Re-disciplining generic skills: An examination of the relationship between the disciplinary context and generic skills in higher education

Anna Louise Jones

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Centre for the Study of Higher Education
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University of Melbourne

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Abstract

This study investigates the relationship between generic skills or attributes and the disciplinary context. Generic attributes have, for a long time, been viewed as super-disciplinary and hence as separated from and overlayed onto disciplinary content. There has been considerable interest in generic skills or attributes over more than a decade and there has also been interest in disciplinary culture and yet there has been little research to date which has examined the importance of disciplinary epistemology in shaping generic skills. This study brings together these two strands of research. The study examined the teaching of generic skills in five academic disciplines, physics, history, economics, medicine and law in two large, research-intensive Australian universities. The study is based on in-depth, semi-structured interviews with academic staff and is located within a qualitative methodology. The findings demonstrate that skills such as critical thinking, analysis, problem solving and communication are conceptualised and taught in quite different ways in each of the disciplines. This study reveals that a de-disciplined approach to generic skills in contemporary policy is poorly aligned with educational practice. Instead it proposes a re-disciplined theorising of generic skills which frames them as part of the social practice of the disciplines and so understood as in and of the disciplinary culture. This new conceptualisation of generic skills acknowledges the integration of skills/attributes with disciplinary epistemology. The notion that there can be one global term 'generic skills' which encapsulates all the aspirations of both the academy and employers is flawed. Instead, a disciplinary understanding of generic skills and attributes requires acknowledgement within the scholarship of teaching, learning and academic development of the influence of disciplinary cultures. Generic skills are intrinsically complex and there are a range of ways of defining and conceptualising them. The findings of this study have a number of implications for theory and practice. In terms of policy, there is a need for careful consideration of the ways in which generic skills are framed, and there is a need for serious dialogue with industry regarding the complexities of generic skills. In terms of scholarship and pedagogy, this study argues for rigorous scholarship of teaching in the disciplines and for a deepening understanding of the importance of the disciplinary culture in teaching and learning.

Declaration

This is to certify that

(i) the thesis comprises only my original work towards the PhD,
(ii) due acknowledgement has been made in the text to all other material used,
(iii) the thesis is less than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Signed……..

Date……..

Preface

Publications from this thesis

Jones, A (2007) ‘Multiplicities or manna from heaven: critical thinking and the disciplinary context’ *Australian Journal of Education, 5(1)84-103.*

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Table of contents

List of tables

List of abbreviations

OSCE	Objective structured clinical examination
AMC	Australian Medical Council
EBM	Evidence Based Medicine
PBL	Problem Based Learning
UK	United Kingdom
US	United States
QCA	Qualifications and Curriculum Authority
LLB	Bachelor of Laws

Chapter One
Examining the relationship between generic skills and disciplinary epistemologies

Interest in the generic skills[1] acquired by students in higher education has increased in the last decade. Generic skills are prominent in the 'public' face of the modern university. They are evident in the publication of statements of generic graduate attributes which students will achieve upon completion of their studies and in the inclusion of generic skills in subject outlines. Despite this overt interest however, there has been little research into the ways in which they are conceptualised and located within the curricula of the academic disciplines. Yet, it is within the disciplines that generic skills are embedded and taught. The enthusiasm for generic skills has moved forward without reference to the disciplinary context in which they are taught.

This study was undertaken to investigate the relationship between generic skills and the disciplinary context. In particular, it investigates the ways in which disciplinary epistemologies shape the ways in which generic skills are constructed by academic staff. To date this important pedagogical issue has received surprisingly little rigorous analysis.

This study will argue for a re-theorising of generic skills based on a detailed understanding of disciplinary epistemic and teaching cultures. It will examine the knowledge culture in five disciplines (physics, history, economics, law and medicine) and from this basis will explore the ways in which generic skills are conceptualised, taught and assessed. It will focus on the higher order skills[2] since these are more complex than skills such as information literacy or presentation skills. The study will reveal the

[1] The term generic skills is problematic as many of the qualities encompassed by this term are, arguably not skills but attributes or values. The term generic attributes is often used in more recent literature in acknowledgement of this. Other equally problematic terms used are key skills, core skills, transferable skills and key competencies. A fuller discussion of the definition of generic skills and associated problems is found in chapter two. The present study uses both the terms generic skills and generic attributes, while acknowledging the lack of precision therein.

[2] A precise definition of higher order skills is outlined in chapter four.

inadequacies of current thinking about generic skills, in particular the assumption that even though they are seen to be embedded in the disciplines, they are at the same time separate from them. The study will demonstrate that a careful examination of disciplinary teaching practices can uncover the ways in which generic skills are in fact part of the disciplinary epistemology.

This thesis will argue that an alternative and more sophisticated position is that generic skills are intrinsically complex and there are a range of ways of defining and conceptualising these skills. The idea that there can be one 'hold all' term *generic skills* that encapsulates all the aspirations of both the academy and employers should be shelved in favour of an understanding of generic skills that takes into account their relationship with context. What is required by employers will vary from industry to industry and what is taught in universities may also vary across universities and between disciplines. Levels of communication between stakeholders can be increased through an exploration of how generic skills and attributes are defined and conceptualised in a given context. The aim is to move towards a shared understanding without guaranteeing consensus.

Generic skills were defined in the following way by the Higher Education Council (1992:20-21), which at the time was one of the key policy-making bodies for higher education in Australia:

> …skills, personal attributes and values which should be acquired by all graduates regardless of their discipline or field of study. In other words, they should represent the central achievements of higher education as a process. They will be introduced and refined in a subject-related context – indeed, it is only through the study of a body of knowledge that they can be acquired – but they will also enable the graduate to transfer skills between contexts. They include such qualities as critical thinking, intellectual curiosity, problem-solving, logical and independent thought, effective communication and related skills in identifying and managing information; personal attributes such as intellectual rigour, creativity and imagination; and values such as ethical practice, integrity and tolerance.

The interest in generic skills is part of the changes in the construction of higher education and its interrelationship with society and the economy. Increasingly, knowledge is understood as human capital, as a costly investment and hence a key strategy in economic performance[3]. The Higher Education Council (1992:20), stated:

> It is therefore inevitable, particularly in times of economic stringency, that questions are asked about the performance of the universities, their quality and their return on the substantial investment of public monies.

Learning, research, the enhancement of labour flexibility, productivity and competitiveness become linked. The argument runs as follows: the knowledge economy (Drucker, 1969) is characterised by rapid change and complexity and requires skills rather than more abstract knowledge in order to enhance productivity. In the knowledge economy, generic skills meet these needs as they are thought to be flexible, transferable and applicable to an employment market which is increasingly service or information focused rather than centred around manufacture or primary industry and so requires skills such as problem solving, communication and critical thinking (Bennett et al., 1999; Candy et al., 1994; Drummond et al., 1998).

Encompassing this push for skills that enhance flexibility, are claims of a move away from what is characterised as theoretical or propositional knowledge (Gibbons' mode one knowledge) towards interdisciplinary, applied and commodifiable knowledge (Gibbons et al., 1994). This apparent change in the forms of knowledge that are valued means that skills are emphasised over disciplinary knowledge.

3 In modern human capital theory all human behaviour is assumed to derive from the economic self interest of individuals operating within freely competitive markets and other forms of behaviour are either excluded or treated as distortions of the model. According to human capital theory, economic performance is enhanced by knowledge stock. It is argued that the basis for national policy should be labour flexibility (Fitzsimons, 1997; Fitzsimons & Peters, 1994).

The importance of generic skills at a policy level is evident[4]. One of the key instigators of the emphasis on generic skills in the United Kingdom, The Dearing Commission, (1997:5) stated:

> … institutions of higher education [should] begin immediately to develop for each programme a programme specification which … gives the intended outcomes of the programme in terms of:
>
> - The knowledge and understanding that a student will be expected to have on completion;
> - Key skills: communication, numeracy, the use of information technology and learning how to learn;
> - Cognitive skills, such as an understanding of methodologies or ability in critical analysis;
> - Subject specific skills such as laboratory skills.

Statements such as these suggest a dual function of teaching in higher education – first the promulgation of disciplinary knowledge and skills and second, the transmission of 'key' skills. The implication of this particular statement is that there is a separation between knowledge and key skills.

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4 The focus on generic skills in Australia began with the report from the Karmel Committee (1985) which emphasised the importance of education in the development of an internationally competitive economy. In this report the focus was on the development of skills such as communication and group work and was centred on the school sector. The Finn Review (1991) outlined the importance of key competencies, generic and transferable skills in the development of a flexible workforce. Here the focus was on post-compulsory education. In 1992 the (Mayer) committee developed a set of key competencies which were designed as preparation for employment. The Australian Industry Group (1999) identified a series of skills such as information technology skills, problem solving, teamwork which should be developed in students in readiness for employment. Following on from this the Kirby report (2000) emphasised the shift to a knowledge economy and the associated need for skills such as learning to learn and creativity. In the same year the Employer Satisfaction with Graduate Skills survey found deficiencies in the area of creativity, communication, problem solving, independent and critical thinking. The Australian Chamber of Commerce and Industry and the Business Council of Australia (2002) then undertook a study of employers views on generic skills and compiled a list of skills required for employability. The focus on generic skills is reflected internationally with similar government reports or surveys of employer groups occurring in the UK, US, Canada and New Zealand. The parallels with the UK are particularly clear. In the UK the White Paper, Higher Education: Meeting the Challenge (Great Britain Department of Education and Science, 1987) emphasised the importance of the role of higher education in meeting the needs of the economy. This was followed by the establishment of the Enterprise in Higher Education proposal (1987). The influential Dearing Report (1997:1) set the agenda, referring to '… increasingly active partnerships between higher education institutions and the worlds of industry, commerce and public service…'.

In Australia, the Higher Education Council (1992:20) argued that while 'discipline-specific skills in many areas have only a short life' generic skills would provide students with the skills for lifelong learning and the ability to adapt to a rapidly changing work environment:

> The groups consulted were as one on this issue – while discipline skills and technical proficiency were seen as important, and more so in some areas and for some purposes than others – the so-called higher level generic skills were seen as critically important.

This emphasis on generic skills remains current in higher education policy. The policy paper *Our Universities: Backing Australia's Future, Assuring Quality* (2005) argues for the promotion and testing of generic skills through the Graduate Skills Assessment (Australian Council for Educational Research, 2001a). The assumption underlying this is that generic skills are transdisciplinary, identifiable and measurable. Key generic skills can be identified, defined, tested and measured in isolation from the disciplinary context.

Underlying these broad objectives for graduate outcomes are a number of unexamined assumptions. While governments, university policy makers and employer groups argue for the importance of generic skills and while there may be some agreement as to the skills which are important, if one closely examines the ways in which these skills are defined, there is a distinct lack of clarity. Barnett (1994:80) argues that the language and objectives around generic skills used by industry and by the university are not necessarily congruent:

> Questions are also begged in the view that the transferable skills required for a successful economy are the same metacognitive skills sought by the genuine higher education. We may use terms like communication skills, analytical skills and so forth to describe what we are up to in programmes of study in universities and they may be terms that are in use to describe skills felt not to be appropriate in the world of work. But are they, in fact, all the same terms?

The ways in which generic skills are currently constructed pays little or no heed to the disciplinary epistemologies within which these skills are situated. Indeed the extent to which generic skills are influenced by the cultures of the disciplines within which they reside is largely unexamined. Universities are structured to a large extent academically, politically, financially, educationally and culturally along discipline lines. Although disciplinary boundaries may be blurring (Barnett, 2003; Ryan, 2002), the discipline remains significant (Becher & Trowler, 2001; Henkel, 2000; Kogan, 2000; Neumann, 2001; Neumann et al., 2002). Disciplines have powerful internal cultures, identities and mechanisms for creating and validating knowledge. Further, as Henkel (2000) argues, disciplines are central in the academic identity.

Because of the central role of disciplinary knowledge, this study argues that the ways in which knowledge is structured in the disciplines influences the ways in which generic skills are conceptualised within the context of these disciplines. The idea of generic skills is founded upon an assumption that it is possible to learn a skill in one discipline and then transfer it to another, or to quite different forms of work. However, there is little empirical evidence that this is actually the case. To date there has been no investigation as to the influence which disciplinary epistemology has on generic skills.

A discussion of generic skills incorporates a number of overt or implicit assumptions regarding learning. The fundamental assumption underpinning this study is that learning is situated and learners involve themselves in a community of practice or inquiry (Brown et al., 1989; Lave & Wenger, 1991). Learning is a process of both individual and social knowledge construction. Learners engage with knowledge in their own epistemological context and in the social context since meaning-making is both an individual and a social practice. It follows then, as part of teaching and learning that conceptualisations of generic skills are similarly situated. The implication is that any serious understanding of the nature of generic skills needs to be framed within the disciplinary context and this study will show the influence of epistemic cultures on the construction of generic skills.

A second assumption is that disciplines have their own epistemologies. Epistemology is the system of beliefs about knowledge or in other words, how we know what we know. The present study assumes that many disciplinary epistemologies are coherent and well established but are not homogeneous, unified or closed, nor are they necessarily shared by all members of a discipline. They are dynamic, complex and permeable. This study does not distinguish between disciplinary epistemology and culture but sees the two as interconnected since epistemology is part of culture. It assumes that systems of belief and the epistemological foundations of a discipline cannot be disentangled. This does not, however, imply that these systems are based merely upon arbitrary convention as systems of belief can be rigorous, logical and founded upon evidence.

The notion of epistemic or disciplinary cultures has been explored from a number of angles. From an anthropological perspective, a number of writers have examined the cultures of a range of disciplines, examining hierarchies, rituals, symbols and boundary keeping (Knorr Cetina, 1999; Traweek, 1988; Ylijoki, 2000). Another influential body of higher education literature has examined disciplinary differences with the seminal work being Becher's (1989a) study of academic research cultures. While there is a considerable body of work in this area (Becher, 1989a; Braxton & Hargens, 1996; Donald, 2002; Hativa & Marincovich, 1995; Kolb, 1985; Lattuca & Stark, 1994; Lenze, 1995; Lodahl & Gordon, 1972; Neumann et al., 2002; Smeby, 1996) this has been contested by the argument that disciplinary boundaries are becoming increasingly fluid (Brew, 2001; Gibbons et al., 1994; Nowotny, 2001 Scott, 1995). Although acknowledging this change in the authority of disciplinary epistemology, the present study considers that disciplines remain a powerful influence on academic identity (Henkel, 2000) and on teaching practice (Neumann et al., 2002) and hence an important starting point for any investigation of generic skills.

The problem with a duality between content and skills is that it prevents a unified understanding of this aspect of teaching and learning. The current assumptions about generic skills suggest that there is disciplinary ('content') knowledge and there are skills or attributes that can be bolted onto disciplinary knowledge or at best embedded in it. In

contrast, the present study argues that generic skills and attributes are part of the epistemology and culture of the disciplines. They exist within the knowledge structures of the disciplines. As a consequence, skills and attributes will be shaped by the discipline of which they are a part. This means that they will not exist in identical form in each discipline. While there may be metadisciplinary skills that transcend disciplinary contexts, this is by no means certain:

> … the doubt is whether skills, at any serious level, can be independent of the context, the forms of life, the traditions and expectations in which they are embedded. Analysing a text, for example, is quite a different form of activity for surveyors, cooks, ballet dancers, historians, social workers and physicists. Indeed what counts as text in those different domains is in itself problematic (Barnett, 1994: 64-5)

1.1 Background

Australian universities are currently required to include a statement of generic outcomes in their operational plans as a condition of federal funding. Universities now include lists of generic skills or graduate attributes on their web pages or prospectuses. These lists include: cognitive, analytic and problem solving skills, rational inquiry, ability to confront unfamiliar problems; capacity for independent critical thought; and self-directed learning; openness to critiques of received wisdom; ability to express ideas orally and in writing; ability to participate as a team member. There is now some acknowledgement at the university level that the disciplinary context is relevant[5]. However, the underlying assumption remains that while there may be differences in emphasis or in the ways in which the skills are embedded in content these skills exist outside of the disciplinary context.

5 See Bowden et al.., (2000) and the University of Sydney Graduate Attributes Project (2006a) for examples of how universities are exploring the ways in which graduate attributes operate in a range of disciplinary areas.

The interest in generic skills cannot be understood as value neutral or as part of a gradual evolution of universities. Instead it must be interpreted in the context of the changing idea of the university and its relations with government, society and the economy. Scott (1995) has argued that the increasing emphasis on skills is indicative of a crisis in higher education. Morley (2003) argues that there is a state of moral panic in the university, that the university has become a site of social anxiety, which is symbolised in the push for 'quality', accountability and the commodification of knowledge. Generic skills have become part of this need for accountability and for the need to market education as product, to governments, the community, employers and students. Barnett (1994:55) suggests that by pushing the skills agenda, universities are losing their critical space.

> The clamour for a skills-focused curriculum is representative of a power-laden discourse. It is ideological and contains a thinly veiled threat. It is ideological in attempting to shift the university in a direction that reflects particular societal interests and is threatening in that its assimilation into higher education will reduce the scope available to the university to fulfil the emancipatory potential in the idea of higher education.

The changing economic and social context in which universities are operating is accompanied by 'new managerialism' (Morley, 2003). Decreased funding for universities has been accompanied by an increase in accountability. A number of writers have commented upon the extent to which academic staff are subject to an audit culture (Ball, 2003; Barnett, 1994; Clegg & Ashworth, 2004; Hussey & Smith, 2002; McWilliam, 2002; Morley, 2003). This is particularly evident in the quality movement, but can also be seen in the requirement to document, measure and evaluate much which had been the everyday business of the university. Generic skills are part of this new agenda as there is now a move for these skills to be identified, classified, stated explicitly and mapped onto the curriculum.

