekly assessment tasks and replace them with assignment modules. Tutors would then only have to perform six rather than sixteen assessment tasks. On average, this strategy should save tutors approximately one hour of time each week;
- Enhance the technology to automate journal feedback to show the team feedback, as well as average peer mark for each student;
- Promote the use of Bulletin Boards to encourage students to help other students;
- Set up an online FAQ section to provide answers to frequently asked questions;
- Provide examples of work, grades received, and tutor comments from previous students; and
- Provide students with clear instructions to help remove any ambiguity from the given instructions.

Self and Peer Assessment Strategies

Even though most students appreciated the reasons for having self and peer assessment, they had concerns about the implementation strategies for both intra-team self/peer assessment using online journals, and inter-team self and peer assessment using the bulletin boards.

Intra-team Self and Peer Assessment

Students were required to reflect on their own and peers' performance during the week, and using the online journals send these to their tutor (in confidence). The tutor then considered these, and if a problem existed would ask targeted students to defend the allegations, or suffer penalties. Some students found this form of peer assessment stressful, embarrassing and in some cases unfair. For example, in one team of four students, two were close friends and bandied together against another team member. Giff felt this situation was totally unsatisfactory as he found it difficult to defend himself against two friends:

> *I felt really uncomfortable at the tutor led peer assessment session. I had to defend myself against things that they sort of made up between themselves. Together they put forward a convincing argument that I wasn't working hard enough, which was pretty exaggerated. I really don't think it was fair.* (Interview with Giff)

In another different team, Helen became very upset with the peer assessment and complained to the course coordinator. She felt that she had adhered to the course requirements, and had performed her duties as outlined in her contract. However, the rest of the team was unhappy with her performance and wanted to transfer some marks. This caused some conflict, and quite a stressful situation for Helen as illustrated in the following comment:

> *I'm sure that I did my work for the team. I was supposed to create all the graphics and documentation. I did all that, and I did it all on time. I don't see why I should lose any marks because they have a different viewpoint to me.* (Interview with Helen)

Legal issues could result from this form of assessment if not handled in the correct fashion. A possible solution may be to incorporate negotiated peer assessment strategies through student contracts at the beginning of the semester. Tutors could discuss options with each team and give them the opportunity to choose their preferred method of peer assessment as follows:

- Tutor-led peer assessment. Based on confidential student journals, and tutor observations. The tutor is responsible for negotiating the transfer of marks between students. In this situation the tutor must make it clear that it is his/her decision to negotiate a transfer of marks based on the collected evidence;

- Student-led peer assessment. Based on agreed performance criteria between the students. Students would be responsible for negotiating the transfer of marks with the tutor acting as an advisor or observer; or

- No peer assessment. Students agree to equally divide the allocated marks given by the tutor.

These choices would allow students to take greater responsibility for the peer assessment implemented. If they weren't happy with the style selected by their team, they would have the opportunity to select a different team.

Inter-Team Self and Peer Assessment

Many students felt that peers didn't have the correct skills to assess solutions posted on the *Conference Centre*. They felt that peers gave inappropriate marks and feedback, which wasn't valid. Many comments made on the Bulletin Boards demonstrated their dissatisfaction with the peer assessment system. For example Tony discusses how his team was penalised many marks for simply not referencing the solution correctly:

> *My team feels that our peers have really lowered our marks by marking too low. The tutor gave us 4/5 so it was obviously a good answer which we did put a lot of effort into. The main argument was that we didn't reference well but we don't believe that we should have been deducted so much for it, especially since we did include a reference. Sure we may have not referenced as well as we could have but getting an average of 2.75/5 from our peers was a bit harsh. I think this team has been unfair in the way it treated us, and I'm not sure they have the skills to properly assess our work.* (Comment taken from bulletin board)

Mandy was very dissatisfied with the peer assessment system, and appealed to the course coordinator to remedy the situation. She felt that students were deliberately marking others work down so that they could get higher grades:

> *After viewing some of the comments made by the other teams, I find that they are attempting to push the marks of other groups down in order for their own gain. This is very unprofessional, inappropriate and certainly unacceptable. Groups have spent many hours working on the weekly problems and such unfairness should not be tolerated. Therefore, I hope the lecturer (Joe Luca) could do something about it. Many of the students are attempting to kill one another because of the "Bell-Curve" situation, whereby the lesser marks the others get, the more marks their group gets... Please do something about it......* (Comment taken from bulletin board)

Another comment from Janet also shows dissatisfaction with the peer assessment system, and asks the course coordinator to not include any of the marks made by peers into their final assessment. She considers that some of the others team were only interested in marking others down for their own benefit:

> *Joe, I've come to the conclusion that these peer assessments should not have any weight at all in our total mark for this unit. Otherwise it would be really unfair. There seem to be a few teams who are way too competitive and unfortunately aren't playing "fair", and are just bent of marking the work of others DOWN for their own benefit!!* (Comment taken from bulletin board)

Sam also agrees with Janet, and is strongly of the opinion that other teams should not have any influence on their marks, as they other motives. He contends that this should be a forum where students constructively help each other, without having any influence on their marks:

> *Ouch... I think this part of the unit just plain SUCKS. Obviously even as third years most people completing peer assessments aren't mature enough to offer CONSTRUCTIVE criticism. Our aim here isn't to pick each other to bits - it is to share knowledge we're all gaining from participating in the weekly solutions! I agree with Janet, the peer assessments should not have any weight with final marks.* (Comment taken from bulletin board)

It can be seen that many students were unhappy with the peer assessment system. However, being able to reflect on others solutions and perspectives is educationally sound. So, how can the educational benefits be maintained without student complaints? A possible solution may be to make the assessment of other students' solutions a course requirement, without placing any mark allocation on it. This would alleviate the problem of students complaining about other students having an affect on their marks. However, the motivation for students to perform this task may diminish if not properly monitored by tutors. Perhaps token penalty marks of say 2 marks could be applied to teams who don't perform the assessment.

Technology Issues

The use of technology was an integral part of the learning environment, and students generally accepted this as an innovative system that had some start-up problems. This included the server crashing, which sometimes caused student frustration. For example, Peter discusses frustrations he experienced when he tried to post his team's solutions. He didn't realise that the server has stopped working, and spent much time trying to determine what the problem was on his computer:

> *A few times I wasted quite a lot time trying logging onto JoePM to post the teams' solution. It was really frustrating as I was near the deadline, and kept trying different things to try and log on. Eventually I got onto Joe, and he rebooted the server. But this took a long time.* (Interview with Peter)

To help improve the effectiveness of the online system, and range of technical enhancements have already been implemented. These include implementing new software upgrades, creating a user login tracking system, re-programming the conference centre and the journal system.

Software Upgrades

In January 2002, the system was upgraded to operate with a new operating system - Mac OSX®. This operating system allows the application to run as a complete solution on one platform. The Apache® web server allows the system to include server-side scripting languages previously not possible using the default web server included with FileMaker Pro®. Also, the Mac OSX has the QuickTime® streaming server built into the operating system to playback the resource videos.

The latest version of FileMaker Pro 5.5 has also proven to be more reliable than FileMaker Pro 5.0. The previous problem of FileMaker Pro not completing all requests and failing to return particular actions seems to been resolved by either the new version of FileMaker Pro or the Mac OSX operating system.

Tracking User Logins

A purpose built user tracking system was implemented to record user logins. This allowed tutors to monitor the amount of system use by individual users and teams in three ways:

- Viewing the total amount of logins within the last seven days;
- Viewing the total amount of logins within the last month; and
- Viewing the total amount of logins since user account creation.

The tracking system also recorded the web browser type and IP address of all logins. This information can be used to plan for future enhancements based on the level of technology current being used by the users.

Conference Centre Submission

The assessment submission system area was changed to use PHP® programming, now available as a server module for the Apache web server. The PHP module was broken down into two separate entities that run in conjunction with the FileMaker Pro back-end database.

The first component in the assessment upload system allows a team to post their assessment as an Adobe Acrobat® PDF (Portable Document Format) by using a standard HTML form. The PHP script takes the team's posted assignment, appends their teamID to the filename, and then places the file in a common upload directory. In the final process the script creates a FileMaker Pro record using CGI® protocol.

The second module is the maintenance component, which allows a team to select assessment files previously uploaded, and delete, or upload newer assessment files. The PHP script first performs the desired file management task then continues with a FileMaker action to update the team's assessment record.

Journal System

The journal system was redesigned to provide summarised data to both students and tutors. The original journal system relied on one journal record that contained student's self and peer assessment entries. This meant that it was difficult to provide summarised data about individual students.

The journal system was redesigned to incorporate a relational database model within the journal database. The student's self-assessment was then posted to a master database file while the peer assessment entries (one record per team member) were posted to a second related database. A student completing the self and peer assessments tasks would create one self-assessment record and up to five related peer assessment records. The related database then used a series of *self-joins* to summarise record information, and average peer-assessment marks by using the userID or teamID.

A *self-join* relationship using the userID key provides summarised data for all records that have the userID identifier. This provides average assessment marks for one team member in any given week. A *self-join* relationship using the teamID then brings this information into the master file that can be viewed by the team and tutor.

These changes should help give students and tutors gain confidence that the online learning system was technically reliable and robust.

Summary

Even though the design of the learning environment was well accepted by the students and tutors as being effective, it was also criticised as having some overheads. Students and tutors both spent many hours completing this unit, much more than university expectations. Removing weekly problem solving tasks, and replacing them with assignment tasks would help moderate the situation, as students would then perform six assessments, rather than sixteen.

Another key issue identified by student feedback was the self and peer assessment. Some students perceived these as being unfair and stressful, and recommended they be removed from the course. These could be replaced with negotiated peer assessment strategies to allow students the freedom of choosing the form of peer assessment they would prefer. Recommendations were also made to make the technology more reliable and robust, in order to help give students confidence in using the system.

These suggested changes would help reduce overheads borne by these students and tutors in this learning environment and help make it more acceptable as a mainstream form of learning.

Chapter 8

Summary and Conclusions

This chapter gives an overview of the research conducted, a summary of the findings and recommendations for further research. It also describes the study's limitations and gives recommendations for further research.

The study sought to investigate ways of developing students' generic skills through the design and implementation of a learning environment that incorporated three key learning principles - authenticity, self-regulation and reflection. These were integrated into a course design methodology that had a primary focus of creating appropriate learning tasks for the given course objectives. Learning resources and learning supports were developed after suitable learning tasks had been created that were authentic, student-centred and reflective in nature.

A learning environment was then created that used both face-to-face and online delivery strategies, and it was tested with a group of final year higher education students, completing an interactive multimedia course. A range of data was collected and analysed by triangulating various qualitative and quantitative research methodologies, which provide a rich picture of how the students were motivated and engaged within the learning environment. An overview of the study is shown in Table 8.1.

Table 8.1: Overview of study

Chap	Title	Description
1	Introduction	Significance and purpose of the thesis
2	Higher Education: A Review of Contemporary Issues	A review of the literature, which considered: • Generic skill requirements in higher education, and the increasing pressure being applied for their development; • Defining generic skills, and generic skills considered essential for all higher education students; • Flexible delivery and new learning technologies – how these can be used to enhance and complement face-to-face instruction; • Contemporary teaching and learning practices that help promote the development of generic skills, as well as deep and meaningful learning experiences
3	Guidelines for Developing Generic Skills	A synthesis of the literature to develop a conceptual framework and design methodology for the study using: • The learning principles of authenticity, self-regulation and reflection; and • A course design methodology with a primary focus of developing effective learning tasks, followed by learning supports and resources Also, the research questions were defined based on the established framework.
4	Designing and Developing the Learning Environment	Using the conceptual framework and design methodology, a learning environment was created that used both face-to-face and online delivery strategies with a group of final year, multimedia students. Learning tasks were created that were authentic, student-centred and reflective in nature, with a view to promote generic skill development and deep meaningful learning experiences.
5	Research Methodology	Qualitative research was the prominent paradigm, though quantitative methods were also used to triangulate data with a view of strengthening the reliability and validity of the results. Data was collected from questionnaires, observations, focus group meetings, and one-to-one interviews to help provide a rich picture of how and why students engaged with the activities.
6	An Analysis of Student Activity	The first research question is considered: *"What factors contribute to students practising generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?"* Results indicated that students were motivated to engage with set tasks due to their authentic nature. The self-regulated nature of the learning environment allowed students to freely practise using generic skills, and consolidate their implementation through reflective practice.
7	Assessing Skill Development and Critical Overview	The second research question is considered: *"To what extent do students develop generic skills in an online learning environment designed using the learning principles of authenticity, self-regulation and reflection?"* Quantitative research techniques were used to measure changes that occurred in students' generic skills with two instruments. Both instruments showed significant positive differences between pre and post-tests. Also, a critical overview of the study was conducted that made recommendations for improving the learning environment.
8	Summary and Conclusions	A summary of the thesis including implications for educational research as well as recommendations for further research.

8.1 Learning Principles

An analysis of research describing generic skill development and learning in tertiary settings revealed a number of consistent themes that suggested three discrete learning principles with strong potential to promote the development of students' generic skills. These three principles were:

- *Authenticity* –settings that provide students with the opportunity to develop knowledge and skills in specific contexts, jobs and roles in situations that allow for the natural complexity of the real world, while at the same time actively engaging with the subject content. In authentic settings, the context reflects the way information is being used in the workplace. Learning activities used to promote authentic context include problem-based learning, real world activities, project work, teamwork, role-play, work experience and industry visits.
- *Self-Regulated Learning* – learning that supports intellectual independence and encourages students to take control of learning strategies, and processes needed to perform the necessary tasks. In settings that promote self-regulated learning priority is placed on students setting their own goals and regulating the learning progresses needed to achieve these goals. Learning activities used to promote self-regulated learning include encouraging students to set their own goals through student contracts, negotiating tasks with peers, having access to a variety of resources and learning strategies, and receiving feedback from a variety of different sources; and
- *Reflection* – the deliberate act of thinking about one's performance in a past event. In settings that promote reflection, learners are encouraged to construct meaning from their experiences by critically self-assessing their performances and considering the opinions of others to create new improved strategies. Learning activities used to promote reflection include engaging students in critical self and peer assessment, using reflective journals and exchanging ideas in team based activities.

8.2 Design Methodology

Using these three learning principles as a framework, an online learning environment was designed and implemented using a methodology that sought to support knowledge construction by focusing on the development of appropriate learning tasks, and then considering the necessary learning supports and learning resources:

- *Learning tasks* – the pivotal elements in the design process used to support knowledge construction and guide the design process were chosen based on the intended learning outcomes, resources and learning supports available. They included creating a project for a real client, negotiating student contracts, solving weekly problems, assessing the work of other students, performing self and peer assessment, and creating reflective reports;

- *Learning supports* or scaffolding – the supports needed to guide learners and provide feedback on their progress: included modelling by tutors, online self paced tutorials, multiple perspectives about the quality of the their work, structured feedback from peers and tutors about their contributions to the team, and online bulletin boards; and
- *Learning resources* – the more visible components of the course included print materials, media and online resources. The resources were chosen to support learners' inquiry and problem-solving activities and to allow students to browse a range of alternative resources. These included online samples of previous students work, multiple perspectives of weekly topics through streaming video, online quality assurance templates/procedures, online resources for each weekly topic, a book, two readers, and an online application to help students monitor and track their time.

Using this design methodology, a learning environment was developed which included both face-to-face and online delivery strategies. A number of important issues related to instructional design, interface design, media production, programming and evaluation were considered.

A project management development methodology was implemented to help create the online application that included design, development, media, programming and evaluation phases. Iterative prototyping was used throughout the design and development phases, with a view to collecting user feedback that would enhance the usability and effectiveness of the product.

The aim of the thesis was to explore outcomes associated with generic skill development. Eleven generic skills were considered important for these students, which included – time management, learning-to-learn, self-assessment, leadership, collaboration, communication, peer-assessment, research, analysis/synthesis, problem solving and task management. The learning environment was implemented with a cohort of students, and learning outcomes and activities explored closely to determine the impact of the dependent variables.

8.3 Research Results

Two major research questions were proposed to guide the investigation, and inform the methods used to collect and analyse the data.

Research Question 1

The first research question was concerned with determining the extent to which the three learning principles contributed to students practising their generic skills, with a view of documenting observed forms of practice and reported by students, to explore how this may have influenced the development. Techniques of qualitative data analysis recommended by Miles and Huberman (1994) were used to analyse data collected from focus group interviews, one-to-one interviews and comments made in students' online reflective journals and bulletin boards.

Results showed that the authentic context provided a motivational context for most students to actively practise using their generic skills. Authentic activities provided a clear link to reality, which embedded learning in a realistic and relevant context that helped these students see significance in what they were doing "beyond the corridors of the academic institution", and motivated a range of skills to be used such as problem solving, collaboration, communication and peer assessment to complete the given tasks. Within this context the self-regulated nature of the learning environment allowed these students to freely experiment with different implementation strategies that suited their learning styles within the given context. Reflection was then encouraged through a variety of activities that provided students with feedback on their performance from a variety of perspectives. This enabled them to modify their behaviour through a continual process of reflective practice.

The results revealed that the design of the learning environment was successful in motivating a majority of the students to practise a range of generic skills, and provided sufficient freedom of choice and reflective practice to help promote skill development. Each of the three learning principles were found to contribute to students practising their generic skills in complementary ways, as well as promoting deep and meaningful approaches to learning.

Most students considered the authentic context and activities promoted through the design of learning environment as being a key motivational factor in this unit. They constantly referred to improving their skills for industry, developing high quality products to impress industry representatives, creating e-portfolios and web sites to enhance their CV and of their desire to impress industry representatives on presentation night. The motivation created through the implementation of authentic activities encouraged most students to actively engage with the self-directed and reflective activities with a view of enhancing their skills and products. This was supported by the large proportion of students who passed this unit. From an original 85 students who started the unit, four students withdrew from the course before academic penalties were incurred. The rest of the 81 students all passed, except for one student (Table 8.2).

Table 8.2: Student results for project management unit

Grade	Percent	No. of Students
High Distinction	(80 -100%)	11
Distinction	(70 - 79%)	28
Credit	(60 - 69%)	34
Pass	(50 -59%)	7
Fail	(0 - 49%)	1
	Totals	81

The results derived from the implementation of this leaning environment suggest a number of design principles that support deep and meaningful approaches to learning as well as promoting the development of students' generic skills. These are based on a design methodology that primarily focuses on creating learning tasks to satisfy required learning objectives, and then considers the necessary learning supports and learning resources (Oliver & Herrington, 2001), as shown in Table 8.3.

Table 8.3: Course design methodology

Priority	Design Elements	Description
1	Learning Tasks	Create learning tasks that are aligned to course objectives and are: • *Authentic* - based on real-world situations, and students perceive as being realistic and relevant to their life, which in many situations are collaborative in nature; • *Student Centred* - encourage students to negotiate their own goals and allow them to make a variety of decisions about their learning with a view of supporting knowledge construction; and • *Reflective* - encourage students to actively participate in activities, reflect on their results by considering a number of different perspectives, conceptualise these and then develop new strategies before again participating.
2	Learning Supports	Develop learning supports that help students complete learning tasks, such tutorials, modelling, scaffolding, guidance and assistance from mentors and facilitators.
3	Learning Resources	Develop learning resources that are varied in representation and rich in format.

Research Question 2

The second research question used quantitative techniques to determine generic skill development over the semester, by using questionnaires to compare skills levels at the beginning and at the end of the semester. Two instruments were used.

The Workplace Competencies Questionnaire instrument (Miles & Grummon, 1996) was a web-based self-assessment package for workplace skills, designed to help students rate themselves against a set of generic skills. The questionnaire is designed to give students feedback on nine professional or generic skills, including: Taking responsibility, working in teams, persisting, a sense of quality, life-long learning, adapting to change, problem solving, information processing and systems thinking. The questionnaire was given at the beginning of the semester (pre-test) and end of semester (post-test) and completed by fifty-one students (pre and post-test). The collected data was analysed for significant differences using SPSS (Paired-Samples t-test) and produced results that showed a significant increase for each workplace competency. Statistically, this suggested that these students showed a significant increase in each of the generic skills being tested over the duration of the semester.

The Generic Skills Comparison Questionnaire was a questionnaire designed to measure differences in student opinions about their own and peers' generic skills proficiency over the duration of the semester. This questionnaire was completed by thirteen students in three different teams, at the beginning and end of the semester. An increase of 14% was obtained in pre-test/post-test scores across all students. This questionnaire was used in conjunction with the Workplace Competencies Questionnaire to triangulate results on generic skill improvement over the duration of the semester.