> Criticised on both fronts (research and teaching) for not responding to this new agenda, universities are anxious to demonstrate that they fully understand and are prepared to meet the role now extended to them. Research will have demonstrable

> ‘impact’ and will secure funding from industry; teaching will ‘embed’ key skills (Barnett, 1999:34).

Yet the danger is that generic skills become empty marketing tools rather than entities with intellectual substance. In the drive to describe and evaluate attributes which are very complex, using simple classifications or statements, the innovative and the sophisticated may become reduced to unproblematised categories. Clegg and Ashworth (2004), writing of outcomes based learning, argue that one major assumption is that learning outcomes can be expressed, albeit imperfectly, and can therefore assist staff and students to understand what is expected of them. However, the metaphor of transparency assumes that there is an unmediated ‘real’ that can be perceived. Clegg and Ashworth suggest that the attempt to specify learning outcomes involves translating the ‘knowing how’ of teaching practice into ‘knowing that’ statements. The distinction between knowing how and knowing that (Ryle, 1949) means that it is not always possible to describe outcomes since knowing how is often tacit. In the case of generic skills, the attempt to provide statements of generic skill and to map them onto the curriculum may oversimplify, given the complex nature of the skills themselves and the ways in which generic skills and the disciplines are interconnected. This is not to suggest that the issue of generic skills is so complex that the attempt to define them is futile. Quite the contrary, it is precisely because generic skills are important and because they are valued by a broad range of stakeholders in higher education that they need to be taken seriously. This requires a careful examination of the ways in which generic skills can be theorised and how they exist within the learning environment.

The issue of generic skills is concerned with the discourse surrounding the role of the university, the nature of teaching and learning and the nature of knowledge. It is both an epistemological and an ontological question since it is about what we know and what that means about our identities. From a Foucaultian perspective the nature of discourse provides a framework for thought and action but at the same time often prevents fundamental examination of that framework. In this way much of the skills agenda has assumed that the university, business and government were (and should be) all talking

about the same skills in the same way. Even within the university there has been an assumption that ideas of critical thinking, analysis and problem solving are unified.

1.2 The study

An investigation into the disciplinary nature of generic skills is timely given the ongoing ambiguity regarding the conceptualisation of these skills. There is international interest in generic skills and an emerging recognition that teaching, learning and academic development are not necessarily generic issues but are (or should be) infused with the epistemic culture of the disciplines (Hounsell, 2005). The context in which this is occurring is an uncertain one given the changing role of the university and the academic, the changing nature of management, the changing relationship between university, government, industry and society, the changing student body and student expectations[6].

This study explores the precise nature of generic skills within their disciplinary context. The study focuses explicitly on the understandings of academic staff in the higher education context. It is an analysis of the ways in which the skills are constructed, taught and assessed. To understand this, the present study draws on previous research which examines the disciplinary context, both from a transdisciplinary perspective and from within the disciplines themselves. It uses this as a context to examine the nexus between skills and context. The study provides an explanation of the epistemic as well as pragmatic influences on the conceptualisation of generic skills. The study reveals the inadequacies of decontextualised constructions of graduate attributes. The main findings of this study are: first that generic skills are highly complex, multifaceted entities; second, that the construction of generic skills is shaped by the disciplinary context; and thirdly, that it is the epistemic culture of the discipline that is central in the ways in which generic skills are constructed. The findings reveal much about the nature of generic skills, the range of dimensions at which they operate and the importance of the

[6] It must be noted that the growing linguistic and cultural diversity of Australian university classes has posed new challenges in the teaching of generic skills. Communication skills are more difficult for students for whom English is a second or third language. Further, the willingness of students to question a point of view is not a given in all societies (Jones, 2004; Jones, 2005).

disciplinary culture in teaching. The conclusion of the present study is that generic skills need to be reconsidered. This study proposes an alternative theorising of generic skills arising out of the context in which they are situated. The study advances knowledge of generic skills through a careful examination of the complexity of their construction and their disciplinary underpinnings.

This study was conducted in two large, well established, research intensive universities in Australia. Both are members of the Group of Eight, which describes itself as representing Australia's leading universities. One of the universities was established in the mid-nineteenth century. It has a student population of around 45,000 students, approximately twenty percent of which are international full-fee paying students. Around eighty percent of the student enrolment are undergraduates. The other university was established in the mid-twentieth century. It has an enrolment of approximately 50,000 students, thirty percent of which are international full-fee paying. Around seventy percent of the enrolment are undergraduate students. Both universities have university-wide statements of graduate attributes. Further, statements of generic skills are included in subject outlines. In some departments, the graduate attributes have been reformulated to reflect the particular disciplines. Both universities had departments or schools that specifically represented the disciplines featured in this study. The study is based on interviews with academic staff and examination of teaching material.

Clear limits were set on the design of this study from the outset; this was done in order to sharpen the focus and precision of the findings:

- The study investigates teaching only, rather than learning although these are linked. It is not specifically concerned with student learning;
- The study is limited to the reported perceptions of academic staff;
- The study is based in the Australian context while drawing heavily on research and policy from the United Kingdom;
- The study is entirely qualitative and is based on interviews and teaching materials;

- The study is not concerned with student outcomes in that it did not investigate the ways in which student learning was affected by the teaching outlined by the participants. Nor did the study examine broader educational or employment outcomes of generic skills.

The study focuses on five disciplines with established epistemic cultures, research traditions and a history of teaching in the academy. In this way clear conclusions could be drawn about the nexus between disciplinary context and generic skills. The study is based on two universities of similar size and reputation, with similar student and staff profiles and research output and so conclusions can be drawn that are based on disciplinary considerations rather than institutional ones. However, in a study such as this there is a great range of diversity within disciplines and the institutional articulation of a discipline is always different. In a study with relatively small numbers of participants such as this, there is no way of knowing whether the views expressed are reflective of a departmental or institutional culture, nor of the effect that the departmental culture has upon the conceptualisation of generic skills and it is acknowledged that the influence of these factors is significant (Trowler & Cooper, 2002). While acknowledging this, the study found notable consistencies within disciplines.

The central question which this study investigates is the relationship between generic skills and the knowledge territory of five disciplines. These disciplines are physics, history, economics, medicine and law. These disciplines were chosen because it was anticipated they would all have a well-defined disciplinary culture and so the relationship between the disciplinary culture and the conceptualisation of generic skills within the discipline could be examined. Further, these disciplines span a broad range from the scientific, social science, humanities and professional disciplines. The study is based on five propositions:

- Disciplinary influence remains powerful in higher education;
- There is a relationship between the disciplinary epistemology and teaching practices;

- Generic skills are embedded in the disciplines and hence in the epistemic and teaching cultures of the disciplines;
- There has been ambiguity in the conceptualisation of generic skills;
- There is a need to reconceptualise the generic skills from the context of the epistemology of the disciplines.

1.3 Organisation of the study

The following chapter explores the context from which generic skills have arisen. It examines in detail the social and political context, the ambiguities regarding the theorising of generic skills and the educational implications. Chapter Three then looks at the importance of disciplinary culture. It explores the ways in which disciplines have been examined in higher education and outlines flaws in models of disciplinary differences, proposing instead that for the purposes of this study, disciplines be considered from the perspective of their intrinsic epistemic culture. Chapter Four outlines the analytic framework upon which this study is based. It presents three key elements which are central to the present study: first the central assumptions about teaching and learning, second, notions of epistemology and thirdly, the theorising of skills. It proposes an operational definition of generic skills which underpins the analysis. Chapter Five outlines the design and conduct of this study. It sets out the conceptual foundations, the rationale and method of data gathering and analysis. Chapters Six to Ten present the findings from the disciplines of history, physics, economics, law and medicine respectively. Chapter Eleven is a discussion of generic skills in context. It examines in detail the notion of generic skills as part of the disciplinary culture rather than separate from it. It then outlines an alternative conceptualisation of generic skills based within disciplinary epistemology. The final chapter sets out the conclusions and directions for future research.

Chapter Two
The pervasive influence of generic skills in higher education

Generic skills have a significant place in higher education. They are considered in government policy, discussed by industry and examined in the scholarly literature. This chapter is an examination of existing research into generic skills. It considers the social, political and educational context out of which the issue of generic skills has arisen. It is arguable that universities have always been concerned to foster generic skills, particularly higher order skills. However, what has changed is that now universities are making generic skills explicit (Bowden et al., 2000). This chapter examines the complexities of this tension between implicit and explicit constructions of generic skills. It explores the reasons why generic skills are a significant issue in higher education and provides a detailed discussion of the ambiguities in the ways generic skills have been conceptualised. As the thesis will show, until recently generic skills have been relatively unproblematised. This chapter analyses the rationale behind the growth in interest in generic skills over the last fifteen years, the ways in which generic skills have been conceptualised and the place of generic skills in the curriculum. It provides a critical examination of the assumptions underpinning notions of generic skills and the inherent problems.

2.1 The importance of generic skills

The current importance attached to generic skills in higher education has been well-documented (Assiter, 1995; Barnett, 1990; Bligh, 1990; Clanchy & Ballard, 1995; Scott, 1995). The Dearing Report in the UK (1997) reflected social, economic and educational changes in the relationship between higher education and employers. This report has since been followed by a considerable international interest at political and educational levels in the skills which graduates take into the workforce (AC Nielsen Research

Services, 1998, 2000; Conference Board of Canada, 2000; Gibbs, 1994; Stanton, 1995; The Association of Graduate Recruiters, 1995; The Secretary's Commission on Achieving Necessary Skills, 2000). Generic skills are a serious issue for higher education in the UK, North America, Australia and New Zealand. The Graduate Skills Assessment (Australian Council for Educational Research, 2001a, 2001b) clearly positions the generic skills as of central importance in higher education. It seeks to assess skills such as problem solving, critical thinking, interpersonal understandings and written communication. These are the generic skills that are identified by the authors of Graduate Skills Assessment as 'popular', transferable and measurable. The test aims to measure these skills at exit and entry level. At a subject level, generic skills are frequently included in subject outlines or objectives, often as a mandatory institutional requirement and so are given significance in the curriculum. After more than ten years, generic skills are still of central interest in the higher education literature and many of the key issues remain unresolved (Barrie, 2004, 2006b; Bath et al., 2004; Butler, 2006; Gilbert et al., 2004; Kreber, 2003; Leggett et al., 2004; Mills & Sharma, 2005; Phillips & Bond, 2004; Sumsion & Goodfellow, 2004; Tapper, 2004).

Hager et al. (2002) identify three key reasons for the growth in interest in generic skills. These are economic and social reasons, pressure from business and the educational value of generic skills. For the purposes of the current study, economic is taken to mean the factors, both social and economic which impact on formal and informal policy. Business is a related area but here is taken to refer to the more micro level employer groups and business interests. The following sections provide a detailed discussion of each of these factors.

2.1.1 Economic and social factors

The economic reasons behind the focus on generic skills stem from the changing nature of work. This change comprises, among other things, a shift from a service economy to a knowledge based economy. This is also associated with a climate of rapid and continuous change, both socially and technologically, requiring workers who are flexible, life-long learners with a capacity for knowledge creation.

The focus on generic skills began in Australia in the mid 1980s with the Karmel Committee (1985) and was given further impetus in the early 1990s by the Finn Review (1991) and more particularly the Mayer Committee (1992). However, it was only towards the end of the 1990s, with the release of the Dearing Report (1997) in the UK, that the interest in generic skills was taken up seriously by higher education in Australia as in many other Western countries. The issue of generic skills arose largely in the context of shifts in the nature of employment due to economic and technological factors. The perception was that there was a need for more labour flexibility and mobility, for skills applicable to the widespread use of information technology and for a move to a service rather than manufacturing industry. Generic skills are seen as meeting these needs because they are perceived as transferable between a range of employment contexts, promote life-long learning and are skill rather than content based.

Marginson (1997) identified three changes which occurred in labour markets after the mid 1970s and which have had a profound effect on education in Australia and are part of a shift also occurring in other Western countries. These changes were first, the end of full employment, which created a buyers' market for educated labour, secondly, the blurring between education and labour market programs and thirdly, the rapid growth in service industries requiring communication and interpersonal skills. The changes meant that education became more vocationally focused, that employees were required to become more adaptive and flexible and that employers could demand skills that were seen as common to a range of employment situations.

Following the Finn and Mayer committees in Australia, the generic skills agenda became driven by notions of work based competence in which work was seen as the 'universal setting' and cultural competence was infused with an economic content and education was required to produce citizens who met economic needs for flexibility and a continual reconstruction of the working self (Marginson 1997:176). In this way educational outcomes were no longer defined by educators but by the needs of employers. In short, a new political consensus arose in which economic growth is the overarching public policy objective of any government. Skilled labour is an essential part of the formula for

sustained economic growth. As a consequence, those whose profits determine levels of growth begin to prescribe the skills which are valued not just in the vocational education sector but also in higher education. Alongside this, although government funding for higher education has decreased in the last two decades, government interest in, and control over higher education has increased.

Associated with this need for adaptability is the need to produce life-long learners. Candy et al. (1994) outline the growth of the idea of life-long learning in the Australian context. Candy et al. suggest that life-long learning really came to the fore in Australia with the Dawkins Green Paper in 1987 and White Paper in 1988 and that these papers linked the need for graduates to develop critical and analytical skills with the need for life-long education to achieve social, cultural, technological and structural change (White Paper, 1988, cited in Candy et al., 1994). This push for universities to produce graduates with transferable and flexible skills, which was seen as crucial to economic success, continued through the 1990s, although Candy et al. (1994) suggest that the pressure may have moved away from a narrow vocationalism and towards a more balanced view of the role of higher education.

2.1.2 Business needs

Closely associated with the economic drive for generic skills policy is the pressure from business for universities to produce graduates who have the cognitive, attitudinal and communication skills to be successful workers in the modern environment. One of the roles of higher education is to prepare graduates for work. As a consequence, employers are one of the powerful stakeholders in university education. As Lyotard (1984) suggests, while the role of higher education is still integral to the social system, it is now expected to supply the skills that are necessary to 'world competition', in particular the managerial and technical skills.

Generic skills are seen as a means of producing graduates with the skills perceived as preparation for working life and this is viewed as the responsibility of the university. This view has been articulated by governments and employers both in Australia and

overseas. The committee of Vice Chancellors and Principals (UK), Confederation of British Industry and Council for Industry and Higher Education issued a joint declaration which argued that one of higher education's purposes was to prepare students for working life and this could be achieved by ensuring that universities were equipped to develop 'attributes' believed useful for life-long learning (cited in Bennett et al., 1999). The Quality in Higher Education Project (cited in Bennett et al., 1999) stated that 'higher education has a responsibility for ensuring that students graduate with competencies that enable them to work effectively in modern organisations'. In the UK the Association of Graduate Recruiters (1995) stated a need for the self-reliant graduate and for the skills of life-long learning. The Qualifications and Curriculum Authority (QCA) UK developed a set of generic skills considered essential for an effective workforce. Employers began voicing a need for graduates with transferable skills such as problem solving communication and teamwork (Bennett et al., 1999, 2000) and this is evidenced in surveys of employers (Harvey et al., 1997). This call at the levels of policy and business for graduates with transferable skills was matched in the educational research literature (see for example Assiter, 1995; De La Harpe et al., 2000; Drummond et al., 1998; Fallows & Steven, 2000; Hoddinott & Young, 2001; Johnson et al., 2002; Kearns, 2001; Moy, 1999; Nyman & Berry, 2002)

2.1.3 The educational rationale

The third rationale for an increased or more explicit emphasis upon generic skills is an educational one. Despite concerns that universities are being pushed by a culture pervaded by economic imperatives along educationally questionable pathways (Barnett, 1994; Bennett et al., 2000; Scott, 1995), there is an educational rationale for a focus on generic skills. Hager et al. (2002) argue that generic skills can provide a consistent terminology for describing course outcomes and so facilitate a link both between disciplines and between university and practice. Yet this study argues that to date the theorising of generic skills has been so patchy that it has created inconsistency and false expectations rather than providing a common language as the same terms have different meanings in different settings.

Another educational justification for generic skills is that there appear to be links between generic skills and deeper learning. Morgan et al. (1996) make a connection between higher order generic skills and deep learning[7] although they do not outline the precise nature of that connection. Some research into the teaching and learning of generic skills suggests that they are best engendered using active teaching approaches (Moy, 1999; Nightingale, 1996) and hence an emphasis on generic skills may also foster student engagement. Bowden et al. (2000) argue that the development of generic skills requires the adoption of a student centred rather than content or teacher centred approach to teaching.

Alongside the changes in employment, the 1980s onwards have seen an increase in demand for higher education and a rapid expansion in student numbers or 'massification' (Scott, 1995) and this has been intensified by an influx of international and non-traditional students. Thus there are an increasing number of students with increasingly diverse needs. This expansion of the student population is linked to the market demand for knowledge workers. The consequences of this are threefold. First, as the student population becomes more diverse, there is a greater need for 'learning to learn' skills that promote the learning of content knowledge. Secondly, Nunan (1999) argues that in a mass higher education environment it is in both the students' and universities' interests that the skills or attributes that graduates achieve are made explicit, thereby enabling universities to distinguish graduates of one institution from those of another as a means of marketing themselves to potential students and employers. Thirdly, generic skills provide students with the flexibility to move into a broad and changing range of employment destinations.