The results from both tests supported the contention that the design of the learning environment was effective in promoting the development of their generic skills for the majority of the students.

8.4 Implications for Educational Practice

As developing students' generic skills is increasingly becoming a valued educational outcome, the issue of how to foster and support these in higher education institutions is likely to received increased attention. This study has proposed a model of designing courseware that others can use to help promote the development of these skills.

The main implication for course designers is that using the proposed course implementation framework (Figure 3.3), learning environments can be designed that promote the development of generic skills without incurring extra overheads needed to teach these skills through direct instruction. In this study, 11 generic skills were targeted, which were considered appropriate for the given context – final year higher education students, studying multimedia project management.

Other disciplines can target required generic skills in a similar manner. For example, consider the design process needed to develop entrepreneurship in a business degree.

- Design authentic activities in which st lents are required to use business skills to promote business with real clients. The activities would focus on implementing business strategies that would help make the business more profitable. Students would collaborate in a team and negotiate strategies with the client using a business plan. At the end of semester these would be formally presented to an audience of students, tutors and industry representatives;

- The activities would be student-centred, allowing students to make a variety of decisions. Students would be able to choose their client, business idea, collect data to support the idea and negotiate roles and timelines with their peers through a contract, signed at the beginning of the semester. Tutors would act as mentors, providing advice and help based on the direction taken by the students;
- Activities would continually promote reflective practice. Students would be required to complete self and peers assessment journals each week to help monitor their own progress, and the progress of their peers. Clients would be asked to comment on the students' business ideas and how effective they would be in returning a profit for the business;
- Provide learning supports through modelling, tutorials, and a variety of perspectives and feedback from different sources;
- Provide varied and rich learning resources such as case studies, books, online information, and previous examples; and
- Provide support materials on how to develop the generic skills being targeted.

This approach would not only help develop business skills, but also promote the development of other skills such as collaboration skills, communication skills, self-assessment skills, peer-assessment skills, task management and leadership skills.

Other disciplines of a more theoretical nature such as mathematics, history and philosophy could also use this approach for course design. The key focus being the design of learning activities that would help motivate students through their relevance and application to real world situations that would help promote their professional skills, CV, portfolio as well as job opportunities outside the academic setting. Once this motivation has been established by creating an authentic context, student-centred and reflective activities can then be implemented and promoted. An integrated approach such as this, which requires no extra teaching time should be attractive at a time when universities are under increasing pressure to develop these skills.

8.5 Limitations of the Study

This research study provides strong evidence of the effectiveness of the implementation framework and online delivery system to promote the development of students' generic skills, as well as deep meaningful approaches to learning. However, there were some limitations to this research.

Time Commitment Required by Tutors and Students

Even though students and tutors considered the unit helped improve their skills, there was a heavy time commitment commanded, that is, success came with a price! Much student and tutor effort was needed in this unit. In some cases students put in up to three times as much effort than is normally required. Tutors and students could not sustain these overheads for all other units.

Tutors were required to assess 16 assessment items – 10 weekly problems, contracts, assignment work and project presentations, which represents a much greater workload than would normally be expected from tutors. This also applied to students, as they were kept busy with developing weekly problems, web sites, meetings and assignment work which included – project proposal, design specifications, quality assurance procedures, metrics, evaluation, post mortem and a presentation to an audience of peers, tutors and industry representatives. There is a need to discover ways to make this approach more sustainable.

Technology Requirements

The use of technology provided strong support for promoting the development of students' generic skills and a rich learning environment. However, much time and effort was needed to develop this application. With the financial support of a development grant, it required the services of two programmers, two graphic designers, a content expert and an instructional designer. The researcher had well developed technology skills and was able to administer the system on a day-by-day basis, and in the absence of the programmer was able to correct system crashes and other technical malfunctions. However, if other academics were to use this system, they may not have the required expertise to keep the system running and maintained, and would require technical support.

The next version of the online system will be developed on a standard courseware management system (Blackboard®), which would be centrally managed by university IT staff. This would then enable other users to easily implement this system. In its current state, customised software is being used (FileMaker Pro®) and training would be required for new administrators to enter required information and manage the conference centre, portfolios, time tracking system and the e-portfolios for each team (web site and related documentation).

Impact of Research on Learning

The students in this study were exposed to continual research and data collection sessions discussing how and why they were practising each of the targeted generic skills promoted in this study. This would have heightened their perceptions and understanding of their generic skill development through the Hawthorne effect (Mayo, 1933). Other implementations of this study may not produce such overt results.

Also, as part of the data collection strategies used in this study, students were regularly asked to reflect on the how well they were utilising their generic skills within the learning environment through questionnaires, focus group and one-to-one interviews. This may have influenced student attitudes and their awareness of generic skill development. If this data collection had not occurred, how would this have affected the results of the study? Based on feedback obtained from students, many students found these sessions valuable. They enjoyed discussing the difficulties of communicating and collaborating with their team and client, and how they often wasted time in the process. Student felt it was worthwhile discussing these issues with students from other groups, as they realised that other teams had similar problems.

Future implementations could include reflective discussion sessions that consider how successfully generic skills have been implemented, and strategies that may be implemented for improvement.

8.6 Recommendations for Further Research

The research conducted in this study confirmed the possibility of implementing a learning environment that promotes the development of students' generic skills. Based on this research it is worth considering some issues that have emerged as a result of this research as well as highlighting possibilities for further research (a to g).

(a) Course Design Structure

Students in this study were in their final year of study, and looking at gaining full time employment at the end of the year. It was relatively easy to motivate these students using authentic activities such as creating web sites and portfolios that could be used as CV, and interacting with clients who were potential employers. However, would this strategy work with first year students? Would first year students be motivated to engage with required content through authentic activities? It may be more difficult to find authentic activities that these students will readily relate to.

Also, would these students be able to adequately engage with student-centred learning activities, and then reflect on their performance? First year students may need different strategies of instruction to help construct knowledge in a hierarchical fashion as proposed by Bloom (1956), that is, learning is hierarchical with learning (objectives) at the highest level as dependent on the achievement of lower level knowledge and skills first.

Course /unit coordinators need to consider when specific generic skills can be targeted in particular units of study, and in which year of study. This will be dependent on teaching and learning strategies implemented in these units, and the context of the subject being taught.

Further research, which considers course design and instructional differences required for final year students as opposed to first year students, is needed to help determine when various generic skills should be targeted.

(b) Mixed-Mode versus Single-Mode Delivery

This study used mixed mode delivery in presenting the required instruction, that is, both face-to-face and online. Each week, students were given a one-hour lecture, a two-hour tutorial, and had access to an online application with a wealth of resources, communication tools, and self-paced tutorials. The combination of both forms of delivery provided a rich instructional environment that enabled students to access many information resources, as well as being able to communicate, track time, view contracts, reflect on the work of peers and other teams, receive feedback from multiple viewpoints about the quality of work, and complete confidential peer assessment reports.

Could a learning environment have been designed using only the online application, and no face-to-face component? This would have required students to communicate and collaborate only through the online communication tools. In the project management unit used for this study, this would require careful consideration, as much time was used communicating and brainstorming. However, as the trend continues towards increased flexibility and diversity of students, this scenario may become more attractive in the near future. More research and consideration is needed to consider the effects this may have on the development of students' generic skills.

The opposite question could also be asked: how successful would this study have been with no online component? Could face-to-face instructional strategies be designed that could successfully replace the online features, and hence circumvent the requirement for technology? Perhaps. Although the convenience offered to students, through the availability of resources, tutorials, communication tools, and various feedback strategies must help enrich students' learning experiences and was useful in this study.

(c) Testing Generic Skills

In this study, two questionnaires were used to collect data using pre and post-test data. An externally administered Workplace Competencies Questionnaire (WCQ) was given to the whole student group, and a Generic Skills Perceptions Questionnaire was given to three focus teams. Both questionnaires were based on student perceptions, and sought to measure skill differences through pre and post-tests. The WCQ was administered through the Web and is charged at a rate of US $2.50 for each student impression (pre-test and post-test). In return, students are given immediate feedback when they complete the questionnaires in the form of average scores for each of the nine competencies, with a customised report making suggestions for improvement.

The Australian Council for Educational Research (1999) has developed a Graduate Skills Assessment instrument (GSA). The test has been designed to assess students' generic skills when they begin at university and just before they graduate. The four areas currently included in the test are critical thinking, problem solving, interpersonal understandings and written communication. The test consists of a two-hour multiple-choice test and one-hour writing tasks.

How effective are these instruments? Can they be modified to test other generic skills? More research is needed to consider how specific generic skills can be tested, and how reliable the tests are. For example, how can collaboration skills be tested? Would using a Likert scale be sufficient to produce a reliable indication of these skills? Other generic skills have different peculiarities, for example, leadership skills, or the ability to analyse and synthesise information. Perhaps different forms of testing are needed for each generic skill.

Research investigating the validity of different strategies currently being used to test these skills would be useful, and recommendations made from such a study would be highly valued by many educational institutions.

(d) Generic Skill Transfer

Designing and implementing an impact evaluation study on recent graduates to determine how effectively students transfer generic skills into the work force would provide valuable research data. If students are showing generic skill developing in their courses, will they transfer these skills into a new context? If so, to what extent?

Research investigating the transfer of generic skills from the university into the workplace would be valuable, as it would help validate the instructional methods used to help develop skills, as well as the results of the pre and post-testing instruments. The results of such a research study would be highly valued in higher education institutions as they would help guide future development and research in promoting the development of students' generic skills.

(e) Demonstrating Generic Skill Competence

When students leave the university, how can they convince potential employers they have competence in a variety of generic skills? What proof of their competence can they show these employers when applying for jobs?

Paper based and e-portfolios portfolios can be used to demonstrate competency. Also some universities are implementing a second or dual transcript at graduation to show students have obtained generic employability competencies upon completion of their award. Are these valid and reliable methods of demonstrating generic skills competence? Would employers be convinced that potential employers were competent in time management, or had good leadership skills on the basis of a portfolio or second transcript?

Further research is needed to develop valid and reliable methods employers can rely on to help decide if graduates are competent with specific generic skills necessary in the advertised position.

(f) Institutional Considerations for Developing Generic Skills

Many decisions must be made a an institutional level in the quest to develop generic skills:

- What supports are needed at an institution level to integrate generic skills in the curriculum across the university? (For example, professional development, time allowances, expert advice, physical resources, quality assurance procedures and templates for consistency across the university etc.)
- Are committees needed in each faculty, or should a central university body coordinate graduate attributes across the university?
- How will each department, school and faculty implement strategies for developing these skills, and collect evidence of student competence in various generic skills?
- Who will incur the costs of implementing these strategies – the university, faculty or school?
- Must all unit syllabi across the university include reference to generic skills?
- Legal liability issues related to using a university second transcript? If the transcript alleges that a student possesses certain attributes, and then an employer determines that the graduate cannot demonstrate these attributes in the workplace, can the university be sued? What are the legal issues?

Research is needed to compare strategies used in different universities, and make recommendations across a number of dimensions to help universities make decisions in their planning to provide graduate skills for all students.

(g) Assessing Collaborative Learning

Collaboration and teamwork is continually promoted in contemporary literature as being essential for constructivist learning environments. However, students often complain about the inequity of teamwork when some students work much harder than others, and they all share the same mark. How can marks be equitably distributed in a team situation to reflect the effort of individual team members? As it can be difficult for tutors to judge whom in the team has contributed the most or the least, it is often appropriate to use peer assessment strategies.

Peer assessment strategies implemented in this study had a powerful effect on students. Students often felt intimidated and embarrassed in tutor-led peer assessment sessions when asked to justify criticisms about their performance, or to transfer marks to other students. Although these sessions proved to be effective in balancing marks gained against team effort, students were critical of the pressure, and also felt the system could be unfair in some cases.

What is the most effective means of assessing collaboration within teams to equitably distribute marks based on student effort and the quality of their contributions? Negotiated peer assessment? Research is needed to evaluate assessment strategies to help make teamwork fair and equitable for all team members. In this way, learning activities based on collaboration and teamwork can be implemented to help promote a number of generic skills in a fashion that is acceptable to all team members.

This study has demonstrated a number of opportunities, but there still remains considerable research to be done to take full advantage of the affordances of new technologies and our understanding of student learning.

8.7 Conclusions

This study set out to design and implement a learning environment that would help promote the development of students' generic skills through a combination of both face-to-face and online delivery. Three learning principles were used in the conceptual framework: authenticity, self-regulation and reflection. The unit design methodology primarily focused on creating *learning activities* that used each of these principles. Once these learning activities were established, learning supports and resources were then considered.

The findings of the study show that the authentic activities were instrumental in motivating most students in this study. Once motivated, these students actively engaged in self-directed activities, and through reflective practice helped to construct knowledge and as well as promoting the development of their generic skills. Being able to see the relevance of the activities, and the rewards they would achieve from successfully completing them, proved to be a key element in the design of this learning environment.

This approach encouraged the majority of students to engage in meaningful learning experiences as well as practising a range generic of skills, without having to take time to explicitly teach these skills. Skill development was a natural consequence for these students as they actively engaged with learning tasks that were authentic, student-centred and promoted reflective practice.

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Appendices

Appendix 1:

Graduate Skills Assessment Test (ACER)

Referenced: p.20

Critical Thinking

The Critical Thinking sub-test of GSA aims to measure the ability of candidates to apply critical thinking skills to text-based information. Aspects of Critical Thinking include the following:

- *Analysis* to identify definitions used, claims being made, arguments, lines of reasoning, points of view, evidence for and against arguments, assumptions, logical implications; and
- *Evaluation* to judge the validity of arguments, claims and lines of reasoning, and the strength and credibility of evidence.

Problem Solving

The Problem Solving sub-test of GSA aims to measure the ability of candidates to apply problem-solving strategies to a range of general practical problems that are presented in brief scenarios.

Aspects of Problem Solving include the following:

- Identify, Comprehend, Restate a problem
- Analyse information relevant to a problem
- Translate and Represent features of a problem
- Identify, Synthesise and Apply information relevant to a problem
- Explore, Identify, Generate problem solutions
- Evaluate solution strategies and their outcomes

The problem solving tasks will tend to be practical, accessible to all candidates, non-specialist in nature and focused on analysis and application. Problem solving items will involve verbal, visual and quantitative reasoning of general kinds.

Interpersonal Understandings

The Interpersonal Understandings sub-test of the GSA will aim to assess the ability of candidates to understand features of interpersonal relationships that may be relevant to the ability of people to work and live together.

Aspects of Interpersonal Understandings include the following:

- Identification of roles and relationships
- Making inferences about feelings, attitudes, motives, values, personality
- Identification of features of effective team workers

- Identification of effective interpersonal communication and listening skills
- Interpretation of team dynamics
- Identification of factors that could affect team performance
- Identification of individual differences and cultural diversity
- Identification of interpersonal issues/problems that may affect teamwork
- Application of interpersonal understandings to solve problems and optimise team effectiveness

Written Communication

The Written Communication sub-test of the GSA aims to measure the ability of candidates to present information and ideas clearly in writing.

Two tasks are currently envisaged. These are:

- An *expository reporting task* in which candidates are offered some information and ideas which they need to organise, paraphrase and present in clear, coherent form.
- An *argumentative task* in which candidates are offered some views of an issue and are required to develop and clearly express a point of view about the issue.

Appendix 2:

Unit Syllabus: IMM3228
"Project Management Methods"

Referenced: p. 93, 194, 221 and 382

Joe Luca - Semester 1, 2001

Unit Outline - Project Management Methodology (IMM 3228/4228)

Edith Cowan University, School of Communications and Multimedia

Aims and Outline

This unit aims to develop skills and knowledge in project management methodology for developing multimedia products in a team-based environment. It investigates the different phases of project management cycles such as feasibility, analysis, design, production, implementation and evaluation.

Project teams are formed to develop a web-based product in which team members are assigned the role of project manager, designer, programmer or instructional designer/tester. The web-based projects are used to promote engagement of the unit content. Contracts, journals and portfolios are used to encourage the development of time management and collaboration skills, when working in a team environment.

Objectives

Students will be required to:

- Develop suitable project management models for different situations
- Manage time effectively to keep to an established schedule, and collaborate/communicate effectively in a team-based environment
- Use "Work Breakdown Structures" and metrics to cost projects
- Plan and track projects using Gantt charts and spreadsheets
- Perform needs analysis, feasibility study and scope
- Use appropriate design methodologies to develop a multimedia product
- Evaluating the quality and effectiveness of the product
- Create appropriate legal documentation
- Develop relevant QA procedures for the development process
- Develop and refine metrics from timesheet data
- Evaluate the quality and effectiveness of their own work and that of their peers
- Make decisions on team role, project, team members, time commitment and skill development strategies

Assessment

Assignment 1	30%
Assignment 2	35%
Assignment 3	35%

Unit Coordinator:

Joe Luca, Phone: 9370 6412 Email: j.luca@cowan.edu.au

Textbook and Readers:

- Luca, J. (1997). "Project Management for New Media", New Media Management
- IMM3228/4228 Project Management Methodology (Readers 1 and 2)

Unit Web Site:

IMM 3228 at http://www-scam.cowan.edu.au/

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- QA Procedures in Closed Reserve Impart Corporation "Multimedia Pathways" http://www.impart.com.au/impart_projects.htm and "The Learning Centre"
- England and Finney (1996). Managing Multimedia. Cambridge: Addison Wesley
- Apple Computer, Inc (1993). Demystifying Multimedia A Guide for Multimedia Developers. San Francisco: Random House/New Media.

Course Components and Information

Lecture

The lecture will be used to discuss:

- the relevance of the weekly material showing video clips of employers, industry representatives, multimedia developers and ex-students
- focus questions to promote comments and highlight important aspects of the weekly activity
- relevant information sources available on JoePM
- the best three solutions from the previous week
- student prototypes which teams can use this for evaluation purposes

JoePM : Online Learning Environment

The unit uses an online learning environment (JoePM) as a basis for communication and resources. It has a conference centre, team/individual information, Filing Cabinet of resources, Student Contract, Journal, Time clock for tracking time, Communications Centre and weekly schedule.

The "filing cabinet" contains the following "drawers":

1. Syllabus, assessments, help sheets and semester schedule
2. Items to complete for each week, skills being targeted and focus questions
3. Streaming video clips of employer and ex-student perspectives, relevant information/examples, useful links and text/reader references
4. Team and individual training activities with solutions

Tutorials

Workshops are structured to provide information, sources of information, activities and solutions to help students acquire skills and knowledge. These can be performed individually or in teams and tutors will be available for assistance if needed. All the tasks will be focused on helping students' solve/complete weekly activities. These will also contribute to, and be part of your major assignment requirements. It is likely that students may not complete these during the tutorial time, in which case they would be required to complete in their own time.

Weekly Tasks

Commencing in week 3, students will be required to undertake research and inquiry on a given task with their team. The tasks appear in the "In-Tray" of JoePM and are central to the focus of this unit. Students must collaborate with their team and use the relevant resources in order to develop solutions to these tasks. Decisions need to be made about what resources to use and also which team members will complete various aspects of the task, and what "angle" is taken in solving the problem. Completed tasks are then posted to the "Conference Centre" and assessed by other teams and tutors. Tutors will model the process in weeks 2 and 3 to give students an indication of the required standard.

Assessment criteria for answers will be based on the following:

- Correct focus in answering the question, with relevant facts and research supporting your perspective
- Synthesis of ideas into a cohesive solution
- Correct grammar and spelling
- Proper referencing of information sources
- Under 400 words, excluding references

Assignments

Major assessments items are based on projects that have "real" settings and based on group-work. Students are required to consider how activities can be equitably distributed, and commitment gained from all team members to perform allocated tasks within given time frames, and to a specified quality. All students are required to perform peer and self-assessment through the use of student contracts and journals (Mandatory). The following online tools will are available to help these tasks:

- Student contracts
- Weekly journals and self / peer assessment templates
- Time tracking software
- A variety of information sources

*NB Penalty for late assignments is 5% per day up to 20%, after which assignments are not accepted

Teamwork

You will decide on your role in a team, who your team members are, the project topic and other related issues. Students are free to work within their groups in whatever ways they decide. All students are required to participate and the groups should encourage their members to share the load. Each week, the groups should indicate those members that made a contribution to the solution. When the marks are calculated, students' levels of participation will be factored into the marks awarded to each.