7 Deep learning relates previous knowledge to new knowledge, sees knowledge from different areas or subjects as interconnected, applies theoretical knowledge to everyday experience, organises and structures knowledge and experience in coherent ways and emphasises intrinsic motivation. In contrast, surface learning is fragmented, memorised, is not reflected upon and motivation is extrinsic (Biggs, 1987, 1999; Entwistle & Tait, 1990; Kember, 1997; Marton & Saljo, 1976; Prosser & Trigwell, 1999; Ramsden, 1992; Trigwell et al.., 1999)

2.2 Defining the nature and scope of generic skills

There are at least three problems associated with notions of generic skills. These are first, questions of definition, secondly, questions regarding the level of complexity of the skills under consideration and thirdly, the notion of transferability. All these questions raise doubts as to what the term generic skill refers, and how much commonality there is amongst the various stakeholders in their understanding of the term. This section will examine these three issues associated with the definition of generic skills.

Golding et al. (1996) define generic skills as those common to more than one occupation or field of knowledge. Bennett et al. (2000) define generic skills as those skills which can support study in any discipline and which can potentially be transferred to a range of contexts, in higher education or the workplace. The emphasis in this definition is on supporting study in any discipline and only secondarily on the skills needed by employers. Definitions of generic skills vary in their emphasis on the centrality of the workplace, on the emphasis on skills or on more general 'attributes' and in their assumption of transferability. The problems inherent in these definitions are outlined below.

Although generic skills are central to higher education, there is uncertainty as to precisely which skills can be identified as 'generic' and even more uncertainty as to how those skills are defined and whether indeed 'skill' is the most appropriate term. One of the central problems in discussing generic skills is that there are a number of terms used in the literature to describe similar phenomena. These terms include generic skills, transferable skills, personal transferable skills, core skills, key skills, graduate attributes, generic attributes or permutations of these terms. Further adding to the confusion is the seemingly interchangeable use of terms such as competences, capabilities, attributes, skills or outcomes (Bennett et al., 1999). Barnett (1994) questions the meaning of the term skills. He argues that the term has no substantive content outside of a definite setting. In addition, he argues that the way in which the skill is acquired will affect the character of that skill. Barnett's argument calls into question the whole notion of generic

or context-flexible skills, since each skill is developed and performed in and arising from a particular context and so may be dependant upon that context.

Even the term 'generic skills' is invested with a considerable degree of ambiguity. Leveson (2000) sees this definitional confusion as one of the central problems, arguing that it has created an expectation gap between educators and employers. Universities may claim that they are teaching generic skills and mean one thing while employers may be expecting something different. Marginson (1993) points out that academic lists of generic skills may not be the same as work-related generic skills, even if there are many terms that are common to both lists. This, he points out, is because the terms arise out of differing contexts and thus take on different meanings. Marginson suggests that one important difference is that in higher education, generic skills are understood in terms of knowledge. The disciplinary context is of the utmost importance because it forms the knowledge base out of which these skills arise and from which these skills are defined. Business may have yet another knowledge base (or series of bases) which are assumed to be universal.

Marginson (1993) identifies a series of problems with interpretation of the term 'generic'. The first is whether it is possible for a skill to be *universal*. In other words, whether it is possible for a skill such as problem solving to be applicable across a range of settings, regardless of the difference between these settings. The second is whether these skills can be understood as *essential* and how one can define the specific and essential elements of a particular set of skills. The third is whether it is possible to understand generic to be the *common* elements of a skill or competency and hence recognisable, regardless of context. Finally, Marginson questions whether generic is *separate* from occupation or discipline specific skills or competencies.

A number of lists of skills and or attributes have been produced by educators (see for example Drummond et al., 1998; Fallows & Steven, 2000; Gibbs, 1994; Gibbs & Habeshaw, 1989; Thorley, 1994) and employers (Harvey et al., 1997; The Association of Graduate Recruiters, 1995). These lists include concepts such as communication,

numeracy, teamwork, technical/mulitmedia skills, problem solving, critical thinking and analysis. Bennett et al. (1999: 76) argue that these lists have been developed pragmatically and that this is characteristic of the atheoretical approach to this field. They state that what the different sets of skills have in common is that they are 'theoretically threadbare'.

The second issue and a further complicating factor in the discussion of generic skills is the acknowledgement that these skills can operate on a range of levels (Golding et al. 1996, Assiter 1995, Clanchy & Ballard 1995). So generic skills can require a high level of conceptual abstraction or can be concrete or practical. In general, the higher order skills appear to roughly correspond with those identified by Bloom (1956) as analysis, synthesis and evaluation. Resnick (1987) defines the higher order skills as non-algorithmic, complex, entailing uncertainty, having multiple solutions, involving nuanced judgement and requiring multiple criteria and the imposition of meaning and effort. Donald's (2002) working definition of the higher order skills includes analysis, synthesis and critical thinking. However, many of the lists of generic skills do not distinguish between higher and lower order skills, nor acknowledge that the generic skills included require quite different sorts of thinking. As Clanchy and Ballard (1995:157) point out:

> Some universities have been quick to embrace the new ideology of Quality Management, publishing lists of the 10 or 12 attributes that all graduates of their universities 'will have'. A quick examination of most of these lists reveals the same hodge-podge of general desiderata with low-level technical competencies (most frequently computing and word processing) lumped indiscriminately together with higher order intellectual skills ('Graduates will reason logically…') and broad motherhood claims about 'ethical' or 'tolerant' behaviour ('Graduates will display tolerance towards other cultures').

Furthermore, there is confusion between notions of 'generic' and 'transferable'. Because the terms are frequently used interchangeably, there is an assumption that generic skills, by their nature, can be transferred between disciplines and from a university context to non-academic context (either professional or personal). However, the evidence that these

skills are actually transferable, and the nature of this transferability is limited (Bennett et al., 1999; Marginson, 1993). Perkins and Salomon (1994) argue that the conditions for transfer of learning cannot be taken for granted but require stringent conditions. Indeed Golding et al. (1996) point out that the notion that generic skills can necessarily be transferred from one context to another is a problematic one because there is an important context specific element to learning.

A further problem with the notion of generic skills is the term 'skill'. As Holmes (2000) points out, the term skill appears to refer to some tool-like entity that is used in particular ways and while this may be an oversimplification, the concept of skill suggests something overly instrumentalist. Much of the earlier work on skills arose from a cognitive framework which understood skills as the active processing of received data. However, this approach to skills does not consider the social and historical construction of thinking and the interaction between these experiences and the context in which they occur. Further, the term skill does not acknowledge the mediating influence of aspects of human character such as values, openness, personal and social responsibility. Just as generic skills cannot be disentangled from the disciplinary context, nor can they be disentangled from values. In response to the concern regarding the applicability of the term 'skill', there is a move now to refer to generic graduate attributes (Barrie, 2004, 2006b).

2.3 Generic skills in the curriculum

There are three broad approaches to developing generic skills: embedded, which involves the skills being developed within the curriculum; parallel in which the skills are developed in free standing modules rather than integrated into the curriculum; and work placements, which are aimed at developing students work related skills (Drummond et al.). The embedded approach to teaching generic skills is probably the one currently most frequently used in higher education, however, skills such as writing are sometimes taught separately. Further, within the critical thinking literature there is an ongoing debate regarding the generalisability of critical thinking and whether it is best taught as

part of disciplinary material or taught separately (Ennis, 1992; McPeck, 1981, 1990; Norris, 1992).

Barrie (2006b) has identified four distinct understandings of generic skills/attributes in higher education: the precursory, complementary, translation and enabling conceptions. A precursory understanding sees generic skills as the attributes to which disciplinary knowledge can be added, the second sees them as a complement to the discipline specific understandings but not part of the discipline, the third views generic skills as enabling the translation of university learning into other settings and the fourth is the most complex understanding of generic attributes, viewing them as the aptitudes that lie at the heart of scholarly knowledge and can both support the creation of new knowledge and transform the individual. Barrie's study points to the clear lack of consensus regarding the nature of generic skills and their place in the curriculum.

A number of studies have considered ways in which generic skills can be taught in the context of the academic disciplines: for example accounting and business studies (Boyce et al., 2001; De La Harpe et al., 2000; Humphreys et al., 1997; Monks, 1995), geography (Brown, 1999; Dyas & Bradley, 1999), multimedia (Oliver & McLoughlin, 2001), social science (Havard et al., 1998), mathematics (Nyman & Berry, 2002) and biological science (Johnson et al., 2002). However, these studies do not consider the relationship between generic skills and the discipline in question, but rather consider a set of externally devised skills, which must be imposed upon the discipline, so that the discipline becomes a vehicle for skill development for those skills perceived as required by employers. These studies identify a fairly broad range of skills identified as 'generic'. These include: research skills, problem solving, communication, presentation skills, teamwork, fieldwork, analysis, synthesis, interpretation, critical thinking, project design and implementation, technical and information literacy and decision making. Few of these skills are overtly defined and there is no discussion of the precise relationship between these skills and the discipline in question. Yet what these studies do point to is a growing interest in overtly teaching generic skills, rather than expecting that they will simply be acquired in the course of learning 'content' or disciplinary knowledge. On a

broader scale, a recent project by Bowden et al. (2000) identifies the graduate attributes in a number of disciplines at a range of higher education institutions and discusses practical steps toward the implementation of such programs.

A further problematic factor is that for each generic skill there are a wide range of curriculum initiatives (see for example Fallows & Steven, 2000). This is not to suggest that there needs to be a singular approach to the teaching of generic skills, quite the contrary, since for most elements of the curriculum there are a range of approaches. However, it does point to the wide variety of understandings of both the nature of the skills and the means by which they are taught[8]. What is of particular interest is not so much the range of techniques for teaching generic skills but the theorising that underpins this teaching.

2.4 The key issues

It is clear then, that there has been considerable work on the issue of generic skills over a number of years. Yet in spite of this level of interest, the complexity of the issues involved has resulted in little consensus. The central issue is that generic skills are exceptionally difficult to define. The implications of this are that there is no unified understanding of generic skills. First, there is no unified agreement as to what the term 'generic skills' means. Second, there is no agreement as to what skills or attributes can be classified as generic. Third, even if a skill is agreed upon as generic, there is little agreement as to what is understood by the term (for example critical thinking). Furthermore, there is an underlying assumption that the notion of generic skills is universal. However, it is by no means clear that there is a shared language for generic skills across employer groups or between universities and employers. What employers understand by generic skills may not be uniform and may not align with what universities

[8] One approach to generic skills is curriculum mapping (Fallows & Stephen 2000) which involves identifying the ways in which the existing curriculum fosters generic skills and the gaps in that development (for example Gibbs, 1994). However, this approach often does not emphasise the complexity of the task (Sumsion & Goodfellow, 2004) which is in turn, a reflection of the complexity and interconnectedness of the skills themselves.

understand by the term. Indeed even within universities there is little evidence that there is a uniform understanding of the term. This lack of a shared understanding of generic skills is a function of the very complex nature of generic skills and in the range of contexts and purposes in which the term is used. Despite suggestions that generic skills are vital for the growth of the economy, the meaning, value and application of generic skills remains unresolved, largely due to the ambiguities associated with definitions.

While there are numerous uncertainties regarding precisely what is meant by ideas such as critical thinking, analysis or problem solving and how these skills can be most effectively engendered, there remains uncertainty as to exactly how these skills will contribute to the economy. If notions of critical thinking are very difficult to define and probably impossible to measure then it is unlikely that there will be any way of assessing in any meaningful way, the extent to which these skills will contribute to the economy.

The educational aspect of generic skills is open to question on a number of fronts. First, there appears to be no consistent educational framework for understanding generic skills, secondly, the links between deeper, student centred learning and generic skills have not been thoroughly researched and thirdly, the argument that generic skills will provide students with flexibility is by no means guaranteed since there are serious questions raised regarding their transferability. Finally, the claim that generic skills can provide a way of distinguishing higher education institutions is questionable if statements of generic skills are open to such a wide range of interpretations[9].

As this chapter has shown, much of the discussion of generic skills suggests that generic skills are entities which precede disciplinary knowledge and hence must be overlayed on the disciplinary content. Yet much of the research evidence is that generic skills are best taught within the context of the disciplines (Clanchy & Ballard, 1995; Golding et al., 1996; Hattie et al.., 1996; Kemp & Seagraves, 1995; Nightingale, 1996). In other words, generic skills are conceived as isolated from disciplinary knowledge, even if they are

[9] Both Morley (2003) and Gale (2000) argue that the drive to encourage universities to compete with each other is part of the new managerialist culture and symptomatic of the infusion of entrepreneurialism into academia.

taught as part of the process of teaching content knowledge. To date this assumption has not been closely examined but may partly explain the reported limited success in generic skills teaching (Drummond et al., 1998; Leveson, 2000).

A further difficulty in the teaching of generic skills is that their complexity means they are difficult to assess. Thus there may not be alignment between statements of support for generic skills and the assessment of them. Although generic skills are valued, what tends to be assessed is the more 'concrete' content knowledge. In addition, the emphasis upon disciplinary knowledge means that generic skills are implict. There is a substantial body of literature showing that assessment drives learning of content (Biggs, 1999; Brown & Knight, 1994; Entwistle, 1997; Ramsden, 1992) and more recently, skills (Haigh & Kilmartin, 1999). As Leggett (2004) point out, the relative importance of skills and the possibility of a gap between espoused theory and practice can be explained by the assessment framework.

In a study of graduate attributes at Monash University, Edwards and King (2002) argue that the discipline was a powerful influence upon the articulation, teaching and assessment of graduate attributes. They found that there were uncertainties as to the definition of graduate attributes, variations of meaning and inconsistencies of interpretation. Alongside this, however, was the assumption by teaching staff that understandings were shared and hence teaching staff expected that their own understandings were common, whereas in fact there were great disparities. This assumption of commonality is not unique to the study by Edwards and King (2002) as it is one of the central suppositions of the generic skills literature. There has been a fundamental premise that there is a common understanding the sorts of skills that can be termed 'generic' and further assumptions regarding what these skills actually entail. However, this assumption has, for a long time remained unexamined.

2.5 Re-examining generic skills as the focus of this study

This chapter has identified a number of shortcomings with the notion of generic skills. It has shown that despite serious consideration of the issue over more than a decade there remain a number of unresolved issues. In summary these are:

- A lack of coherence regarding the definition of generic skills;
- A perceived gap between what employers want and what higher education is delivering;
- A need for rigorous theorising on the teaching of generic skills;
- Misalignment between objectives and assessment of generic skills; and
- Separation of generic skills from the disciplinary context.

It is clear from this that there is a need for a reconceptualisation of generic skills. Either generic skills will continue to be understood in differing ways in employment and educational contexts and there will be different ways of understanding and defining generic skills within industry and within the university. If this is the case there will continue to be a gap in expectations between what employers want and what universities are delivering. The alternate position is that the understandings from the labour market will be implemented by higher education in order to create the sorts of graduates required by employers. Neither position seems satisfactory. First, there is no single employer position on generic skills. Secondly, while one of the roles of the university may be to prepare students for work, this need not necessarily be reactive. Thirdly, and most importantly, a careful examination of the literature on generic skills suggests that there is no simple way to identify one single, common definition that can be acceptable across all employer groups and taught across all universities.

This chapter has shown that the issue of generic skills is highly complex. An examination of the literature raises a number of questions. These include the inconsistencies in definition, questions as to which skills can be referred to as ‘generic’, doubts about whether the term skills is appropriate, and fundamental questions as to whether generic skills are indeed generic, that is whether they are transferable and

generalisable. Because of the complexity in theorising generic skills there are associated difficulties in articulating the teaching of generic skills.

Much of the conceptualising and teaching of generic skills is already deeply embedded within the disciplines. Thus an exploration of the ways in which disciplinary understandings shape generic skills is timely. A number of authors (Li et al., 1999; Pascarella & Terenzini, 1991; Tsui, 1999, 2002) suggest that there are differences in the ways skills such as critical thinking are perceived across different disciplines. Preliminary studies of the Graduate Skills Assessment (Australian Council for Educational Research, 2001b) suggest that there are distinctive profiles of student performance on the Graduate Skills Assessment which are related to fields of study, for example humanities students do relatively well on critical thinking[10]. Given the embedded nature of generic skills, an exploration of the disciplinary influences upon their conceptualisation and teaching is significant.

Clanchy and Ballard (1995:160) argue that the central question regarding generic skills was: 'What is distinctive about the ways in which such skills (as problem solving or communication) are engaged and manifested in higher education?' They argue that any attempt to answer these questions will need to be framed in terms of two fundamental principles:

1. Generic skills (and attitudes), while by definition at work across the broad range of university education, can only be developed within specific contexts of knowledge. Critical thinking, for example, cannot be developed independently of some subject matter about which such thinking is taking place.
2. The contexts (the disciplinary structures of knowledge) with which generic skills (and attitudes) are being developed determine the form which those skills (and attitudes) will assume in any particular instance.

[10] See Smith and Bath (2006) for a detailed discussion of the problems associated with tests such as the Graduate Skills Assessment

They also make the point (citing Becher 1989 and Dall' Alba 1992) that 'while the demand for analytical thinking is inherent and universal in (is 'generic' to) university education, the form it takes is specific to the discipline' (p161). Moreover, the actual forms within which such generic skills are embedded, however, are highly sensitive to context. This argument was made forcefully more than ten years ago but despite this, it appears to have been largely ignored. The reasons for this tacit consensus around generic skills are first that there is little incentive to problematise an issue when there is no obvious solution or when the solution is that definitions of generic skills are dynamic and so will require continual redefinition and renegotiation. Second, there is a general reluctance to admit uncertainty about 'common sense' ideas that are part of general usage and so, at first glance seem obvious. Third, if generic skills can be assumed to be relatively unproblematic, they can be measured (albeit not effectively) and so can be incorporated into managerialist notions of quality.

This study examines the unanswered questions raised by Clanchy and Ballard (1995) through exploring in-depth the ways in which generic skills are understood in their academic context. It considers whether a concept such as critical thinking as understood in physics has any relationship to critical thinking in history or economics. By considering the nexus between generic skills and disciplinary context, this study questions the extent to which these skills are then likely to be transferable to a workplace in which the context may be quite different. While there is a widespread view that the higher order generic skills are the central purpose of the university (Assiter, 1995; Barnett, 1990; Bligh, 1990; Scott, 1995), the nature of these skills, the relationship between these skills and the disciplines and the degree to which they are in fact transferable is still open to debate. These are the central questions of this study.

Chapter Three
The disciplinary landscape

The previous chapter argued that generic skills are best taught within the context of the disciplines. To understand the position of generic skills within the disciplines, this chapter explores the notion of epistemic cultures. If the ways in which content knowledge[11] is understood is fundamental to the discipline, it follows that this influences the way in which generic skills are understood since these skills are taught within the context of content knowledge. This chapter builds up a framework for analysis that allows the epistemic cultures of the disciplines to be considered, as a precursor to understanding how generic skills fit into these cultures or knowledge territories.

The chapter will show that disciplinary culture is an amalgam of social practices and understandings around knowledge creation, verification and transmission. Central to each discipline is its epistemology, or theories and beliefs about knowledge and its structure. Epistemology addresses questions about what constitutes knowledge, its nature, how it is acquired, its scope and its form[12].

Knorr Cetina (1999:1) describes epistemic cultures as:

> …those amalgams of arrangements and mechanisms – bonded through affinity, necessity and historical coincidence – which, in a given field, make up how we know what we know. Epistemic cultures are cultures that create and warrant knowledge…

So if epistemology is the theory of knowledge, then epistemic cultures are the communities grouped around these theories and the practices, beliefs, ways of making meaning, the rituals, rules, traditions, patterns of apprenticeship and induction, the key

[11] The concept of content knowledge is in itself highly complex. This study presents a brief outline of participants' constructions of the knowledge which is central to their disciplines. It can also be understood as the main cognitive purpose of the discipline (Neuman et al.. 2002).

12 Epistemology is an important branch of philosophy but this study does not aim to tackle theories in detail.

figures and ways of marking out boundaries which accompany these theories. The epistemic culture is comprised of the assumptions and practices regarding the nature of knowledge, its creation and verification. This includes methodologies, forms of argument, language (for example mathematical, musical, technical), ontological assumptions about the nature of being, conceptual structuring, the practicalities of research, the level of consensus, reliance on certain paradigms and the dissemination of knowledge. Further, epistemic cultures resonate with the ways teaching and assessment are organised.

3.1 The disciplinary framework

Shulman (1987) argues that teachers have a conceptual framework to guide their teaching in their discipline. This is used to sequence material and formulate questions. He argues that while this knowledge about the way to convey the content matter of their subject may be tacit, a teacher must understand 'the structures of the subject matter, the principles of conceptual organisation, and the principles of inquiry'. While Shulman's study was concerned with school teachers, his argument is equally relevant to higher education as it is these epistemic structures which frame the ways in which teaching occurs.

One of the central, though problematic ways of understanding epistemic cultures has been to consider disciplinary differences. Much of the work on disciplinary differences in higher education can be traced back to Biglan (1973a, 1973b). He categorised the disciplines according to three dimensions: whether they were hard or soft (i.e. the degree to which a paradigm exists), pure or applied and life or non-life. Independently, Lodahl and Gordon (1972) identified a similar form of classification which they termed paradigm development, based on Kuhn's notion of the paradigm. They argued that disciplines could be categorised on the basis of consensus within a field regarding theory, methodology, techniques and problems. A similar framework was later developed by Kolb (1985) although unlike Biglan, his categories were developed from data on student learning strategies rather than academic perceptions of knowledge. Kolb's abstract-

concrete and reflective-active dimensions match Biglan's hard/soft, pure/applied classifications, leaving out the life/non-life dimension.

Other discussions of disciplinary differences are based upon, or are variants of, the Biglan model. Smeby (1996) categorised the disciplines according to three variables – the paradigmatic status, the codification and the degree of dependence between academics. He argues that disciplines can have a single paradigm (and hence a high level of consensus) or multiple paradigms (and so less consensus). Codified disciplines have a high use of mathematics whereas literary disciplines are qualitative. Mutual dependence refers to the level of interconnectedness and collaboration between academics. This system of categorisation can be linked to the hard/soft, pure/applied framework in that hard pure disciplines can be seen as single paradigm and codified with a high level of mutual dependence, whereas the soft pure disciplines are multiple paradigm, literary, with low mutual dependence. A further way of understanding the disciplines is to view them in terms of the restricted/unrestricted nature of the questions considered and the methods available for investigating these questions (Becher, 1989a) and it appears that this can be linked with the level of paradigm consensus.

Further developing this model at a fine-grained level, Donald (2002) discusses knowledge structures in the disciplines. She argues that there are four levels of knowledge acquisition: the nature of concepts, the logical structure of the discipline, criteria used to determine validity and the methods employed. Concepts are the units of thought or terms that allow us to organise what is 'known' and, according to Donald, can be at varying levels of abstraction. The patterns of relationship between concepts can vary between disciplines. Donald investigates the ways in which concepts are linked in the different disciplines and argues that the number of relationships between key concepts was greater in sciences than in social sciences or humanities and that sciences tended to have a hierarchical structure. When considering criteria used to determine validity, Donald argues that at the 'hard' or structured end of the disciplinary continuum, the paradigm is not only the logical structure of the discipline but is also the criteria for determining validity. Validation processes vary both between and within disciplines yet

there was more commonality across disciplines than may have been expected. Yet despite some commonality in areas such as validation, her studies still point to certain fundamental differences between the disciplines.

The key features of the so-called hard and soft disciplines as outlined in the Biglan/Kolb model and its descendents are outlined in Table 1 below.

Table 1: Key features of hard and soft disciplines

Hard	Soft
▪ Single, well-developed paradigm ▪ Consensus regarding theory, methodology and technique ▪ Restricted nature of questions to be considered ▪ Codified ▪ Quantitative ▪ High levels of mutual dependence amongst researchers	▪ Multiple or less well-developed paradigms ▪ Little consensus ▪ Less restricted range of questions which can be considered ▪ Interpretive ▪ Qualitative ▪ Low levels of mutual dependence amongst researchers

The pure and applied quadrants separate theoretical or basic knowledge from that which has a direct practical or professional application.

Using this model, disciplines can be 'plotted' in one of the quadrants, depending upon their level of paradigm development, codification and restriction and on whether the discipline is pure or applied. However, this model is an oversimplification. As Becher and Trowler point out (2001) the boundaries between hard and soft, pure and applied cannot be located with much precision. There is probably no absolute or rigid distinction between hard and soft disciplines and certainly in some disciplines there are elements of both, or sub-disciplines that display the characteristics of one within the broader context

of the other. Neuman et al. (2002) give the example of sociometrics, which is hard, within sociology, which is soft. In addition, disciplines can change their character over time. Economics was a soft social science in the past but now in many departments is influenced by a harder econometrics. In addition, many disciplines, even those that at first glance could be classified as hard or pure contain aspects that are soft or applied and thus there is much more fluidity than this model would suggest.

Becher's (1989a, 2001) extensive study is based on the Biglan model. He explored the intellectual culture of academic disciplines. In doing this he examined the nature of knowledge and the ways in which the disciplines define and organise themselves and the ways in which the intellectual tasks engaged in by academics shape the organisation of professional life. Becher concluded that the epistemic nature of a discipline has a profound effect upon the academic culture. While the strength of Becher's emphasis on disciplinary culture has been questioned (Ryan, 2002), Braxton and Hargens' (1996:35) conclusion that the differences between academic disciplines are 'profound and extensive' remains a pertinent one.

Like all models it operates at a level of generalities rather than detail. For this reason it is a useful first point of reference in examining the structures and assumptions around which knowledge is understood as by polarising the differences it clarifies contrasting ways in which knowledge is conceptualised. However, the model needs to be treated with considerable caution as disciplinary knowledge is much more complex than this model implies. As Brew (2001) points out, disciplinary boundaries are neither static nor stable. There is both increasing specialisation and increasing inter or transdisciplinarity and boundaries between disciplines may be dissolving and giving rise to new forms of knowledge (Gibbons et al., 1994).

Rather than viewing the disciplines as discrete entities that can be plotted onto quadrants, the current study describes them as cultures with a defining essence but also with some overlapping interconnections, 'cross border' relationships, irregularities and complexities. Geertz (1983) argues that thinking is about making meaning, about organising the

patterns of significance. He advocates an ethnography of thinking, suggesting that we should examine 'how thought frames change, how thought provinces are demarcated, how thought norms are maintained, thought models acquired and thought labour divided' (p154). He maintains that the various disciplines of modern scholarship are more than just intellectual vantage points but are ways of being in the world, that physicists or historians inhabit a world that is not just a technical task but is a cultural frame that defines a great part of one's life. Geetz suggests an examination of the 'intellectual villages' that are academic communities in order to understand the depth and nature of the differences.

3.2 Disciplinary teaching and learning practices

Central to this study, and not part of Becher's work, is a consideration of the ways in which the disciplinary culture and its underpinning epistemology affect the teaching and assessment practices in the disciplines. A number of studies have considered disciplinary knowledge from a range of angles, such as the epistemic understandings as they apply to teaching and learning (Donald, 2002; Hativa & Marincovich, 1995; Neumann et al., 2002; Ylijoki, 2000) and organisational issues (Knight & Trowler, 2000; Moses, 1990; Smeby, 1996). There have also been efforts to elucidate the nature of particular epistemic cultures, or elements of that culture (Donald, 2002; Hativa, 1995; Knorr Cetina, 1997; Lenze, 1995; Traweek, 1988; Ylijoki, 2000). These studies provide background for this research as they consider the ways in which knowledge, research and teaching are conceptualised within particular disciplines and hence provide insight into the ways in which generic skills might be understood within a disciplinary context.

Some studies, based on the disciplinary differences model (cf. Neumann, 2001; Neumann et al., 2002) examine the differences in teaching and assessment practices based on the knowledge structures in the disciplines. While the present study is cautious about the validity of the Biglan/Kolb model, a consideration of work on the relationship between disciplinary cultures and teaching forms a very useful background.

If hard, pure disciplines are described as being accretive and hierarchical then knowledge is seen as atomistic and built up sequentially (Neumann et al., 2002). This implies that teaching (at least in the undergraduate years) focuses on logical reasoning and the learning of facts, principles, concepts, classification or description and that the curriculum is based on 'established facts and demonstrable theories, rather than uncertainties and relativities' (Neumann et al., 2002:407). Teaching in these disciplines is organised into lectures or laboratory sessions as the information is transmissible in more straightforward ways. If it is accepted that there is a connection between knowledge structures and curriculum, then assessment practices can be understood in the light of the ways in which knowledge is understood and hence teaching is organised. Neumann et al.., (2002) argue that in hard pure disciplines, focused examination questions are preferred which test students' ability to remember facts or theorems, solve logically structured problems and use quantitative calculation.

In contrast, in the soft, pure disciplines, knowledge is understood as more qualitative, constructive and interpretive (Neumann et al., 2002). These disciplines require the ability to synthesise, discuss and develop an argument. The skills which are emphasised are creativity, fluency of expression, analysis and the ability to critique rather than accept existing knowledge. As a consequence, teaching is often organised into smaller groups with face-to-face contact, which facilitates discussion and interpretation (Lattuca & Stark, 1995). Assessment in the soft, pure disciplines is organised around essays and reports, which can demonstrate the level of understanding of complexity and an ability to understand the relative nature of a debate (Neumann et al., 2002). What is seen as important areas to assess are the abilities to think laterally, clarity of expression and the interpretation and evaluation of theoretical perspectives (Braxton, 1993). A recent study by Lindblom-Ylänne et al. (2006) based on a Becher-style understanding of disciplinary differences, found that there were clear differences in approaches to teaching in hard and soft disciplines. It supported many of the differences previously characterised by Neumann et al. (2002).

However, while this way of understanding teaching and assessment is a useful starting point, knowledge cultures and the corresponding teaching practices are much more complex than the above descriptions might imply.

It is important also to acknowledge that not all curriculum and assessment practices are necessarily influenced by the knowledge structures of the disciplines, and to be mindful that the knowledge structures may not necessarily determine teaching practice. Many teaching and assessment practices may be influenced by institutional or departmental factors as well as disciplinary ones (Trowler & Cooper, 2002). Teaching and assessment practices may be historical as much as disciplinary and this study does not assume that just because something tends to be done certain ways that it is necessarily a product of the disciplinary culture, rather than other elements of the departmental or institutional culture.

However, the apparent difference in the ways in which knowledge is understood in the disciplines in turn appears to influence teaching and assessment practices. If this is indeed the case, it has profound implications for the generic skills as they are situated within the teaching of the content of the discipline. In order to investigate whether conceptualisations of the generic skills are shaped by the discipline in which they are situated, it is necessary to examine the disciplinary epistemology in greater depth.

This chapter has developed a theoretical understanding of the importance of the disciplinary culture. It began by defining the notion of disciplinary epistemology. It then examined the existing frameworks for describing disciplinary differences and analysing some of the shortcomings of these frameworks. The key rationale for this study is that the influence of disciplinary epistemic culture is fundamental and hence any re-theorising of generic skills must be carried out in the context of understanding the ways in which the disciplines shape the construction of generic skills. Based upon the strength of current research conversations, the current study reinforces the primary role played by the discipline in teaching and learning. The present study contends that disciplinary culture provides a powerful tool for examining the complexity of generic skills. Without a

situated understanding, generic skills will continue to be beset by confusion or oversimplification. The following chapter maps out the theoretical framework which draws together the strands that inform this study. Subsequent empirical analysis will then identify themes and patterns and examine them against previous research.

Chapter Four
Theories of knowledge, teaching and learning in higher education: The place of generic skills

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The previous chapters have examined the idea of generic skills and of disciplinary cultures. They explored the antecedents of this study and provided a detailed examination of existing analytical frameworks and outlined the limitations of prior research. It has been argued that the notion of generic skills has risen to prominence in higher education policy and scholarship and yet despite the high level of interest, the theorising of generic skills remains problematic. To date, higher education research has put little emphasis on exploring the articulation between the disciplinary context and conceptualisations of generic skills, despite research that has pointed clearly to the importance of the disciplines in both research and teaching. With this perspective in mind, this chapter draws together ideas of skills and ideas about the disciplinary epistemology within which these skills reside to develop a preliminary theory of generic skills.

This chapter considers the theoretical factors that are of key importance in a discussion of generic skills. It returns in more detail to some of the issues raised in Chapters Two and Three. It begins by discussing assumptions about teaching and learning that underpin the current study. It then examines the central concepts which form the basis of this study, epistemology and theories of skills and attributes. The thinking behind this study lies at the nexus between these concepts and while they are initially considered separately, it is the relationship between them that is paramount and this chapter outlines the interconnectedness of these ideas.

4.1 Assumptions underpinning the study of generic skills

Any discussion about the relationship between disciplinary epistemology and generic skills in higher education incorporates assumptions about the phenomenon of teaching and learning. As learning is a highly complex phenomenon, it is subject to a range of interpretations, some of which are contradictory. For this reason it is important to declare the assumptions that are being made about teaching and learning which underpin this study. These are ultimately epistemological assumptions about the nature of knowledge. This study is based upon the assumption that learning is situated (Brown et al., 1989; Hutchins, 1995) and that individuals learn by involving themselves in communities of practice and hence there is a relationship between the social context and the individual teachers and learners.

Constructivism is the philosophical position which holds that all knowledge is constructed because it is contingent on human perception, convention and social experience[13]. The domain of constructivism is a large and complex one and there are an array of different 'constructivisms' (Bickhard, 1997; Matthews, 1997; Nola, 1997). However, within educational research there two major schools of thought concerning constructivism – the individual constructivist perspective and the social constructivist perspective. The emphasis is either on individual cognitive processes in the former or the social co-construction of knowledge in the latter. Individual or cognitive constructivism emphasises how individual learners impose intellectual structure on their world (Piaget, 1973) whereas social constructivism emphasises social processes. The individual constructivist perspective suggests that knowledge is constructed internally and then tested through interaction with the outside world (von Glasersfeld, 1993). Knowledge construction is a process that occurs internally through the integration of new knowledge into internal knowledge structures and the alteration of existing structures. A social constructivist perspective (Vygotsky, 1978) posits that knowledge develops internally but

[13] Bruner (1960) is one of the key theorists of constructivism but its intellectual history can be traced back to Rousseau, Kant and more recently, Piaget. Piaget (1950) argued that learning is a process by which individuals transform information into knowledge through a process of adapting and accommodating that information. This is a process of transforming information through engagement with context.

through social interaction with the outside world (Wertsch, 1991) and so the social context is central as it is within this context that learning occurs.

These perspectives have been critiqued from a number of philosophical positions (Bickhard, 1997; Matthews, 1997; Nola, 1997). An objectivist position runs counter to constructivism, arguing that knowledge exists independently of the knower and that learning is a process of discovering that which already exists. From this position, constructivism has been critiqued as being relativist. However, viewing knowledge as a human product, as is the case with constructivism, does not condemn it to subjectivism nor to a reliance upon arbitrary convention since this view of knowledge does not preclude rigorous examination. Rather, it acknowledges the social dimensions of knowledge. Another critique of constructivism arises from the constitutionalist perspective, which views both cognitive and social constructivism as dualistic since proponents of constitutionalism maintain that there is a separation between the individual and the world (Prosser & Trigwell, 1999). However, the contention of the present study is that knowledge has both individual and social components and these cannot be viewed as separate in any meaningful way (Cobb & Yackel, 1996).