Peer Assessment

In this unit, there will be much teamwork (75%) in which you will have to "carry your own weight" or be penalised by your peers and tutor. To enable this process, the online application JoePM has contracts, time clock and journals that commit students to specific tasks through weekly entries which are complemented with self and peer assessment.

In intra-team tutor led peer assessment meetings, tutors use summarised information gained from the online journals to negotiate marks with students. The tutor verbally summarises the feelings of the team, without stating who allocated specific marks or comments. For example, if the team consensus formed from the online journals is that Carol has been working harder than Bill, then the tutor targets Bill in the meeting, and asks for a defence to the allegations. If Bill cannot support his defence, the amount of marks are negotiated and transferred. For example, Carol may be given 5 extra marks and 5 marks are taken from Bill for her extra work (and his lack of work) over the past 3-4 weeks.

Inter-team peer assessment is also used between teams in the "Conference Centre", where each week teams assess other teams solutions.

Client Role

Student teams will use tutors from other classes as their clients. All teams are required to fill in and submit the "Client Evaluation" form for assignments 2 and 3.

Timesheet

Categories	PM	Graphic Designer	Prog	Media Producer	ID	Totals
[illegible]						
Weekly Activities						
R&D (Learning new information)						
Tota						
[illegible]						
Feasibility, Needs Analysis and Scope						
Estimating Cost						
Scheduling and Milestones						
Legal Contract and Acceptance Criteria						
Content Issues, Collection and Map						
Implementation and Maintenance Issues						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
[illegible]						
Interface/Graphic Design						
Navigation Structure						
Style Guides and Screen Templates						
Visual Story-Boards						
ID Story-Boards						
Rapid Prototype						
Evaluation						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
[illegible]						
PM Documentation (team)						
PM Procedures & Reflections (ass 2 - Individual)						
PM Procedures & Reflections (ass 3 - Individual)						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
[illegible]						
Graphics (2D, 3D, Levels...)						
Animations (2D, 3D, Levels...)						
Media (Photos, Sound, Video, Text)						
Programming – Applications						
Programming – Code						
QA (Evaluation, Testing, etc..)						
Implementation						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
[illegible]						
Critical Analysis (Post-Mortem)						
Metrics developed						
Post-mortem						
Evaluation Report						
Admin/Other						
Meetings (Team, Client, End Users)						
Tota						
Grand Tota						

Weekly Outline and Tasks

<table>
<tr><th>No</th><th>Topic</th><th>Concepts and Skills</th><th>Weekly Tasks</th></tr>
<tr><td rowspan="2">1</td><td>Introduction to Project Mngt</td><td>Understand the value of project management, job selection criteria and team roles</td><td>• Discuss syllabus, assessments, student contract, journals and portfolios with tutor, in particular self/peer assessment.
• Get books and readers
• Check previous students' work at http://www-scam.cowan.edu.au/projects
• Become familiar with JoePM and the resources available eg "Project Proposal Template". Also, fill out personal details in JoePM
• Discuss your skills and preferred team task within your tutorial - tutor will have a matrix of skills on the board
• Consider what role you want in a team, who your team members will be and what project topic you would like to take
• Fill out LASSI questionnaire (on-line) and Ethics form</td></tr>
<tr><td colspan="3">NON-ASSESSABLE TASK – This week students are required to become familiar with JoePM and complete the given weekly tasks.</td></tr>
<tr><td rowspan="2">2</td><td>Team Issues and Basic QA</td><td>Create basic QA procedures, manage time, collaborate, communicate and determine personalities</td><td>• Observe tutors modelling how to use the conference centre to post a solution for the task in Week 2
• Watch team video in lecture
• Work on student contract with your team - to be ready for next week</td></tr>
<tr><td colspan="3">NON-ASSESSABLE TASK – Students to observe tutors modelling how to answer and post the following: "What strategies would you recommend your team adopt to ensure deadlines are met and all tasks are performed satisfactorily by all team members and to the required standard"? (400 words or less).</td></tr>
<tr><td rowspan="2">3</td><td>Financial Management</td><td>Manage finances, estimate and track budgets, record and track timesheets and develop metrics</td><td>• ** First week in which students are required to post activity solution (Fri 4pm)
• Complete timesheets and journals (Fri 4pm)
• Observe tutors modelling how to assess solutions on the conference centre
• ** Sign team contract - assisted with a tutor led meeting. Copy for tutor.</td></tr>
<tr><td colspan="3">All project managers struggle to keep within budget over the lifecycle of a project. Prioritise three procedures that you consider essential for your team to follow in order to help with budgeting (400 words or less)</td></tr>
<tr><td>4</td><td>Project Proposal</td><td>Develop a project proposal, scope a project, perform a feasibility and needs analysis, create a risk analysis, collect content and develop legal documentation</td><td>• ** First week in which students are required to mark/comment other teams work (Mon 4pm)
• Post solution (Fri 4pm)
• Complete timesheets and journal (Fri 4pm)</td></tr>
</table>

	What do you consider to be the 5 essential elements of a project proposal that will ensure that both the client and producer will be satisfied with, and will form the basis of a trouble free product? (400 words or less)		
5	Scheduling and PM Models	Design PM models, plan and track using GANTTs, define categories and WBS's	• Mark/comment other teams work (Mon 4pm) • Post activity solutions (Fri 4pm) • Complete timesheets and journals (Fri 4pm)
	In order of priority, outline what you consider to be the essential procedures/commitments needed to effectively track the progress of a project (400 words or less)		
6	Design Specifications	Prepare design specifications, interface design, templates, SB's and rapid prototypes	• Mark/comment on other teams work (Mon 4pm) • Post activity solution (Fri 4pm) • Complete timesheets and journals (Fri 4pm) • ** Tutor led peer assessment - Session 1
	Outline your strategy for developing a design specification that will satisfy the needs of the client, producer and end users (400 words or less).		
7	Evaluation	Design and plan an evaluation, develop data collection tools and analyse data and report results	• Mark/comment other teams work (Mon 4pm) • Post activity solution (Fri 4pm) • Complete timesheets and journals (Fri 4pm) • ** Submit Assignment 2 (team and individual)
	In order of priority outline what you consider to be the key processes that will really make a difference to the final quality of your product? (400 words or less).		
Week 8 & 9 = Contact Free			
10	Production	Integrate media elements, work to agreed standards and track progress	• Mark/comment other teams work (Mon 4pm) • Post solution to activity (Fri 4pm) • Complete Timesheets and Journals (Fri 4pm)
	When you are in the production phase, how will you ensure that you keep to budget, time and agreed quality? (400 words or less)		
11	Quality Assurance	Implement QA practices	• Mark/comment on other teams work (Mon 4pm) • Post activity solution (Fri 4pm) • Complete timesheets and journals (Fri 4pm) • ** Tutor led peer assessment - session 2
	Almost all teams experience difficulties in handling documentation and production standards eg working with old versions of documents, coping with clients whom change their minds etc. Outline a strategy you will implement to ensure "quality" documentation and standards (400 words or less).		
12	Legal Issues	Develop legal contracts	• Mark/comment on other teams work (Mon 4pm) • Post activity solution (Fri 4pm) • Complete timesheets and journals (Fri 4pm)
	Legal contracts are important for any multimedia production effort. Using key headings, develop a Client/Developer "legal template" that covers essential legal areas needed in multimedia productions (400 words or less).		
13	Hand-over	Handover, implement projects, post-mortem and close projects	• Mark/comment other teams work (Fri 4pm) • Post activity solution (Fri 4pm) • Complete timesheets and journals (Fri 4pm)
	What issues need to be considered in the final phase of the project's life cycle? Outline in order of priority, essential procedures for this phase of the project (400 words or less).		

14	Presentation Skills	Prioritise tasks for presentations	• Mark/comment other teams work (Mon 4pm) • Post activity solution (Fri 4pm) • Complete timesheets and journals (Fri 4pm) • Fill out Web LASSI
	Outline in order of priority what you consider to be essential aspects of performing a quality presentation that will impress clients in a large audience (400 words or less).		
15	Project presentations		• * Present Web Sites • * Submit assignment 3 (team and individual) • *Tutor led peer assessment - session 3 (can also be done in week 14)
	Student teams present their web sites and metrics		

Assignments

Assignment 1: Weekly Activities (Team Based - 30%)

Consists of 10 weekly activities to be completed with your team. You are to create solutions to the given activities, which are posted to the "Conference Centre" and assessed by your peers (25%) and tutor (75%). Each submission is worth 3% and directly contributes to developing solutions for assignments 2 and 3. Each week a new activity is presented and teams are expected to:

- Decide on the scope and parameters of the required solution
- Use the Web and other sources to explore the topic and to consider a solution
- Prepare and post a solution by the end of the week which does not exceed 400 words
- Assess the solutions of 3 other teams (allocated randomly and anonymously), which requires giving a grade and a brief comment (Teams will be penalised for not completing this activity)

The timetable for posting and marking solutions covers a two-week cycle as follows:

FIRST WEEK - Monday to Fri

- New activity started from "In-tray" and discussed in lecture with focus questions and resources
- Teams explore the activity/problem and gather information to solve and post a solution
- Teams can post solutions during the week, which will be confidential only to their team. This can be edited until Friday 4pm.

FIRST WEEK - Friday 4pm

- Posted solutions to JoePM are locked and cannot be changed. If solutions are not posted on time, marks are deducted – this is an absolute deadline.

- JoePM allocates teams for assessing others ie each team will be allocated three other teams to assess. Students are required to read, mark and comment on these

SECOND WEEK - Monday 4pm

- Post marks and comments for other team solutions
- (Cycle begins for new activity)

SECOND WEEK - Wednesday 4pm

- Tutors post marks and comments for solutions
- Final marks and comments (peer and tutor) are available for viewing
- Best three solutions across all the tutorial groups are shown on JoePM

SECOND WEEK - Rest of the Week

- Students have the option of discussing the assessment results on the bulletin board

Assignment 2: Project Proposal and Design Specification (35%)

Project Proposal (Team - 15%)

To be written in a professional manner, worthy of industry standard as for a "real" client in a paid job!