According to constructivism, learning is a personal endeavour whereby we experience something new and make sense of it though past experiences of knowledge constructs we have previously established (Bruner, 1960). New knowledge is formed on a foundation of prior knowledge and that new knowledge then becomes the foundation for the building of more knowledge. The present study is located more specifically within a social constructivist framework discussed previously, which emphasises the importance of culture and context in understanding what occurs in society, with particular reference in this study to teaching and indirectly, to learning. Vygotsky (1978) argued that learning is a joint and social process which requires the active participation of both students and teachers. It is a social contract between teachers and learners in which the students participate and teachers provide the conditions which facilitate learning. A Vygotskian (1978) social constructivist perspective posits that knowledge develops internally and yet is driven by social interaction with the world and hence the social context is of great

significance. The key assumptions of social constructivism are concerned with knowledge and learning. Knowledge is a human product and so individuals create meaning through interactions with each other and their environment. As learning is a social process it does not take place only within the individual but meaningful learning happens through interrelationship with others and there is an 'intersubjective' relationship between people that enables learning to occur. Learning happens as actual achievements and as potential development or the 'zone of proximal development' which is a person's emerging capabilities (Vygotsky, 1978:86). A teacher makes judgements not only about the actual capabilities of a student but also about their potential for development.

Furthermore, knowledge is conceived of as situated in that it arises from particular contexts and relationships and it is also partial since each individual perspective cannot be complete. Given that truth emerges from an individual perspective in a social context, knowledge is also multiple since there is no single position that can be arrived at. Knowledge is a product of the activity and situations in which it is produced and thus a concept is always under construction because it is negotiated between the learners and the social situation (Brown et al., 1989). The learner does not gain a discrete body of knowledge but engages in a process which emerges from particular settings and relationships and so meaning is not a self-contained structure but is defined relative to its context. This is not to suggest that there are no cognitive structures, but rather that these structures may be reconceptualised by the context.

In summary, this study is based on the assumption that knowledge is constructed, both individually and socially. The claim that knowledge is socially constructed does not deny that there are vast differences in the worldviews of members of a group but rather that knowledge is a way of making meaning and this is negotiated within a culture or subculture (in this case the discipline). However, people also construct their own (often quite idiosyncratic) understandings of the world, which may be influenced by the culture in which they operate and may also be influenced by other factors. Thus this study emphasises the importance of disciplinary culture but also acknowledges the spectrum of individual differences within this.

This study does not assume that generic attributes are utterly context-dependent nor that these skills exist only relative to their context. Rather, it assumes that although there is the possibility for abstraction and generalisability, the way in which the skills are conceptualised cannot be understood in isolation from the social and cultural context within which they exist.

4.2 Epistemology

Epistemic considerations are significant to this study because they inform notions of teaching and learning, since the ways in which knowledge is theorised influences the ways that it is taught. Epistemology was discussed briefly in Chapter Three but will be considered in more detail in this section. Questions of epistemology are closely related to questions of ontology since epistemology is the study of what it means to know, while ontology is an understanding of the nature of reality and existence. Within epistemology, ontological questions can either be tacit or overt but an understanding of the nature of knowledge is embodied within an understanding of the nature of reality. Epistemology can be conceptualised at three levels. At the macro level are the broad, fundamental assumptions about the nature of knowledge in general. These are general assumptions and inform more specific disciplinary knowledge. The meso level is disciplinary epistemology, which is influenced by macro level epistemology but also has elements specific to the discipline such as the boundaries set on appropriate knowledge and acceptable methodologies. At the micro level is the set of beliefs about knowledge that are held by each individual. These beliefs are infused by both macro and meso level epistemology but may also be shaped by factors specific to each individual. The meso or disciplinary level is the central focus of this study but the macro and micro levels are considered briefly in order to place disciplinary epistemology into context.

4.2.1 Macro level epistemology

This level of epistemology is the theorising of knowledge that transcends disciplinary boundaries since it is the set of fundamental assumptions about the nature of knowledge. These assumptions can be shared by people from a range of disciplines. For example

many physicists, chemists and botanists might agree broadly on the nature of knowledge. It is not necessary for the purposes of this study to do more than briefly outline some of the key macro level epistemologies[14]. Perhaps one of the central divides in modern understandings of knowledge is between the positivist and post-positivist perspectives, although this divide is by no means a binary one. While it is possible that some disciplines may lean more towards positivism than others, it is also possible for a discipline to contain those individuals who understand knowledge from a positivist framework and those who do not and for individuals to contain elements of both positivism and post-positivism in their thinking. The assumption upon which positivism is based is the notion of observable facts – objects have meaning prior to and independent of human awareness of them and hence the meanings which are 'discovered' are objective and value neutral. From this perspective, knowledge derived from observable facts is accurate, certain and valid when compared to other forms of understanding. These claims are based, in part, upon notions of empiricism, which posits that the world can be understood either through logic and mathematics (abstract, analytic knowledge) or through matters of fact, sought through observation and experimental reasoning.

The idea that knowledge must be sought through logic, must be quantifiable and tested experimentally is one which influences much of scientific practice. However, it would be overly simplistic to suggest that the so-called hard disciplines (as discussed in Chapter Three) are positivist. Positivism has come under serious challenge (Feyerabend, 1975; Foucault, 1972; Kuhn, 1970; Lakatos, 1970; Popper, 1972), but remains an influential intellectual position, particularly in the sciences and social sciences. Although many scientists and others may subscribe to the principle that a theory is only (and will remain) a tentative hypothesis (Popper, 1972), and that theories cannot be entirely value neutral (Duhem, 1977) many in practice treat the theoretical principles underpinning what they do as substantial and objective and scientists will defend their theoretical frameworks even against conflicting evidence (Chalmers, 1999; Kuhn, 1970).

[14] This chapter provides a small snapshot of this field, much more detailed discussions can be found in, for example Alcoff (1998), Shope, (1983), Sosa & Jaegwon (2000).

Post or non-positivism can come in a number of forms but generally assumes that reality is multiple and constructed and so there is no single tangible reality but a multiplicity of realities. The knower and the known are inextricably linked and all knowledge, and hence the findings of research, from a post-positivist perspective are not objective and theory-free. Knowledge is constructed by the knower and from this point of view, research acknowledges the relationship between the subject and the context. Importantly, inquiry is seen as value laden (Lincoln & Guba, 1985). In social science the effect of post-positivism is far reaching and encompasses a broad range of social theorists from Durkheim onwards.

Post-positivism includes a number of critiques of the positivist perspective. An exploration of the history of science shows that the scientific endeavour is a process of struggle with ambiguous and competing observations (Kuhn, 1970). Duhem (1977) argues for the impossibility of making theory-free observations in science, suggesting that scientific observations cannot be carried out by the naïve observer and further, that observations are the result of a large number of inarticulated theories, hypotheses, suppositions and inferences that guided the selection and interpretation of the observation and hence the observations are not neutral or value free. Quine (1953) argues that theory in science is a 'web of belief' which is connected to empirical experience but this experience is not its entirety[15]. A theory to be tested is not isolated but is linked to many other theories. Expanding on this, Churchland (1989) maintains that the choice of theory is not only made by use of empirical observations but that a number of theoretical moves must be made that are beyond the observations. Churchland goes on to suggest that the choice of a particular theory on account of its simplicity, coherence and explanatory power is not merely an aesthetic judgement but reflects an evolutionary process for distinguishing relevant information from background noise. Along a similar line, Einstein (cited in Hickey, 2005) suggested that in addition to having logical and empirical dimensions, science was guided by themata, which are pre-theoretical suppositions about nature that guide discovery, such as aesthetic factors like simplicity and integrity. Thus

[15] The Quine-Duhem thesis posits that for any given set of observations there is an uncountable number of explanations (Martin, 1991).

science is not simply a discovery of neutral 'facts' but is complex and dynamic process of discovery, theorising, careful experimentation, making meaning, false starts and serendipity.

4.2.2 Meso level or disciplinary epistemology

The second strand of epistemology is disciplinary epistemology and this was discussed in detail in Chapter Three and so will not be covered in-depth here. The epistemology of each discipline is the particular way in which knowledge is organised, understood, verified and studied. It is the network of beliefs and practices about knowledge that is specific to that discipline, although has close relationships with other disciplines. Disciplinary epistemology is not static but shifts and changes with time and situation and can be influenced by larger historical, institutional and social factors. Disciplinary epistemology is also shaped by its application or the means for which knowledge is used. This is particularly important in applied disciplines because of the interplay between the disciplinary background or 'parent', practical application and the demands of the professional persona.

Kuhn's (1970) notion of paradigm development is useful in understanding disciplinary epistemology. Kuhn's argument is that disciplines can be viewed according to the degree of paradigm development[16]. In discussing the nature of science, Kuhn's theory posits that a single paradigm becomes the central structuring principle for the scientific community and this paradigm shapes the 'what' and 'how' of knowledge exploration. In other words it provides legitimation and boundaries. A paradigm is an internally coherent and apparently consistent system. In what Kuhn refers to as mature science, there is consensus about a paradigm and in this case much of the paradigm is taken for granted and challenges are dismissed or even demonised. Kuhn refers to this as 'normal science'. This notion of the strength of the paradigm is useful when considering the position of generic skills in disciplinary epistemology as it allows us to see how the discipline is shaped and to examine the rigidity of its internal structure and boundaries.

[16] However, Kuhn's notion of paradigm shifted in his later work.

Kuhn points out that eventually ideas cannot be accommodated within the paradigm so challenges increase and a 'crisis' develops. The flawed paradigm is eventually abandoned and a new paradigm replaces the old. However, while the notion of paradigm is useful, it is misleading to suggest that all disciplines (scientific and otherwise) will move towards the acceptance of a dominant paradigm. In some disciplines, knowledge is contested and multiple and this is not an interim phase between paradigms. In other disciplines some knowledge is more clearly established and hence there is likely to be greater levels of consensus.

For some of the disciplines in this study, in particular the professions (medicine and law), the ways in which knowledge is understood is shaped by the imperatives of practice and by the professional persona as well as by the discipline. The disciplinary epistemology is also shaped by its application, in other words the means for which it is used. This is particularly important in professional disciplines because of the interplay between the 'parent' disciplinary background and the practical application and because of the strictures of professional accountability. Thus ideas about professional identity and performance are important in the epistemology of the discipline.

4.2.3 Micro level or personal epistemology

Whereas disciplinary (meso level) epistemology is the set of beliefs broadly held by a disciplinary community, micro level or personal epistemology is the set of beliefs held by an individual. This is relevant here since disciplinary epistemology influences personal epistemology both for students and teachers. Moreover, since it is *individuals* who are the teachers, it is the personal beliefs about knowledge that will have an impact upon teaching, even if teaching takes place within a disciplinary community. It is at the level of personal epistemology that the relationship between epistemology and teaching is most apparent. While the nature of the discipline is significant, epistemologies are also negotiated between the student and teacher and hence there is a complex and individual relationship between the teacher and the ways in which knowledge is conceptualised.

Personal epistemology is the study of how an individual develops a conception of knowledge and then use of this conception to understand the world (Hofer, 2001; Hofer & Pintrich, 2002). Notions of personal epistemology do not necessarily run counter to ideas about situated learning since there is an interplay between the individual and the social context. It is clear from earlier research that there is a close relationship between disciplinary and personal epistemology. Previous studies have found that disciplinary differences in the personal epistemology of students are strong and first year students of science see knowledge as more certain than in other disciplines (Hofer, 2000). While this study is focused at the disciplinary rather than personal level, a consideration of personal epistemology is relevant due to the impact that it has on teaching.

Much of the work on student personal epistemology considers development to be in stages. The earliest framework was developed by Perry (1970) and his ideas remain influential. Later studies build on this framework (Baxter Magolda, 1999; Kitchener & King, 1981). These stages generally move from knowledge as absolute and discovered to knowledge as relative and constructed however, this may be an oversimplification (Elby & Hammer, 2001).

Importantly, the ways in which students understand knowledge to be structured has an effect on learning (Beers, 1988; Edmondson & Novak, 1993; Schommer, 1993; Schommer & Walker, 1995). For example some studies suggest that students who were identified as positivists tended to be rote learners and those who were identified as constructivists used strategies such as seeking to understand meaning or structure (Edmondson & Novak, 1993). Epistemologies can be shaped by the classroom conditions, not always in positive ways. As Schommer and Walker (1995:430) point out 'if we want students to be thoughtful, independent learners and yet we teach them lists of facts as if they are immutable, then we may be instilling philosophical systems in students that resist our own teaching objectives'. This is relevant for this study since it points to the need to examine the ways in which knowledge is conceptualised by teachers and how that is (or is not) translated into teaching and assessment, in particular of generic skills.

Students' beliefs about knowledge arise from their own previous educational and other experiences (Biggs, 1999; Entwistle & Tait, 1990; Kember, 2001; Prosser & Trigwell, 1999) but are also shaped in the classroom by teaching and assessment practices. As Beers (1988) points out, teachers both model attitudes towards knowledge and reward and punish attitudes through assessment and these two processes are intertwined – teachers model and embody epistemological assumptions in the organisation of their courses and interactions with students. They demonstrate their assumptions by the organisation and content of the syllabus, assignments and conduct of class. This is also done in the ways in which work is assessed.

Yet teachers' own epistemologies are not always overt or clearly articulated, to themselves, let alone to the students. This can result in 'epistemological confusion' (Beers, 1988). Teachers may believe that knowledge is relative and constructed and yet teach in ways that suggest it is absolute. In addition, Beers makes the point that epistemology can be negotiated between students and teacher. If students react in negative ways to a particular style of teaching, the teacher may modify his or her teaching style.

> The negotiated assumptions of the classroom may become disassociated from the teacher's own epistemological assumptions… Teachers may inadvertently confirm or modify students' conceptions of knowledge in ways that teachers would characterise as erroneous... The teacher may seek to shape students' conceptions of knowledge and they in turn may be shaping the teacher's (p92).

This idea is developed by Lyons (1990), in her concept of 'nested epistemologies' in which there is an interrelationship between student and teacher epistemology. Taking a Vygotskian perspective she argues that knowledge is social and hence teachers and students influence each other's ways of knowing. She argues that both students and teachers can hold multiple conceptions of knowledge in different configurations and so she resists the notion of a simplistic or linear conception of epistemology, favouring instead the idea of knowledge as a dynamic interaction between student and teacher.

Lyons argues that a teacher's judgement about how to present and assess material is mediated by his or her own understanding of how students learn, by their epistemological stance towards their discipline and through personal understandings of their own knowing. So what is presented to students is a dynamic interaction between beliefs about the nature of knowledge, beliefs about learning and disciplinary epistemology. This point is significant as it points to an interrelationship between fundamental theories of knowledge, disciplinary knowledge and an individual's beliefs about teaching. The practice of teaching and learning is influenced by the ways in which knowledge is theorised.

An important issue in an examination of teacher perceptions are the notions of espoused theory and theory-in-use (Argyris & Schon, 1974). Espoused theory is the set of values which people believe forms the basis for their behaviour. Theory-in-use is the set of values suggested by action or the maps people use to take action and there can be incongruence between espoused theory and theory-in-use. There are a number of reasons for this incongruence, including lack of awareness of the gap, pragmatic decisions and self-defence. The notion of espoused theory is significant in this study since while participants may discuss the value of particular attributes, how this is actually played out in their teaching may be different. So while certain epistemological beliefs may be central to a person's values, they may not necessarily be directly enacted in teaching. The relationship between epistemology and teaching practice, while a very important one, is not a simple or directly causal one.

4.3 Framing generic skills

This section of the chapter sets out the framework for an examination of generic skills that underpins the analysis of the data as set out in Chapters Six to Ten. This understanding of generic skills brings together notions of the importance of the discipline with a means of structuring ideas about generic skills. The section begins by considering the ways in which skills and attributes are theorised. The policy and curriculum aspects of generic skills were discussed in detail in Chapter Three but this section aims to

examine the theorising of these skills and to provide a definition of the generic skills or attributes considered in this study. The skills or attributes selected as the focus of this study are those that appear frequently in the literature and which are referred to as desirable both by employers and educators. These include critical and analytical thinking, problem solving and communication. Each skill or attribute will be considered separately and then an operational definition of generic skills and attributes will be formulated.

Skills such as critical thinking, analysis and problem solving can be referred to as higher order skills. The notion of higher order skills is often linked to Bloom's Taxonomy (Bloom et al., 1956). Resnick (1987) defines higher order skills as having a number of characteristics: they are non-algorithmic and so the path of action is not fully specified in advance; they can have multiple solutions; they require nuanced judgement and interpretation; they can involve the use of multiple criteria, which may conflict; they involve uncertainty; they require self regulation since the cognitive processes cannot be mapped out in advance; and they involve imposing meaning and finding structure in apparent disorder. These skills or attributes are abstract and so resist precise definition.

Mapping out the relationship between skills such as critical thinking, analysis, problem solving and communication is exceptionally complex. Communication is a rather different skill from the other three as it utilises abstract or conceptual skills (such as critical thinking) and so is the conduit through which these skills come into being. Critical thinking can probably be viewed as the overarching skill which utilises skills such as analysis and synthesis. Problem solving can also be understood as part of critical thinking, however, as discussed below, there is a considerable body of literature on problem solving in science and medicine and so it is discussed separately. Although these skills or attributes are separated in this discussion for the purposes of clarity, the aim is not to suggest that they are discrete concepts but rather that they are closely interwoven.

4.3.1 Critical thinking

One of the widely emphasised beliefs about a university education is the importance of critical thinking (Fox, 1994; Marton et al., 1997; Ramsden, 1992; van der Wal, 1999). However, what critical thinking actually entails is much less clearly defined (Johnson, 1992). Much of the literature defines critical thinking as a set of practical cognitive skills. Yet this fails to acknowledge it as part of the culturally established structures of meaning that constitute a discipline. It also fails to acknowledge the role of critical thinking in examining these structures (Jones, 2004).

Much has been written on the nature of critical thinking and in the majority of this literature it is understood as a cognitive skill of problem solving and logic (Ennis, 1987; Facione, 1996; Halpern, 1996; Kurfiss, 1988; McPeck, 1981; Paul, 1989; Siegel, 1988). Kuhn (1999) outlines two forms of cognitive skills in critical thinking – analysis, which examines the cause and effect relationships in multivariate systems and argument, which is a framework of alternative assertions each associates with supporting and discrepant evidence. The Delphi Report describes critical thinking as:

> purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation and inference, as well as explanation of the evidential, conceptual, methodological, criteriological or contextual considerations upon which that judgement is based (Facione, 1990:1).

The Delphi Report (Facione 1990) identifies six key elements of critical thinking:

- *Interpretation:* categorisation, decoding significance, clarifying meaning;
- *Analysis:* examining ideas, identifying arguments, analysing arguments;
- *Evaluation* assessing claims, assessing arguments;
- *Inference:* querying evidence, conjecturing alternatives, drawing conclusions;
- *Explanation:* stating results, justifying procedures, presenting arguments;
- *Self-regulation:* self-examination, self-correction.

The writers of this report argue that critical thinking requires cognitive skills and a commensurate disposition to utilise that skill.

There are three broad interpretations of critical thinking in the literature. These are first, critical thinking as an instrumental or problem solving skill, secondly, critical thinking as argument analysis and thirdly, critical thinking as a transformative process. As a problem solving skill, critical thinking requires the operational system of the particular type of problem, for example mathematical, economic or clinical. It often utilises logico-deductive reasoning, however, this is not the only form of problem solving. As argument analysis, critical thinking requires understanding of informal logic, definitions, evidence, assumptions, conclusions and implications as well as the knowledge and theoretical basis of the discipline in question. Critical thinking as a transformative process involves what Barnett (1997) refers to as 'metacriticism' or as 'critique in action'. It is the ability to engage in critical self-reflection and to go beyond the discipline in question and provide a critique from without. In Pennycook's (2001) terms it is a critique of social relations which encompasses notions of power and structure and ideas about change for the betterment of society. This can also be described in Habermas' terms as the 'emanicpatory' form of critical reasoning as opposed to 'instrumental' reasoning which is a much more pragmatic (Habermas, 1971).

4.3.2 Problem solving

Problem solving is often viewed as a subset of critical thinking, however, problem solving can also be understood simply as the application of a particular knowledge set without an evaluative focus. Te Wiata (1996:14) argues that in contrast to the broader idea of critical thinking, problem solving 'does not rely on a process of developing support for a position in which a person's values are the underlying basis for judgement'. In addition, problem solving is outcome focused, whereas critical thinking is more broadly evaluation focused. For these reasons, problem solving is considered separately from critical thinking.

There is a considerable body of literature on problem solving. The most salient feature of problem solving is that while there can be general approaches, much of the literature on problem solving is specific to particular disciplines or to domains such as business, interpersonal or technical problem solving. From a more general perspective, Bransford

and Stein (1993) refer to the importance of change in state or situation in problem solving, claiming that a problem exists when the current situation is different from a desired situation. Problem solving involves a move to or towards a desired situation. Polya (1957) writes about mathematical problem solving although his problem solving outline can be applied more widely. It involves first understanding the problem, second, devising a plan, third, carrying out the plan and finally, checking the solution. The key features of problem solving are an ability to understand, structure or restate the problem, an ability to gather, select organise or encode information and an ability to reorganise knowledge to address the problem.

Some areas, particularly medicine and science, have considerable bodies of literature regarding the teaching of problem solving which is specific to these areas. There is a vast body of literature on problem solving in science (Gable, 1994). Much is from a cognitive perspective and suggests that problem solving requires that skills and information are transferred into the students' cognitive structure where it can then be stored for use on other tasks. Trigwell et al. (2002) suggest that this understanding of problem solving views the cognitive structure as having separate compartments – information, generic problem solving skills and domain specific skills[17].

Problem solving is described as the key skill in physics (Bolton & Shelagh, 1997; Dawes, 2003; Laurillard, 1984), however, definitions of what constitutes a problem vary. Well-defined (or well-structured) and ill-defined problems (or ill-structured) are the two central ways of describing problems (Jonassen, 2000). Well-defined problems have a clear goal, starting point and clearly defined operations. Ill-defined problems are much more vague. Another way of describing problems is the term closed problems, which have a unique mathematic solution and open problems, with no single correct answer. However, while problems can be described in this way they often operate on a continuum (Bolton & Shelagh, 1997). In addition, while there may be one single correct answer, there may be multiple ways of reaching that answer, with some ways being more elegant than others.

[17] This is not their own viewpoint, which they describe as experiential.

Some studies break down the problem solving process into stages (Bolton & Shelagh, 1997). These stages are preparation, working and checking. Preparation involves getting an overview of the problem, brainstorming and then deciding what is known (usually in the form of equations) and what is unknown and formulating a plan of attack. The working phase is the algebraic manipulation and substitution of given quantities. Checking encourages students to explore alternatives. Bolton and Shelagh (1997) refer to the importance of creativity in problem solving, however, they point out that in teaching problem solving it is possible to provide students with a framework or a set of techniques to guide them through the process. Other studies advocate presenting knowledge as complex is by using philosophy of science in teaching physics problems (Kalman, 2002). This encourages students to understand and analyse their own views and to examine the evolution of science. In this way they gains an understanding of how theories came about and how new theories replace old ones.

Most importantly for this study is the research in physics which demonstrates that reasoning and problem solving is not a separate skill that can be developed independently of disciplinary knowledge (Larkin et al., 1980; Chi et al., 1981). Both discipline specific knowledge and cognitive skills are essential for effective problem solving and it is the interrelationship between knowledge and metacognition that are key.

Problem solving in medicine is referred to as clinical reasoning and is the process by which medical problems can be identified and treated. There is a substantial body of literature devoted to clinical reasoning. Higgs and Titchen (1995) argue that effective clinical reasoning requires: scientific knowledge of human physiology and psychology, aesthetic perception of human experiences, personal understanding of the uniqueness of the self and others and the ability to make decisions within concrete situations. Thus notions of problem solving or clinical decision making are a combination of knowledge, decision-making skills and personal or human understanding. Norman (1988) describes clinical decision making as requiring clinical and technical skills (craft knowledge), knowledge and understanding (propositional knowledge), interpersonal knowledge and problem solving and clinical judgement. Hence clinical problem solving in medicine

requires an integration of content knowledge, technical skill, cognitive skill and interpersonal skill. This is interesting as there is no separation between the skill and the knowledge base. Clinical decision-making involves abstraction (discovering patterns and meaning), understanding of systems (cause and effect and the relationship between problems and solutions), experimentation and testing (curiosity, scepticism analysis, evaluation of data, conclusions, interpretations, understanding of how to make judgements and how to interpret. Further, it also requires collaboration and communication skills.

Clinical reasoning can have three forms (Higgs & Jones, 1995): first, the hypothetico-deductive form which generates hypotheses based on clinical data and existing knowledge, the testing of the hypotheses through further enquiry and the use of this to make clinical decisions. Second, clinical decision-making can utilise pattern recognition or inductive reasoning which is a form of reasoning used by experts in non-problematic situations and involves automatic retrieval of information from a well-structured knowledge base. Third, clinical reasoning requires integration of knowledge and reasoning. There is a considerable body of literature that suggests that clinical reasoning is not separate from professional or disciplinary knowledge and that it is the interaction between knowledge and skills that are central to clinical reasoning (Bordage & Lemieux, 1991; Elstein & Schwarz, 2002; Elstein et al., 1978; Norman, 1988). In addition to these three forms of reasoning, a very important aspect of clinical decision-making is ethical or pragmatic reasoning, in which the clinician must draw on notions of values and constraints in order to make decisions regarding, for example, how long to continue treatment or whether to use particularly invasive treatment.

Another important element of clinical reasoning is that it requires reflection and professional self-management. In other words, the decision maker is required to examine their own process of decision-making and action and to examine the process and outcome and their own role in it in order to improve their practice.

Higgs and Jones (1995) argue that since the clinical reality is context based, multifaceted, based on ill-defined problems with complex goals there is no single method of decision-making that is appropriate but rather the skill of the clinician depends partially upon the ability to match the reasoning strategy with the particular variables and this is not a process that can be neatly described. However, a very important feature is that it is outcome or end point focused. The process of reasoning involves determining the problem, making sense of the evidence, making decisions, conscious reflection and management of professional actions.

Higgs and Jones (1995) suggest that clinical reasoning has three elements: cognition (skills such as analysis, synthesis and evaluation), understanding of the discipline specific knowledge and metacognition which is the awareness of one's own thinking and is the integration between cognition and knowledge. Thus clinical reasoning comprises the knowledge base and the ability to critically analyse both data and decisions (one's own and other's). Further, clinical reasoning draws upon three types of knowledge: propositional, practical or craft knowledge and reflective knowledge. In the past propositional knowledge has been the dominant form but there is increasing emphasis on the other forms of knowledge as the medical curriculum has changed. Higgs and Jones argue that there is an emerging conviction that clinical reasoning and clinical knowledge are interdependent. Clinical reasoning cannot be developed independently of knowledge and there is an interaction between knowledge and skills.

4.3.3 Communication

Communication is a rather ill-defined term since it can mean a range of things including written work such as reports, argumentative writing, short answer questions and oral work such as presentation skills, debate and discussion as well as interpersonal communication. Moreover, the written genres used at university are not necessarily the same as those used in the workplace. Even within written communication there is a wide range of genres each with different structures and language conventions. There has been considerable work done in the area of applied linguistics on the structure of written

genres and the fine grained differences between text types (Bernstein, 1990; Christie & Martin, 1997; Eggins, 1994; Halliday, 1985; Martin, 1993; Swales, 1990).

Further, communication is a rather different skill to the others since it utilises or expresses other higher order skills and in turn is part of the successful execution of these skills. It is the purposeful and informed control of understanding and demonstrates organisation and expression of these ideas. So critical thinking, analysis and communication are inextricably linked, although they are not the same. As Allen (1997) points out, reasoning and analysis are always communicative acts. In other words, critical analysis is relatively meaningless in a university context unless one can express the ideas either in writing or in conversation. However, communication is even more complex since in physics or mathematics one can solve a problem symbolically, with minimal use of English. In this way one is communicating effectively to those who also understand the symbolic system. It is also possible to communicate clearly and yet not utilise any of the higher order skills[18] .

4.4 An operational definition of generic skills

The previous sections of this chapter have laid the foundations for a definition of generic skills that informs this study. In the following, the key features of generic skills are described, along with a conceptual map which describes the relationship between generic skills and the disciplines which is explored in this study. It is proposed that generic skills or attributes have a number of features. The first is their limited transferability, the second is that they are often tacit and hence not clearly articulated or explicitly taught, the third is that generic skills/attributes are organic, so while it is common to speak of critical thinking, problem solving or analysis as separate attributes, each is intertwined with the other and not easily disentangled. The final element of generic skills is that they are taught within the disciplines and appear to be embedded within the content.

[18] There is a vast body of literature on communication skills in applied linguistics, cognitive psychology, sociolinguistics, conversation analysis, discourse analysis to name a few (Bernstein, 1990; Fairclough, 1992; Fauconnier, 1997; Gee, 1999; Sacks, 1992).

4.4.1 Limited transferability of skills/attributes

The transferability of generic skills and attributes was discussed in Chapter Two. The idea of transfer is taken to mean the skills and attitudes learned in one context that can be used in another context (Misko, 1995). There is much evidence to suggest that transferability of generic skills is limited (Barnett, 1994; Lilly, 1995; Lohrey, 1995; Marginson, 1994; Misko, 1995; Perkins & Salomon, 1994) and Misko (1995) clearly points to the failures of transfer of skills from education to the workplace. Misko argues that if transfer is to take place, the skills of transfer must be explicitly taught. Further, she points to the importance of content specific knowledge and discipline based learning. Referring to the literature on expert and novice learners, Misko argues that content specific knowledge is one of the major factors in producing expertise.

4.4.2 Embedded nature of skills/attributes

Previous chapters have outlined the embedded nature of generic attributes and the centrality of the disciplinary context was discussed in Chapter Three. However, the importance of generic attributes as embedded cannot be assumed. There is an influential and long running debate in the literature on critical thinking regarding its generalisability (Ennis, 1992; McPeck, 1981; Norris, 1992). Ennis and Norris are proponents of the view that critical thinking is a generic skill and can be taught independently of content[19]. McPeck (1990), in contrast, argues that disciplinary knowledge already contains what is central to critical thinking. Smith (1992) argues that one of the key elements of critical thinking is knowledge. He points out that one cannot think critically unless one has knowledge of the topic. So one must think analytically or critically *about something*. One must solve problems using a particular body of knowledge and all the conventions accompanying it. This is particularly the case in higher education since without an understanding of the theoretical or technical knowledge, it is difficult to imagine how one could think critically or analytically or in a problem solving manner. Disciplinary knowledge and higher order generic skills are intertwined.

[19] An example of material designed to teach critical thinking external to disciplinary content is the 'Rationale' program (see Austhink http://www.austhink.com/rationale/).

There is a considerable body of evidence both empirical and theoretical to suggest that generic attributes exist within, and are best taught from within, the disciplines and so generic attributes do not exist in isolation. For some time there has been research that has pointed to the importance of the relationship between discipline specific knowledge and skills such as critical thinking and problem solving (Alexander & Judy, 1988; Baron & Sternberg, 1987; Nickerson et al., 1985). What is important is the interaction between knowledge and the skills and attributes of reasoning (critical thinking, analysis and problem solving) and the ways in which this is then communicated to others. So there is a network of interconnections between disciplinary knowledge and how that is structured, between reasoning skills and attributes and between the skill of communicating the knowledge and reasoning. Generic skills arise out of the dynamic interplay between the disciplinary skills and reasoning skills.

4.4.3 Tacit nature of skills/attributes

The tacit nature of generic skills can be explained in part by their embeddedness in the disciplines. Although they are often seen as skills that are extraneous to the disciplines they are taught within the discipline and so often assumed to be learnt by 'osmosis' through the teaching of disciplinary knowledge. As Atkinson (1997:74) points out with reference to teaching, 'academics, normally considered masters of precise definition seem almost unwilling or unable to define critical thinking'. Fox (1994) argues that academics find it very difficult to define analysis or critical thinking even though the terms are used interchangeably in discussing students' work and the reason for this is that critical thinking is cultural, learned intuitively and hence recognised but difficult to explain. Research into critical thinking in economics shows that while it is a skill that is valued, it is often not made transparent to students (Jones, 2004, 2005).

4.4.4 Organic nature of skills/attributes

Generic skills are organic, interconnected networks rather than discrete skills. That is they are entities which are interwoven with the discipline and with each other. In other words it is very difficult to meaningfully disentangle critical thinking from problem solving, from analysis and from communication of these ideas.

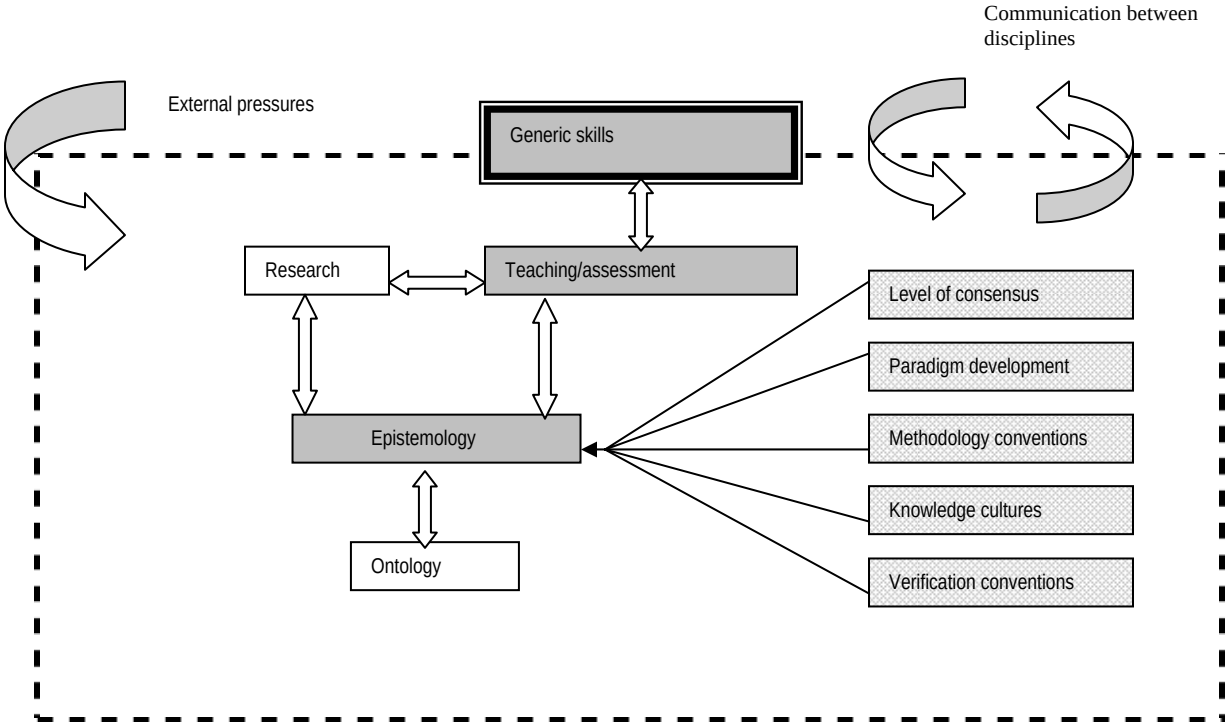
Part of the complexity of generic skills/attributes is the relationship between them. Bloom (1956), in devising his taxonomy, argued that higher order skills are separate and form a developmental hierarchy. Bloom's Taxonomy identifies six levels in the area of learning: knowledge, comprehension, application, analysis, synthesis and evaluation. This is open to question as there are doubts regarding the separate and hierarchical nature of these skills (Nodrvall & Braxton, 1996). So while higher order generic skills are frequently referred to as separate entities, it may actually be more useful to understand them as overlapping or clustering. Hager et al. (2002) point out that in practice they overlap and interweave 'like the threads in a carpet'. So while at one level higher order generic skills such as analysis, problem solving and critical thinking can be regarded as separate, in reality they are interconnected and interdependent. It may not be possible to think critically without analytical skills, nor to solve problems without elements of analysis or critical thinking.