- Executive Summary - includes client objectives, team members and roles, why you are the best for the job, etc..
- Needs analysis, purpose/rationale and major objectives ie client's needs?
- Feasibility issues - perceived problems, risk analysis, company support, maintenance, client resources (SME's, end users), technical difficulty given the available resources, etc.
- Scope
- Content overview - collection issues, concept map, perceived problems in collecting, sources, cost in collecting, legal issues, time needed to collect, tracking sources etc..
- Schedule and milestones (GANTT, PM Model and categories)
- Budget - estimated cost and resources needed
- Legal and contract issues (Copyright of content, IP of code and graphics, educational software issues, rights to have name in credits, scope creep, acceptance criteria etc
- Implementation and maintenance issues
- Client sign-off and evaluation form

Design Specification (Team - 10%)

- Overall "look and feel", interface and navigational design strategies
- Examples of different design explorations
- Generic design aspects, templates and other style guides showing all screen and navigation elements, buttons, logos, text style, colour scheme, animation etc.
- Broad representative sample of storyboards with content and navigational map
- Rapid prototype (online sample)

Portfolio of Procedures and Reflections (Individual - 10%)

- Two project management procedures utilised by your team (IMM 4228 students are required to submit 3) eg team communication issues, collaboration issues, financial management, project proposal, scheduling, design etc. Students will be assessed on the clarity and re-useability of procedures / templates and must be supported with references. No two team members should have the same procedures (6 marks)
- A reflective report discussing what strong / weak points you think you have as a team member? How will you try to improve on your weak areas? How do you think that your team could improve on its performance ie what changes would need to be made? (4 marks)

Assignment 3: Web Site Presentation, Final Report and Portfolio of Procedures (35%)

Production of Web Site and Presentation (Team - 10%)

- The site will be assessed on the elegant use of database access, interface design, navigation, media mix, learning strategies, technical enhancements and overall quality, quantity and significance. The final web site is to be fully operational in student presentation area, with the lecturer notified of any special plug-ins needed for the browser
- The presentation will be assessed on clarity, interest generated and keeping to time. 5 minutes to show the site discuss metrics developed, evaluation findings and 3 lessons learnt! Students are NOT to read from a script! Finish with 2 minutes of Q&A (7 mins total)
- Client Sign-off and evaluation form

Final Report (Team - 10%)

Students are required to submit the following:

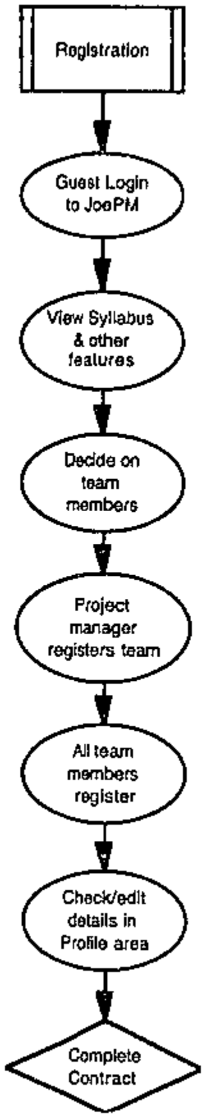
- A "Post-Mortem". Were you satisfied the team met the original objectives? If your team had to do this project again, what changes would you make for improvement? What aspects worked well?

- Evaluation study. Show key issues considered, evaluation instruments used, samples of feedback, summary of key findings and *recommendations made to client based on the results of the evaluation study*
- Metrics developed and critical analysis of all time sheet data. Cost per screen, cost per graphic, different quality of graphics and other forms of costing are required. Also, provide an analysis of the hours input by each team member and how this compared to original estimates i.e. actual versus estimated time? Were there any surprises or discrepancies? If so, why?

Portfolio of Procedures and Reflections (Individual - 15%)

- Two new project management procedures, different from assignment 2 and of higher standard
  (IMM 4228 students are required to submit 3 new procedures). Can be based on procedures for evaluation and testing, production aspects, QA, legal, hand-over or developing generic skills. Students will be assessed on the clarity and re-useability of procedures and must be supported with references (6 marks)
- A reflective report discussing "rules" and procedures you have developed to help make you a better team member. For example, what rules / procedures have you developed for managing your time, collaborating effectively with your team, communicating effectively with others, resolving conflict and accepting and giving positive criticism? IMM 4228 students are also required to give supporting references as well as provide some evidence of their experiences (9 marks).

Help for Using JoePM



Configuring Browsers to Use JoePM

- JoePM only works with Internet Explorer V5 or V5.5
- You must have the following plug-ins installed: QuickTime V4.1.2 and latest Shockwave. These are available from the introduction page of JoePM. If you have trouble running JoePM after installing these, then try uninstalling Shockwave with the uninstaller
- Works best with resolution of 1024 * 768
- JoePM works by having 2 windows open at the same time – the main interface and another window is opened to display relevant information. Do not close the second window i.e. always use JoePM with two windows open
- The URL for this site is 139.230.40.223 if you need to bookmark it

Getting Started – Registration, Profiles and Contracts

Registration

- In the first week, new users should login as "guests" through the "Welcome to JoePM" screen by typing in *guest*, *guest* for the nickname and password. Use this mode to familiarise yourself with the online application
- Once you have identified other team members (team size of 4 or less) the elected project manager must register the team from the "Welcome to JoePM" screen using the team registration option – be sure to pick a tutor name!
- Once the **team** is registered, all team members (as well as the project manager) must register through the "Welcome to JoePM" screen using the "student registration" option
- Once students are registered, they should enter the application and go to the "Manage your Personal/Team Profile" area to check their details

Personal/Team Profile

- *View All Profiles* – look at the profiles of all the students enrolled in this unit
- *Edit Your Profile* – make changes to the original profile entered when subscribing
- *View Team Profile* – View the profile of your team members
- *Edit Team Profile* – this option is only available to the project manager of the team

Student Contract

By week 3, students are required to complete a contract that commits them to a team role, time allocation and broad deliverable's. This is discussed at a team meeting that is attended by the tutor, and a "Team Contract" is signed. A copy is given to the tutor, and the project manager retains another copy.

Completing Weekly Tasks and Posting to "Conference Centre"

To access weekly tasks, course content and the conference centre you MUST FIRSTLY SELECT A WEEK NUMBER eg for what week are you checking the conference centre or resources?

View Weekly Tasks (In-Tray)

The in-tray on the desk contains weekly tasks, which student teams need to carefully consider each week. These make up 30% of the overall assessment and also directly contribute to completing the other two assignments.

Use Resource Centre (Filing Cabinet)

The filing cabinet has 4 drawers, each of which contain:

Draw	Title	Description
1	The Syllabus	Syllabus, assessments, help sheet and semester schedule
2	The Brief	Outlines the items to complete, skills being developed and focus questions to help students consider related issues
3	Resources	Contains streaming video clips of employer and ex-student perspectives, relevant information/examples, useful links and text/reader references
4	Training	Contains team and individual training activities with solutions

Conference Centre and Peer Assessment (Other Teams)

Is used to post solutions created by your team. Solutions must be posted by Friday 4pm, at which point JoePM will prevent further posting and allocate teams to mark other teams solutions. Options include:

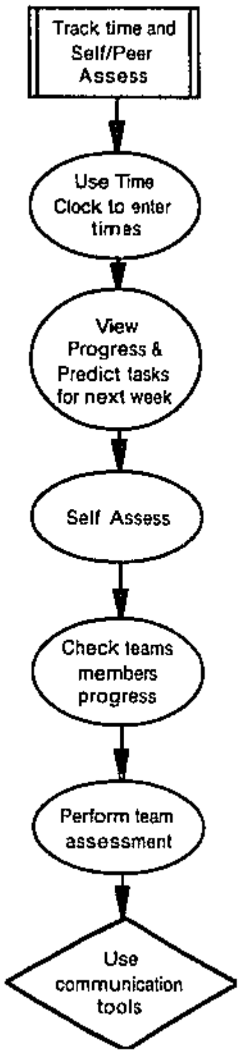
- *Post Solution : Edit Solution* - allows student teams to post weekly task solutions and then edit them if needed (edit option is only available until Friday 4pm deadline). Students are also required to SELF ASSESS their team solution before posting
- *Assess Other Teams* - allows student teams to assess the solutions of 3 other teams which are dynamically allocated by JoePM (randomly and unanimously). Peer

assessment must be completed by 4pm Monday of the following week (at which point the system will we locked). By 4pm Wednesday, the tutors will have marked the solutions and the best 3 overall solutions can be viewed

- *View All Solutions* - students can view solutions of all the other teams after 4pm on Friday
- *View Best Solutions* - shows the best three solutions for the week, based on peer and tutor marking

Communications Tools

The communication tools area contains a bulletin board, area to view other students web sites and prototypes, Post an URL and message of the day archive.



Tracking Time and Self/Peer Assess (Within Team)

This unit is based on 75% group assessment. It is important therefore to track your own effort and the effort of your team members so that comparisons can be made to apply self and peer assessment. Both the Time Clock and the Self/Peer Assessment entries must be complete by **4pm each Friday** to reflect your progress and that of your team members.

Time Clock

Allows students to keep a log of their times which are needed for developing metrics for the team web site project, and peer assessment. JoePM uses this information in the Journal to compare to original projections made in the contract and shows ongoing progress.

Journal

Tutors will use information stored here to make decisions about team peer assessments over the duration of the semester in three-team meeting. Times entered in the Time Clock will be seen in the Journal and reflect progress based on completion of tasks and self-assessment. Options here include:

- *View Progress* - Students are required to reflect on their progress for the week. JoePM shows the estimated time from the original contract, the actual time entered this week from the Time Clock and the running total time
- *Self-Assessment* – for individual task completion. Students are required to self assess their success in completing tasks from the previous week (success, quality and time management), and give a short comment. They are also required to list the

tasks they will complete in the following week (these cannot be changed once entered)

- *Team Assessment* - Students are required to self and peer-assess the contribution of all team members. This information is only available to tutors who keep it confidential and use it confidentially at team meetings to make decisions about adjusting marks between team members

The information stored in the journal is instrumental in helping tutors adjust team marks to reflect fair and equitable contribution by all team members. If students do not fill out these journals each week, they cannot expect marks to be adjusted.

Sample Legal Agreement for ECU Projects

School of Communications and Multimedia, ECU

Project Title: ____

The School of Communications and Multimedia and

Department/Company Name: ________________________________

We the undersigned agree that:

- the project described above can be used for academic purposes only (as the software being used for its development is only for academic purposes);
- each student team member will be acknowledged by name in the credits of the completed package;
- each student can use the final product as part of an electronic folio for employment;
- the students will ensure that their work is copyright free; and
- the client will ensure that the content provided is copyright free.