4.4.5 A conceptual map of generic skills

This section briefly summarises the concepts underlying this study. The present study explores what teachers believe about knowledge in their disciplines and how this shapes their understanding of higher order generic skills. It also examines how in turn this shapes their emphasis on particular generic skills. This study also considers how this shapes their teaching of these skills and the way these skills are integrated into the subject and the assessment. These ideas are illustrated in the following diagram (Figure 1). This diagram represents the conceptual relationships that are central to this study. The shaded areas denote those that are specifically investigated in this study. The diagram considers the relationships within the disciplinary context. The dotted outer line is intended to suggest that while there are some boundaries between disciplines, these are porous. The arrow in the top right implies there is communication between disciplines and movement of academic staff and ideas across disciplinary boundaries. The diagram represents the relationship between ontology, epistemology, teaching, research and generic skills. The relationship between disciplinary epistemology and research has been the focus of previous studies (Becher, 1989a; Becher & Trowler, 2001) and so is not the key focus of this study. Disciplinary epistemology includes a number of elements, which are

illustrated on the right of the diagram. The generic skills are on the boundary of the discipline because, in current theory, they are considered to be skills which are transferable across disciplines. The diagram also acknowledges that all these factors are influenced by external pressures, both institutional and political or economic.

Figure 1: Relationship between the discipline and generic skills



There has been a considerable amount of work on teaching and learning in higher education, much of it centred around the deep and surface learning framework (Biggs, 1987; Entwistle & Ramsden, 1983; Marton & Saljo, 1976; Ramsden, 1992). However, these theories do not take into account differences in disciplinary epistemology and culture. Much of the work on teaching in higher education is based on conceptions of learning and teaching (Entwistle & Tait, 1990; Kember, 1997; Kember & Gow, 1994; Martens & Prosser, 1998; Marton & Saljo, 1976, 1997; Prosser & Trigwell, 1999; Ramsden, 1992; Samuelowicz & Bain, 1992; Trigwell et al., 1999).

Much of this work on conceptions of teaching focuses on the ways in which teachers conceptualise their teaching of particular content based phenomena. Studies into teachers' perceptions of teaching and learning have shown a relationship between teachers' perceptions and their approaches to teaching (Prosser & Trigwell, 1997; Trigwell & Prosser, 1996). More importantly, studies have also found that there is a clear relationship between the teacher's orientation to teaching and students' approaches to learning (Kember & Gow, 1994; Ramsden & Entwistle, 1981; Trigwell et al., 1999). These studies suggest a clear relationship between what teachers believe about teaching and what they actually do. Further, the literature on disciplinary differences discussed in Chapter Three suggests that there is a relationship between the discipline and teaching practices. This chapter has outlined the role of epistemology in shaping beliefs about teaching. So in summary, it is possible to infer that there is a link from disciplinary epistemology to beliefs about teaching to teaching practice. There has been a considerable amount of work on learning and teaching in a disciplinary context (Dall'Alba et al., 1993; Donald, 2002; Lybeck et al., 1987; Prosser & Millar, 1989) but to date there has been little research which has explored the teaching of generic skills and attributes and their relationship to that disciplinary context.

This chapter has formulated a framework for examining generic skills by bringing together the two key factors: epistemology and ideas of generic skills and attributes. It proposes that teaching and learning are situated and that the discipline is the central point of identification for those doing the teaching. Since disciplinary scholarship and teaching is about the creation, verification and transmission of knowledge, then epistemology, as the theorising about knowledge is a central element in teaching. Further, it is proposed that generic attributes have a number of key features and their quintessential characteristic is that they are highly complex, multilayered and nuanced entities which will resist precise definition. Nonetheless they are worthy of very careful examination. It is at the intersection of thinking about teaching and learning, disciplinary epistemology and generic skills that this study is situated. The preceding chapters have set out the antecedents of and theoretical foundations for this study. This chapter has outlined a theoretical understanding of generic skills by examining the potential for articulating a

relationship between notions of epistemology and notions of generic skills. The possibilities outlined by this chapter identify a theoretical space for determining, in the subsequent empirical analysis, the extent to which there is a relationship between disciplinary epistemology and generic skills and how this is manifested in teaching.

Chapter Five
Methodology

The previous chapters have presented a conceptual analysis of the idea of generic skills and this analysis has provided a foundation for the inquiry. They have examined the idea of generic skills and the notion of disciplinary culture. It has been argued that to date the theorising of generic skills has had shortcomings, and the analysis in the preceding chapters examined the inconsistencies, unmet expectations and lack of congruence between theory and practice with regard to generic skills. The previous chapter also marked out a theoretical understanding of what a re-examination of generic skills might involve. This chapter outlines the underlying assumptions, rationale and design of the study and the methods of data collection and analysis.

This research explores the relationship between the disciplinary context and the ways in which higher order generic skills are conceptualised. This involves first examining the ways in which academic staff describe the epistemology of their discipline, second, how that translates into the curriculum with a particular focus on the undergraduate years. Third, this study examines which generic skills were seen as important by the participants, how they were conceptualised, taught and assessed. In this way possible connections between the disciplinary context and understandings of generic skills can be examined. The following research questions were formulated to guide analysis:

- How do academic staff conceptualise knowledge in their disciplines?
- How do they understand the curriculum structure and what do they see as the relationship between disciplinary knowledge and curriculum structure?
- What do academic staff understand as the key generic skills in their discipline?
- How do they conceptualise these skills?
- What accounts do they give about how they teach and assess these skills?

A study of the construction of generic skills is irreducibly subjective. It is about value judgements, meanings and beliefs. Meaning here is understood to be both subjective and social. The aim of this study is to interpret the teaching cultures from within the disciplinary context. It aims to bring into focus the deep assumptions and meanings that inform teaching practice. This thesis is based upon the ontological assumption that realities are multiple, interconnected and constructed. Hence they cannot be understood separate from context.

5.1 Overall design

Because the nature of higher order generic skills is complex and highly abstract, an in-depth qualitative approach was used as this allows for the collection of rich data which captures the complexity and detail of the material. A quantitative study might have been able to explore the questions in more breadth but would have lost the depth required in order to be able to carefully examine the ways in which the generic skills are conceptualised in the disciplines. Because the study is concerned to explore the relationship between disciplinary epistemology and the conception and teaching of generic skills, the reported perceptions of teaching staff are central to this study. Insights into these perceptions were gathered through in-depth interviews with academic staff and the collection of teaching materials.

5.2 Methodological framework

This study is located within a qualitative methodology and is based around the assumptions of naturalistic inquiry (Lincoln & Guba, 1985)[20]. It seeks to uncover the

20 The five axioms of naturalistic inquiry as outlined by Lincoln and Guba are are:
1. The nature of reality: reality consists of multiple realities existing largely as constructions in the minds of people. They are intangible and can be studied only in holistic and idiosyncratic fashion;
2. Inquirer-respondent relationship: the independence of subject and object, particularly in a human context is questionable and the interaction between the two in naturalistic inquiry is not necessarily undesirable;
3. The nature of truth statements: the aim of inquiry is to develop an ideographic body of knowledge which can be understood as a series of 'working hypotheses' that describe a particular case. Generalisations are dubious since human behaviour is not time or context free but there can be some transferability depending on the similarity of contexts;
4. Causality: The determination of cause and effect is difficult in human relations since they are caught up in an interacting web of multiple factors;

meanings of interactions and in so doing develop an understanding of the relationship between ideas and their context. This study is based on a conceptual framework that sees notions of education as socially and culturally constructed. Learning is assumed to be situated, dynamic and affected by the learning context (Brown et al., 1989; Lave & Wenger, 1991; Vygotsky, 1978; Wenger, 1998). Teaching and learning are considered as being part of a complex web of social interactions, which are interdependent upon each other. The data is largely emic as it is based on the understandings of generic skills from the insiders' perspectives (Lincoln & Guba, 1985; Merriam, 1998). As a consequence this research is concerned with the meanings the participants themselves attribute to interactions (Marshall & Rossman, 1999). Hence, the data are the teachers' own reports of their teaching. Interviews are used so as to explore the ways in which a group of teaching staff and students describe their understandings of generic skills. Teaching materials such as subject outlines or copies of particular assessment tasks were also collected. While this is not the central focus of the data collection, these materials provide concrete examples of ideas discussed in interviews.

The research is not intended to be generalisable in that it is a context specific study and hence does not seek to make claims that are applicable to all situations (Lincoln & Guba, 1985; Merriam, 1998). It does not aim at definitive descriptions of generic skills but at understanding the reported perceptions of academic staff in particular contexts. In addition, it is a snapshot rather than a longitudinal study, as the perceptions which are revealed are situated in a specific time and place. The picture of generic skills that arises from this study is highly context specific, however, it has much in common with previous literature which discusses notions of generic skills. Hence it is anticipated that the findings that arise from this study will be relevant to other teaching contexts.

The rationale for the use of interviews is that they provide rich data and an insight into academics' views on their discipline and their teaching. Many aspects of teaching,

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5. Relation to values: inquiry is not value free but is part of the process - decisions are made about the selection of the problem, theory used, instruments used, method of data analysis, assumptions on which the study is based.

disciplinary culture and notions of generic skills are known only to academics themselves. Interviews provide a means of illuminating some of these understandings. The interviews are able to explore how academics actually think about the teaching of generic skills. These ideas exist at an ontological as well as epistemological level in that they are concerned with issues of identity as well as knowledge. The use of interviews enabled theoretically derived ideas to be examined in a rich context as they allow for subtleties and nuances to be reflected.

5.3 Sampling and selection

The disciplines, universities and participants were chosen in a purposeful manner. Participants were selected based on those from whom most information on the central issues could be gained (Patton, 1990:169; Lincoln and Guba, 1985). In order to avoid institutional bias, staff from two institutions were interviewed. The two universities were selected because both were large, well established, research intensive universities. These two universities were chosen for their similar focus so that the difference between the newer and/or technical universities and older research universities did not cloud the findings. The study was designed so that the focus was on the discipline rather than the institution, although these are connected.

This study involved academic staff in five disciplinary areas:

- Physics;
- History;
- Economics;
- Law;
- Medicine.

These disciplines were chosen as they represent a basic or ‘hard, pure’ science, a humanities or ‘soft’ discipline, a social science that has elements of both the hard and soft, pure and applied, and two professional disciplines, one based in the sciences and the other in the humanities/social sciences. This was done so as to explore disciplines which

have different epistemic cultures. This is in order to identify clear differences in the conceptualisation of generic skills. The purpose of choosing these disciplines is not to suggest an absence of blurry edges, nor that all disciplines can be neatly placed into quadrants, but as a means of examining how generic skills are conceptualised at the 'epistemological extremes'. The study did not impose the Biglan/Kolb disciplinary differences model upon each discipline, but rather, participants from each discipline were asked about the nature of their own discipline. In this way the structure emerges from the data itself rather than the data being forced into a particular framework.

The participants were selected so as to gain a range of perspectives within their discipline (different specialities in medicine, a broad range of research areas in history, economics and law, and participants from both theoretical and experimental physics). Certain participants were selected because they had a particularly influential role in education in their areas (for example heads of departments or education units, coordinators of first year programs, people who had been instrumental in developing graduate attributes). In selecting participants the aim was also to have a range of age, experience and position level. Very few members of staff who were invited to participate declined. One declined in economics, one in physics, one in history (the historian expressed a great interest in the study but was overwhelmed with work). One declined in medicine because he was overseas and another did not return emails. No one in law declined to be interviewed.

Initially six people from each discipline were selected (three from each institution). Further interviews where then conducted when necessary until saturation was achieved, which is the point at which no new themes are observed in the data or when the same ideas keep reoccurring from participants (Miles & Huberman, 1994). In history, saturation occurred after the initial six interviews, in economics eight interviews were conducted, in physics seven, in law six and medicine nine. Saturation was seen as occurring in each of the disciplines when interviews consistently revealed much of the same material.

Table 2: Number of participants in the study

	History	Physics	Economics	Medicine	Law
University 1	3	4	5	4	4
University 2	3	3	3	5	3

In history participants were chosen for their range of research area. In physics participants were chosen from theoretical physics, experimental physics and astrophysics. At one university there were physicists who resided in both physics and mathematics departments and so participants were chosen from both departments. In economics the aim was to interview people from a range of research areas from the highly quantitative or econometric to the more qualitative. In law participants were chosen from a range of research and teaching backgrounds. Some were chosen because they were involved in particular teaching or curriculum developments associated with generic skills. In medicine the aim was to select participants from a range of specialties. In addition, some people were chose for their particular role in medical education. Two participants who were chosen were not clinicians but had pivotal roles in medical education in their schools.

In addition to the formal interviews, the researcher had a number of informal conversations with a range of people from each of the disciplines to gain some background into the culture of the disciplines and into the educational issues that were pertinent to each area.

After ethics clearance was granted, emails were sent to the heads of the ten departments chosen for the study, requesting permission to interview members of staff. Once permission was granted, potential participants were contacted either by telephone or email and an interview requested. Background material was provided and their interest in

involvement in the project was determined. Participants were emailed an outline of the research and a plain language statement as required by the ethics committee.

5.4 Data collection

The research was inductive in that it sought to examine the understandings of generic skills from the perspectives of academic staff. In the first phase an interview schedule was devised and tested on two pilot interviewees. These pilot interviews allowed the interview schedule to be re-designed in the light of the interviewees' comments and the interviewer's observations regarding lack of clarity, logical order and precision of the questions. The data from the pilot study are not reported here since the interviews were necessarily provisional.

This study presupposes that rather than the interview being a neutral encounter, it is a setting in which knowledge is actively constructed. As Holstein and Gubrium (2004) point out, both the interviewer and interviewee are active in the process of meaning creation. Respondents are not repositories of knowledge which is revealed by the interviewer but both people in the encounter are constructors of knowledge.

The intention of the interview was for the participant to discuss his or her understanding of their discipline, the ways in which generic skills fit into the curriculum and how these skills are understood. Participants were encouraged to use examples and to discuss both their discipline and the ways in which the skills reside within the discipline in as much detail as possible. The interview aimed for academics' reflections on their discipline and their teaching. For this reason the interviews were constructed as a dialogue.

The interviews were semi-structured and an interview schedule was used as a guide (Minichiello et al., 1995). However, the schedule contained a number of open questions and probes which allowed the researcher to explore each participant's particular perspective. As Merriam (1998) contends, one of the problems in using a highly structured interview schedule is that it only deals with the interviewer's preconceived

notions rather than the interviewee's own understandings. However, the probes allowed the interviewer to explore the interviewee's own perceptions. In addition, if the participant raised an issue that was not part of the schedule but was still considered significant, that was followed up. The interview schedule is included in Appendix 1. The questions on the schedule were theoretically driven in that they aimed to investigate the key research questions, which had arisen from the literature. The rationale for interviewing is the assumption that academic staff thinking about their discipline and teaching practices is meaningful and can be made explicit.

Each interview lasted between fifty and ninety minutes and was conducted in the participant's office. The interview began with casual conversation to establish rapport. The participant was given a hard copy of the plain language statement and asked to sign a consent form. At the end of the interview participants were asked if there was anything they wanted to add that had not been covered. The interviews were audio-recorded and transcribed in full by the researcher. Each participant was identified by a code in subsequent analysis of the data.

In addition to interviews, copies of particular assessment tasks, subject outlines, lists of generic skills included in subject objectives and department versions of university graduate attributes were collected from each participant. Specific material was not selected but participants were requested to provide samples of subject outlines, teaching materials and assessment tasks at their discretion. These were discussed with the participants at the time of interview in the context of questions regarding the ways in which generic skills were taught. They were also used as an additional resource when analysing how generic skills were taught in each discipline, for example whether writing tasks were utilised, the extent to which problem solving or critical thinking (as defined by participants) was present in assessment. While teaching materials were a valuable resource, they were considered as additional material rather than the central focus of the data collection.