STUDENTS

Name	Signature	Date
______________________	______________________	____________
______________________	______________________	____________
______________________	______________________	____________
______________________	______________________	____________

CLIENT REPRESENTATIVE

Name/Position	Signature	Date
______________________	______________________	____________

Client Evaluation

School of Communications and Multimedia, ECU

Student Name: ______________________________

Please complete and return to the tutor

1 = Unsatisfactory effort, 3 = Average effort, 5 = Outstanding effort

(1) Attitude and team-work	1	2	3	4	5
(2) Technical and project management skills	1	2	3	4	5
(3) Communication skills	1	2	3	4	5
(4) Quality of the final product	1	2	3	4	5

Comment:

Appendix 3:

Tutor Led Peer Assessment Sessions

Referenced: p. 115

Tutor Led Peer Assessment for JoePM

IMM 3228 – Project Management Methods (Joe Luca – ECU)

If peers and tutors perceive that a student is not contributing adequately, then marks should be transferred. However, the tutor is responsible for summarising opinions and putting forward a case to transfer marks – it cannot be solely based on student opinion, as this may be biased. The tutor is the driver and must gain agreement from the "targeted student/s that marks should be transferred.

Journal Entries

For each team, print the summarised student journal entries for the relevant weeks. Identify consistent complaints across all team members i.e. there may be disagreed about who is contributing. This may still be worth mentioning and trying to work out where and why the disparity exits.

Determine Amount of Marks Being Negotiated

Quality Issues

- The quality of a student's work is affecting team assignment marks. Negotiate that the student receives less marks and the balance be redistributed to team;
- Other team members have had to re-do the work of others. This can be difficult to negotiate, especially if student believes the work was at the correct quality! May have to compare both pieces of work to make a decision?

Contribution Issues

- Team member not participating enough in meetings, being late, not collaborating sufficiently, or generally not contributing enough to teamwork. Try to determine how the lack of contribution affected the team's work?
- Team member not completing assigned or allocated tasks. How many marks involved? If tasks were not completed, how many marks would have been lost?

Running the Session

- If there is an obvious "target" talk directly to that student about concerns through the summary of opinions, comments and ratings you have;
- Make a recommendation of how many marks should be negotiated;
- "Targeted" students are required to defend why they shouldn't loose marks;
- Other students are welcome to comment but should not feel that have to. Tutors must maintain confidentiality about who made comments through the journals.

Summary Sheets for ______________________

Average Score from Journals

Assessment Categories					
Was he/she/you regularly at group meetings and punctual?					
Did he/she/you collaborate well, try to assist, cooperate etc?					
Did he/she/you complete assigned tasks to the best of their ability?					
To what quality did he/she/you carry out the assigned tasks?					

Person	Comments

Adjusted Marks (Recommended by Tutor)

Person 1	Person 2	Person 3	Person 4	Person 5	TOTAL
					0

Summary Comments and Disparate Issues

Appendix 4:

Technical Documentation to Working (Workplace Competencies Questionnaire)

Referenced: p. 162

Public Policy Associates

Karen M. Maduschke and Phyllis T.H Grummon

Public Policy Associates

June 1996

Public Policy Research, Development, and Evaluation

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Overview of Working

What Is Working?

Working is a self-assessment of workplace skills. The assessment is designed to offer students insights into the skills employers require. The types of skills that workplaces want go beyond academic competencies and technical know-how. Working is designed to give students feedback on nine essential, transferable, workplace skills. Working is diagnostic and prescriptive. The results can be used by teachers to design instruction and by students to develop their own strategies to enhance their workplace success.

How Can Working Be Used?

Working is meant to be used as:

- a diagnostic measure to identify areas in which students could benefit most from educational interventions;
- a basis for creating individual plans for bolstering weaknesses and building on strengths; and,
- a counseling tool for those involved in helping students be successful in the workplace.

Working Scales

There are nine scales in Working, designed to assess each of nine key constructs. The scales are:

- Taking Responsibility
- Adapting to Change
- Working in Teams
- Permanent Problem Solving
- Persisting
- Information Processing
- A Sense of Quality
- Systems Thinking
- Life-Long Learning

The following paragraphs describe each of the scales and list the items included in each. Items which are negatively valanced and, thus, reverse scored are indicated with an (R). Bach scale, with the exceptions of Problem Solving and Systems Thinking, has six items. Problem Solving and Systems Thinking each have four items.

Taking Responsibility

In order to be successful at school and work, students must be willing to take personal responsibility for their assigned tasks. Students also need to be able to identify the range of actions that will lead to success and to make sure that they are done satisfactorily. If students do not take personal responsibility for task completion, they are unlikely to be successful in life, regardless of their natural abilities or talents.

Students' scores on this scale measure their desire to complete tasks they begin and to ensure that all aspects of a task are identified and done well. Students who score low on this measure need to work on learning strategies for identifying the components of a task and setting goals for task completion. Students who consistently neglect their responsibilities may need counseling on the long-term consequences of such behavior, particularly on their likelihood of succeeding in a job.

The items for this scale are:

- I keep and use a list of things I've got to do.
- It really bugs me to see a problem that no one is trying to solve.
- I check up to make sure that others have done what they said they would do.
- I don't usually think about what I need to do until it's almost time to do it. (R)
- As soon as I finish one task, I look for another one to do.
- I prefer to let others take the lead in getting something done. (R)

Working in Teams

One of the skills that employers consistently rank as most important to success in a career is the ability to work in teams. Teams are used to make products or deliver services, to solve problems, and to manage the work environment. Employees at all levels of an organization must be able to work with others to accomplish tasks and solve problems. Teamwork involves attention to both the goals of the group and to the social processes used to accomplish those goals. Students need to be skilled in both the task and the process of teamwork.

Students' scores on this scale measure the degree to which they feel comfortable working in teams and are able to use the skills associated with effective teamwork. Students who score low on this scale may need more experience in working in teams to accomplish a task. They need to learn the qualities of an effective team member, including taking responsibility for individual assignments and for deciding how the team should accomplish its goal. Communication is also a critical factor in successful teamwork.

The items for this scale are:

- I don't usually like others giving me suggestions on how I should do something. (R)
- I like working in teams,
- I have found that group decisions are often better than individual decisions.
- I prefer to learn with other people.
- I explain to others why we need to work together.
- I'll frequently hold on to my opinion rather than compromise with the group. (R)

Persisting

The desire to stay with a task until it is completed satisfactorily is an essential quality for success in school, work, and life. Persisting involves the expenditure of time and effort to ensure that what is started is finished. Students who are able to persist until they master information or skills are at a definite advantage in school and work. Students must also be able to recognize when enough has been done and to not spend more time than is necessary on a task.

Students who score either low or very high on this scale may have trouble in this area. Students who score low have trouble sticking with a task or learning assignment long enough to see it to its satisfactory completion. They may give up too soon to really benefit from instruction. Students who score too high may be seen as stubborn and unwilling to compromise when such compromise is needed because of limited resources or available time.

The items for this scale are:

- I won't let go of a problem until I've got it licked.
- I follow through on things no matter what it takes.
- I set definite goals, then keep working on them until I've achieved them.
- If I can't catch onto something quickly, I sometimes just drop it. (R)
- I get a job done even when it's much harder than I first thought.
- I don't let go of something until I understand it.

A Sense of Quality

A focus on the quality of one's work is essential for successful performance at school and work. Students need to take pride in their work and to invest the energy and time needed to produce quality work. Appropriate attention to details is a key aspect of a student's orientation to quality, as is the desire to go beyond stated requirements to enhance a product. Without a desire to produce quality work, the completion of tasks is less meaningful.

Students who score low on this scale need help in understanding how exceeding expectations can help them succeed in everything they do. Students may need guidance in learning how to judge what is "just enough" versus "more than expected" and why doing more is beneficial. Students who score low are also likely to need help in focusing in on details and paying attention to the quality with which work is done, rather than simply doing work.

The items for the "sense of quality" scale are:

- I do extra work to make sure things are done just right.
- I won't settle for doing the minimum on anything, no matter what it takes.
- I can't quit thinking about something until I'm sure I've done it very well.
- I don't worry about the little details as long as I've done the main things okay. (R)
- I seek out new activities and responsibilities.
- I usually do my work with great care only if someone will be checking up on me. (R)

Life-Long Learning

The pace of change in information and skills dictates that everyone be willing and able to learn throughout their lifetime. Some studies predict that people will change careers up to five times during their working lives. Even those who stay in an occupational area will be confronted with rapidly changing knowledge and skill demands. In order to be successful, students must have the desire and the ability to continue to learn, whether from formal schooling or on their own. Employers identify the ability to learn as a key to success on a first job and to advancement to higher-level work.

Students' scores on this scale indicate an interest in engaging in learning in a variety of settings. Students who score low on this scale have a reluctance to look for learning opportunities and to take advantage of them when they are presented. Students may need help in identifying the many places and ways in which they can learn that go beyond the traditional educational setting. Students who are not motivated to continue learning may find their skills obsolete sooner than they wish.

The items for this scale are:

- I don't usually ask questions that go much beyond the immediate task at hand. (R)
- I like to experiment with ideas and possibilities in my head.
- I prefer to know what's in it for me before I spend a lot of effort learning something. (R)
- I usually don't make a special effort to learn new things. (R)
- I'm one of the first to volunteer to learn a new procedure or method.

- When I have to wait, I will read anything I find lying around.

Adapting to Change

Organizations are experiencing change at a rapid rate. Employees who can be flexible and adapt to change are more likely to be retained by an organization and to be successful in it. When people and organizations undergo frequent changes, the ability to thrive in ambiguous environments can help an employee to feel less stress. A student's sense that change is not threatening and that it can be managed for positive outcomes is an important component of success in the workplace.

Students' scores on this scale indicate their level of comfort with frequent or major changes in their environment. Students who score low are less likely to seek out new experiences or to adjust to changes they experience. Students with a low tolerance for change may have trouble working in many environments where change is the norm. They need counseling to help them identify ways in which they can increase their ability to adapt to change.

The items for this scale are:

- I adapt quickly to new situations.
- I usually do something I've enjoyed rather than try something different. (R)
- I am uncomfortable when I have to handle several things at once.
- I worry a lot about what could happen when things are changing. (R)
- I am usually most comfortable when things are predictable.
- It can take me a long time to get used to a major change in my life. (R)

Permanent Problem Solving

Organizations must be concerned with the ability of employees to actively participate in solving its problems. Employees need to be able to recognize problems and to use systematic methods for identifying the components of a problem and developing solutions to it. Whether working alone or with others, organizations rely on employees to help them improve by permanently solving a range of problems.

Students' scores on this scale indicate their interest and skill at using systematic problem solving methods when approaching complex problems. Students who score low need help in understanding how to approach problems in a step-by-step fashion. Experience in using the scientific method or other systematic problem solving approach should help them increase their skills in this area.

The items for the "problem solving" scale are:

- When solving a problem, I keep double-checking to be sure I'm on the right track.

- I make a detailed plan before I tackle a complex problem.
- I consciously consider several different approaches before tackling a problem.
- I will offer a suggested solution whenever I bring up a problem to someone.

Information Processing

The ability to organize information so that it is connected to past experiences and to other knowledge enhances its usefulness. When learning a new skill or subject, students who can use a variety of strategies to build bridges to what they already know will have a distinct advantage. Students who understand their own learning process can use that understanding to learn material more rapidly and more completely. Since the ability to learn is valued highly by organizations, effective information processing plays a role in employees' workplace success.

Students' scores on this scale provide insights into their competence in managing their own learning and in having and using multiple strategies when learning. Students who score low on this measure need to learn methods that they can use to help add meaning and organization to what they are trying to learn. Encouraging students to make active connections to their prior knowledge and experience is important. Equally important may be many basic study skill techniques, like outlining, paraphrasing, and summarizing.

The items for this scale are:

- I learn by figuring out how I can apply the things I'm learning to my life.
- When trying to understand something complicated, I carefully break it into parts.
- When learning something, I first think carefully about the very best way to tackle it.
- I understand new things by seeing how they fit with what I already know.
- I consciously ask myself questions to see how well I understand something.
- I make a mental picture of what I am trying to learn or solve.

Systems Thinking

As organizations assign responsibility for production and problem solving to all levels, it becomes essential that all employees understand how their work fits into the overall goals of the organization. Employees who use systems thinking can see the interrelationships of the parts of the organization and understand how actions in one part affect other parts. Systems thinking enhances the ability of employees to find permanent solutions to problems.

Students' scores on this scale indicate their understanding of the relationship among parts in a system and the effects of actions within a system. Students who have a working knowledge of one system may still need help in translating that knowledge into general principles of systems thinking. Students who score low may be helped by learning the components of a specific system before being introduced to these general principles. These students need to understand that events do not happen in isolation and that their actions may have effects that are distant in time or space.

The items for the "systems thinking" scale are:

- I want to see how one task is related to other tasks.
- I tackle a problem by first trying to see how it affects others.
- I frequently come up with new ideas for how to do things better.
- I know how to get things done in a system or an organization.
- The following sections describe the development and validation of the nine scales described above.

Appendix 5:

Generic Skills Perceptions Questionnaire

Referenced: p. 167 and177

"HOW & WHY" have you practised using generic skills in this unit?

Use the table below to complete the following:

- How did you practice these skills i.e. what aspects of the unit caused you to practice?
- Why did you make an effort to practise and improve i.e. what were your personal motivations?
- Use the given blank page for extra comments

Scale	1	2	3	4	5
How often have you practised or used this skill?	Never	Once or twice	Occasionally	Many times	Always
As a result of this unit, has this skill improved?	Not at all	A little	A reasonable amount	Quite a lot	To a large degree

Skills related to SELF i.e. skills needed to promote your own learning and productivity			
Skill	**Scale**	**HOW i.e. In what ways did you practise this skill?**	**WHY i.e. Why did you make the effort i.e. motivation?**
Managing time and setting objectives	How often used?	**eg: I used a diary to plan my time**	**eg: I felt that I didn't want to let the team down**
		1.	**1.**
	Improvement shown?	**2.**	**2.**
		3.	**3.**
Taking responsibility for own learning	How often used?	**eg: I taught myself to use FLASH**	**eg: It helped make the web site better**
		1.	**1.**
	Improvement shown?	**2.**	**2.**
		3.	**3.**
Self-assessment	How often used?	**eg: I kept a diary of how well I was completing tasks**	**eg: I needed to record my progress as part of the unit**
		1.	**1.**
	Improvement shown?	**2.**	**2.**
		3.	**3.**

Skills related to **OTHERS** i.e. skills needed to work effectively within a team and with others

Skill	Scale	HOW i.e. In what ways did you practise this skill?	WHY i.e. Why did you make the effort i.e. motivation?
Leadership and negotiation skills	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.
Collaborate and inter-personal skills	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.
Communicating	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.
Peer-assessment	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.

Skills related to **INFORMATION** eg finding and synthesising information for weekly problems & web site

Skill	Scale	HOW i.e. In what ways did you practise this skill?	WHY i.e. Why did you make the effort i.e. motivation?
Research skills	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.
Analysing and synthesising information	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.

Skills related to completing **TASKS** eg web site and solutions for weekly problems

Skill	Scale	HOW i.e. In what ways did you practise this skill?	WHY i.e. Why did you make the effort i.e. motivation?
Using problem solving skills	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.
Task management	How often used?	1.	1.
	Improvement shown?	2.	2.
		3.	3.

Appendix 6:

Statement of Disclosure and Informed Consent

For:

- **Workplace Competency Questionnaire**
- **Unit Perception Questionnaire**

Referenced: p. 170

Statement of Disclosure and Informed Consent

(Generic Skills Development Research Study – Joe Luca)

Dear student,

You are about to commence the project management methodologies unit, IMM 3228/4288. The object of this unit is to develop expertise in project managing the development of a web site as well as developing students' generic skills. This comes at a time when employers are showing increasing dissatisfaction with new graduates in regards to generic skill development such as critical thinking, problem solving, communication and teamwork. This is also reflected by many government funded research reports (DETYA), which have found that generic skills such as personal skills, communication skills and the ability to continue updating and developing industry specific skills continue to be critical factors in determining the recruitment of new graduates.

This research is attempting to promote the development of generic skills. Subjects involved in the research will be given learning tasks, learner supports and course materials that support the development of these skills. It is hoped to use the results to further knowledge about how best students learn to develop generic skills, while at the same time take a deep approach to learning. Also, the results will be used to help improve the unit in future semesters.

I would like to request your help with this research by asking you to fill out a online questionnaire (WORKING) at the beginning and end of the semester, as well as a perceptions questionnaire at the end of semester. WORKING will test the following generic skills: Taking Responsibility; Working in Teams; Persisting; Sense of Quality; Life-Long Learning; Adapting to Change; Problem Solving; Information Processing; and Systems Thinking.

Your identity will always be kept private and anonymous i.e. at NO stage will your name be known or mentioned in any research analysis or publication. Also, a participant's current position will not be prejudiced in any way by his or her refusal to participate in any of this research.

I ____________________________________ have read the information above (or, "have been informed about all aspects of the above research project") and any questions I have asked have been answered to my satisfaction.

I agree to participate in the following activities, realising I may withdraw at any time.

- *Complete a pre and post Web LASSI questionnaire*
- *Complete a post course questionnaire to assess my perceptions about the course*

Participant or authorised representative ____________________________Date ______

Appendix 7:

Statement of Disclosure and Informed Consent
(For focus teams)

Referenced: p. 170 and174

Statement of Disclosure and Informed Consent (Focus Teams)

Promoting the Development of Generic Skills
(Research Study – Joe Luca)

Dear student,

You are about to commence the project management methodologies unit, IMM 3228/4288. The object of this unit is to develop expertise in project managing the development of a web site as well as developing students' generic skills. This comes at a time when employers are showing increasing dissatisfaction with new graduates in regards to generic skill development such as critical thinking, problem solving, communication and teamwork. This is also reflected by many government funded research reports (DETYA), which have found that generic skills such as personal skills, communication skills and the ability to continue updating and developing industry specific skills continue to be critical factors in determining the recruitment of new graduates.

This research is attempting to promote the development of generic skills. Subjects involved in the research will be given learning tasks, learner supports and course materials that support the development of these skills. It is hoped to use the results to further knowledge about how best students learn to develop generic skills, while at the same time take a deep approach to learning. Also, the results will be used to help improve the unit in future semesters.

Your identity will always be kept private and anonymous i.e. at NO stage will your name be known or mentioned in any research analysis or publication. Also, a participant's current position will not be prejudiced in any way by his or her refusal to participate in any of this research. I would like to request your help with this research in the following ways. Permission to analyse and code the following, which you will be required to maintain as part of the course requirements during the semester ie to perform research analysis on materials generated as part of your course requirements: journals entries, online learning contract, online dialogue, used to provide feedback to other teams, self and peer assessment results and timesheet data. Also, besides using materials from your course requirements for the research, other data collection instruments will be used. I also seek your agreement to be involved in the following:

- attend three focus group meetings during the semester, at approximately one hours each.
- complete three questionnaires assessing the progress of their team members regarding generic skill development
- allow informal observations sessions to be carried out during team sessions during the semester

Participating students will be renumerated for their time with a $20 book voucher

If there are any questions the participant has concerning the above research procedures, for the "Generic Skills" project then these can be directed to Joe Luca (Principal Investigator) in the School of Communications and Multimedia on 93706412

If you have any concerns about the project or would like to talk to an independent person, you may contact Associate Professor Ron Oliver, on 9370 6372

CONSENT FORM

Research Study: Developing Generic Skills

I ________________________________ have read the information above (or, "have been informed about all aspects of the above research project") and any questions I have asked have been answered to my satisfaction.

I agree that the research data gathered for this study may be published provided I am not identifiable, and agree to participate in the following activities, realising I may withdraw at any time:

- have research performed on materials generated as part of my course requirements
- complete survey questionnaires to assess my generic skill development and that of my peers
- allow informal observations sessions to be carried out during team sessions throughout the semester
- participate in focus group meetings during the semester
- complete a post course questionnaire to assess my perceptions about the course

Participant or authorised representative ________________________

Date __________

Appendix 8:

Refereed Published Articles

Referenced: p. 152

Book Chapters

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Conference Papers (Refereed)

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