5.5 Data analysis

As the analysis of qualitative research is emergent, data collection and analysis formed part of an ongoing and connected process. The analysis process began with verbatim transcription and careful reading and rereading of the transcripts. Miles and Huberman (1994:429) identify three processes in data analysis: data reduction, data display and conclusion drawing/verification. In this research, the data reduction involved coding of the interview transcripts using the software *QSR Nvivo*. The coding followed the steps outlined by Miles and Huberman (1994). The initial coding was inductive (Goetz & LeCompte, 1984; Miles & Huberman, 1994; Patton, 1990) in that the codes were not based on a pre-existing list. The advantage of this is that the codes used were ones that functioned in their context (Glaser & Strauss, 1967). However, they were informed by the conceptual framework and the research question. The coding unit was usually a multi-sentence 'chunk'. The analysis process followed that outlined by Strauss (Strauss, 1987; Strauss & Corbin, 1990). Transcripts were reviewed line by line and codes were generated. This coding involved re-reading and validation through cross-checking across all transcripts. From this coding, themes or patterns were identified and refined. Hypothetical relationships identified in the initial coding were confirmed, modified or rejected on the basis of this process. The definition of the codes was also reviewed as the analysis progressed. As patterns emerged the codes were structured into a conceptual order involving more conceptually inclusive categories and more differentiated subsections. The analysis process was not linear or one-way but a continual moving from the raw data to the categories and back again. In this study the theories were generated, refined and verified through the processes of categorising and relating (LeCompte & Preissle, 1993). From this coding, themes or patterns were identified. Once the codes were finalised, the data was sorted and displayed using *QSR Nvivo*.

5.6 Rigour and trustworthiness

Silverman (2005) refers to the importance in qualitative research of avoiding anecdotalism or relying upon a few well chosen examples rather than basing findings on a critical evaluation of the data. This study avoided this in the following ways.

Verification was an ongoing part of the fieldwork. As Patton (1990) has pointed out, observation of the setting will give rise to categories and dimensions that help organise what has been experienced and observed. These emergent concepts and dimensions generated by fieldwork are also verified by fieldwork (Patton, 1990:266) and the rich descriptions of qualitative research allow the reader to understand the complexities of the issues in question. The rigour of the research was maintained by triangulation of sources (Patton, 1990), that is, a variety of data collected from a variety of sources. Once participants were interviewed their various perspectives could be balanced against and used to inform each other. Triangulation was not intended to lead to what Patton (1990:467) refers to as a 'single, totally consistent picture' as the variety, complexities and ambiguities are considered to be important. However, through the richness and complexity of the data, patterns and meanings can be created. The constant comparative method (Silverman 2005) was also used by inspecting and comparing the elements of a case. Member checking (Lincoln & Guba, 1985:236) was carried out by showing transcripts to those participants who requested it. Further, once analysis had been carried out, the work was sent to participants and their input considered. In addition, the analysis was shown to a member of each discipline who had not been a participant in the study, in order to determine whether the findings 'rang true'. In all but one case the comments from participants and non-participants were supportive of the findings. The only instance in which there was a substantive comment regarding the findings was from one of the participants and this person's suggestions were incorporated into the analysis. Finally, some of the findings have been presented at international conferences and published in refereed journals so the methodology and analysis has been scrutinised by other researchers.

5.7 Limitations of the study

From the outset clear limits were set on the design of this study in order to sharpen the focus and precision of the findings.

- The study investigates teaching only, rather than learning although these are linked. The study is limited to the reported perceptions of academic staff. It

examined some materials prepared by academic staff but did not directly observe their teaching practice, student work, departmental policy or university policy. It is not specifically concerned with student learning and this is an important area for future research.

- Although there are a number of stakeholders involved in the issue of generic skills (policy makers, administrators, academic staff, students, employers), this study is an investigation from the perspective of teaching staff only. The study comments on higher education policy and management with regard to generic skills but does not examine policy in detail. While there is employer interest in generic skills and this has been a very important background to this study, the particular focus on this research is to consider generic skills only in the higher education context.
- The study is not concerned with outcomes in that it did not investigate the ways in which student learning was affected by the teaching outlined by the participants. It did not consider student understanding of generic skills nor their perception of their importance. Nor did the study examine broader educational or employment outcomes of generic skills.
- The study focuses only on higher order skills and attributes and more specifically on critical thinking, problem solving and communication. Earlier chapters of this thesis have discussed the complexity of characterising these skills. The aim of this study was to consider only a small range of generic skills in order to bring into sharp focus the nature of the relationship with the disciplinary culture.
- The study focuses on five disciplines with established epistemic cultures, research traditions and a history of teaching in the academy. In this way conclusions could be drawn about the nexus between disciplinary context and generic skills. It does not examine newer or interdisciplinary areas and this would be a very fruitful area for future research.
- The study is based on two universities of similar size and reputation, with similar student and staff profiles, and research output. In this way clear

conclusions can be drawn that are based on disciplinary considerations rather than institutional ones.

- The study is based in Australia while drawing heavily on research and policy from the United Kingdom.

The following five chapters present the key findings from analysis of the interviews with academic staff in the five disciplines. The material from each discipline is presented separately.

Chapter Six
History

This chapter presents finding from interviews with historians. It begins by briefly discussing the ways in which history has been described by both historians and non-historians in the literature in order to put the views of the participants in this study in context. This chapter then examines the disciplinary culture as described by the participants. Following this it outlines the participants' ideas about the history curriculum. The chapter then specifically considers generic skills as conceptualised by the historians in the study.

All the historians in this study come from a background in history although some have associations with other disciplines such as literature or languages. They specialise in a broad range of histories from European of various periods, Australian and American and their research covers a range of issues and is tackled from an equally broad range of perspectives. One of the historians in the study has also been involved in formulating the statement of graduate attributes in his university and so has a particular interest in generic skills and attributes.

6.1 The disciplinary landscape

The characteristics of history as an academic discipline have been investigated by those outside the discipline (Becher, 1989b, Quinlan, 1999) but are also the subject of much vigorous contemporary discussion by historians themselves (see for example Barcan, 1999; Carr, 1964; Elton, 1969; Macintyre, 1999; Windschuttle, 1994). History is a discipline that emphasises the constructed nature of knowledge and the role of the historian in selecting and interpreting. It emphasises the multiple, the contested and the contextualised and this notion of history is one that has been around for some time. E. H. Carr, writing in the 1960s stated:

> The facts only speak when the historian calls on them: It is he who decides to which facts to give the floor and in what order or context. Some facts are ignored by historians, others given importance. The historian is necessarily selective. The belief in a hard core of historical facts existing independently of the interpretation of the historian is a preposterous fallacy. (Carr, 1964:11-12)

> The facts are not like fish on a fishmongers slab. They are like fish swimming in a vast and inaccessible ocean and what the historian catches will depend on chance but mainly on what part of the ocean he chooses to fish in and what tackle he chooses to use – these two determined by the kind of fish he wants. By and large the historian will get the kinds of facts he wants. (Carr, 1964:23)

More recently, in the foreword to *The History Wars* (Macintyre & Clarke, 2003), Anthony Mason writes:

> There is no one 'right' view of Australian history. There can be no absolute certainty about the past. All too often primary facts are eminently contestable. When they can be established with any degree of probability, they may be open to competing interpretations (p x)

However, given the possible range of interpretations, it is the responsibility of the historian to be open, honest and critical about the evidence they use. As Macintyre points out:

> History attracts large numbers of undergraduates, excites them with the allure of the past and introduces them to the procedures of historical interpretation. One of the first lessons it teaches is that they must form their own judgements based on their understanding of the subject, their reading of the evidence, their evaluation of the arguments, their capacity for empathy, engagement and lucidity. Students learn how to find the sources that are relevant to their inquiry, and the conventions of citation that ensure it is properly documented and open to inspection (Macintyre & Clarke 2003:27).

For the historians interviewed in this study, an interest in the past is expressed as a fascination with things, people, ideas and societies that were very much 'there' but are no longer, a paradoxical combination of escape from and connection with the present, of engagement and disengagement and an interest in 'the other'. It is very real and resonates into the present and yet at the same time is ephemeral. The ways in which historians in this study spoke of their discipline reflect the findings of Becher (1989:264) who describes history as to do with 'notions of stability and change as they manifest themselves in the interactions between societies and between people within societies'. Moreover, Becher describes history as characterised by internal unity despite great variety in the ways in which the discipline is interpreted and practiced, and external openness.

Central to the notion of history is the importance of people and of empathy, an interest in difference, in human nature and in what motivates human beings. Key questions that preoccupy many of the historians in this study are the reasons behind actions – what people did and could have done, what they could have known, could have thought, their fears and fantasies. This is expanded into the deeper existential questions about human experience, what we can say about the human life of the past and what that tells us about our current human condition.

The key theme in which historians are interested is change, in particular change over time and causality. They are interested in the reasons for change and are interested in this from both a structural and an individual perspective, and in the relationships between social/cultural/political structure, the individual and circumstance. So while the social structures and settings are highly important, the individual voice within this is also important. There are a broad range of approaches to history, with some historians concentrating on the broad or thematic picture and others on the personal, some on the social or cultural, others on political, many on interactions between these factors, and so on.

The centrality of the human voice is emphasised by the participants in the fascination with 'history that hasn't been written yet', an interest in people on the margins, people who do not leave diaries, letters or public statements, people who are often 'only glimpsed when they are in trouble'. Thus there is an interest in the marginal of various kinds, indigenous people, women, the poor, those on the fringes of society for reasons of class, race, sex, ethnicity, sexuality, illness, crime and so on. One historian in the study commented that it is important to consider 'who was in the crowd, who was not speaking and how you find them'. There is an interest in examining the gaps and silences as well as the overt, to look at the stories that are not being told.

Perhaps one of the most striking features of history is its breadth of time, place, social milieu and methodology. Historians in the study point out that they draw on other disciplines and characterise their discipline as complex but grounded, necessarily interpretative and peculiar because what historians are studying had gone irretrievably, leaving only traces. History is something that is 'there but it is amorphous, we can't touch it anymore'. As a consequence it is necessary to use research skills in tracking down and interpreting sources to construct a plausible argument while at the same time being aware that there will be many histories and that we will 'never really know'. So history requires both interpretive skills and concrete research skills, the ability to assemble evidence, and to present an argument.

In history the same event or time period can be seen from a number of perspectives, even in opposing ways, creating heated debate[21]. Thus history is seen as multifarious and often contradictory: 'Of course there is a past out there but it is such a complicated, multilayered, multiwoven thing. There is a coherent story but actually there are many, not just the one.'

Despite the importance of the individual and the subjective, the participants in this study are very reluctant to claim that a totally relativist position is defensible. They argue

[21] The so called 'History Wars', for example involved dispute regarding Australian history: (Macintyre & Clarke, 2003; Reynolds, 2001; Windschuttle, 2002) and the teaching of history has been referred to by the Prime Minister of Australia and discussed in the media (Darien Smith, 2006; Rood & Leung, 2006).

against the notion that ‘one story was as good as any other’ and claim instead that it is the job of the historian to marshal the evidence to present the most convincing argument.

Although historians maintain that there is very little consensus within history, paradoxically there is a high level of agreement among the historians in this study. While they claim that the only thing that unites them is a fascination with the past, there is very little difference of opinion regarding the nature of their discipline. All agree that there are a wide range of approaches, and philosophical or political positions, that history is about interpretation and that it is possible to come to different conclusions about an event, phenomenon or period of time. All are of the view that this lack of consensus sits very comfortably in history departments, particularly now, although the older participants pointed out that twenty or so years ago this was not always the case. They seemed to relish their diversity in a way that unified them. It was a discipline, the historians argued, which developed and grew because of this flexibility and willingness to draw upon other disciplines and yet not be engulfed. History as a discipline had integrity and unity despite its eclecticism.

Despite the assertion that history valued a range of perspectives there was apparent agreement regarding the use of primary and secondary sources, the use of evidence, the need to examine what counts as evidence, a consideration of whether a question was reasonable and the importance of constructing an argument in a coherent and justifiable manner.

The historians in the study argue that history is not the past but is a way of organising knowledge about the past and it is important to acknowledge that this always involves a notion that history is ‘made’. Thus historians are self-conscious and aware of their own role in the construction of history. Hence they are at the same time both humbled by the awareness of their own role in that they do not see themselves as discovering one immutable truth but also assured about their role within that complexity. This was expressed in a number of ways:

> Everything that we read about the past is already inflected in certain kinds of ways.
>
> We are very conscious, probably more so than previous historians have been of the way that present preoccupations inform the questions we ask and the conclusions we come up with.
>
> There is a real past but our ways of getting to it are incredibly complicated.

A further important element of history is its connection with the present. Although a divide is referred to between those historians who are interested in the past for its own sake and those who are interested in the past because it helps us understand our own times, history is spoken of in terms of its connection with the present - 'we used to hate presentism but the present and the past are integrally connected'.

Thus history is seen as a process rather than 'the past' and there is a dialogue between the past and the present. By examining the choices made in the past it may be possible to gain some insight into how to deal with similar dilemmas and predicaments in our own experience. Historians use a range of examples of the ways in which notions such as friendship, war and poverty have particular resonance in our society, which allows us to gain new insights into the past. So our present preoccupations inform the questions we ask and the conclusions we come up with and hence interpretations of the past are seen through the lens of the present but although we view the past through modern eyes, an understanding of the past can deepen our understanding of the present.

Another important theme is the interest in ideology and power. The historians in this study are very clear that they are not telling 'objective' stories or providing facts about the past but are conscious that certain stories get told and gain prominence and others do not, that certain voices are heard and recorded while others are not. Thus they are interested in examining what matters and more importantly why something is important and equally, why other things are considered unimportant. Many historians argue that power is as evident in the silences as it is in words.

The dust cover of a recently published history emphasises the themes current in much contemporary history – the emphasis on context, the range of perspectives and the link between the past and the present:

> *Struggle Country* revitalised the field of rural history, bringing a nuanced approach to studies of 'the bush' that distinguishes between farmers and country town dwellers and their different experiences and beliefs. It provides both historical and contemporary analysis that place recent problems within the broader context of the development of rural Australia. It examines the perspectives from which country people have seen themselves and their future and how this has affected development in country areas (Davison & Brodie, 2005).

Higher order generic skills are viewed by the participants as an essential part of the nature of history. All the historians interviewed are concerned with carefully examining many of the following: evidence, argument, assumptions, implications, power relations, bias, gaps and silences, ideology. Critical thinking, analysis, synthesis and problem solving are part of the ways in which historians conceptualise their discipline. These skills or attributes are not understood as separate from history although it is possible that they may be utilised in other contexts. They are part of history and as a consequence are shaped by it. The ways in which a historian understands generic skills is part of the ways in which he or she understands history. The following section will examine the ways in which this translates into teaching.

6.2 The history curriculum

While the history curriculum in Australia was sequential in the past (students studied the Reformation, the Renaissance and Modern Europe in that order), with the broadening of the curriculum, this is no longer so and contemporary history courses are now thematic or nationally based. The historians argue that there is now much more focus on skills and on development of independence, originality, complex interpretation, synthesis, understanding of context and use of theoretical frameworks (such as Marxist, post-

colonial, feminist, post-structural). Over the course of a three or four year degree, students develop a complex set of skills:

> They are drawn further into the skills that history is good at, such as organising yourself as a researcher, identifying how to tackle a research question, locating the relevant literature, finding the information, writing, appreciating the complexities of evidence, critically reviewing the work of others.

First year subjects are broad either in time span or geography and focus on the basic skills such as essay writing, document analysis, research skills, information literacy. The use of primary sources is a very important skill for the historian and students learn to read a document in context, examine its authorship, the influences, language etc. In second year students become more familiar with the debates in history and think about secondary sources, who the historian is, when they lived, their philosophy. In this way they become more aware of the interpretative nature of history. In third year the constructed nature of history is made more explicit. It is usually around this stage that students are introduced to historiography and to more complex documentary evidence. If students go on to fourth (honours) year they do more historiography, are expected to have a detailed theoretical understanding of the nature of history, the nature of knowledge and the generation of historical knowledge. While they have an increasing accumulation of content this is secondary to an understanding of the generation and interpretation of knowledge. Because honours students are required to write a thesis or long research paper, they learn to develop a sustained, well written, well evidenced, carefully theorised argument.

However, historians from both universities argue that the curriculum structure is not ideal for facilitating the development of generic skills as there is no clear notion of progression. At one university, second and third year students are taught together, however, often they do not have the same skill level. At the other university there were concerns that there was no common first year subject and so no systematic way to ensure that students developed the necessary foundation skills.

6.3 Generic skills in history

The historians argue that while generic skills such as critical thinking, analysis, synthesis and communication are integral to history, they are also highly problematic. This is because these skills are part of the nature of history rather than separate from it. Because of this, learning these skills is described as 'a vague, subconscious process that they [students] pick up as they walk along, by listening, understanding, writing, talking.' History is about skills as much as content and what students take with them when they leave university is a way of thinking rather than specific knowledge and 'two years from now I don't think students remember ninety percent of the content.'

Many of the historians argue that they have been teaching these skills all along but now they are under pressure to make them more explicit, but that became a meaningless process: 'Generic skills go in the subject outline but you just copy them off last year, you don't sit there and work out the generic skills you are going to teach.'
Another participant remarked:

> Generic skills go in the handbook …but this becomes generic in itself. We actually have templates. You choose which items from the list you want to go into your catalogue. Those lists tend to be very general.

One problem was that generic skills were very difficult to assess:

> How do we demonstrate that we have been teaching those skills, how do we measure those skills? There is still a lot of work to be done in terms of trying to have a real connection between the generic aims, the way they are taught and a way of measuring whether we have had an impact.

Moreover, content is clear, concrete and manageable, whereas skills are less easy to define and hence to teach in a way that is overt rather than bundled up in the teaching of content:

> We focus on conveying packets of knowledge. But we have to move away from that if we really want to teach these skills in a systematic way. We'd have to take more time away from the lecture and that is difficult to do, it is easy once you have written a lecture to present the material. Sacrificing more content, something has to be dropped out, make a series of trade offs. And I think it is easier to keep content than teach skills.

Although generic skills and attributes are seen as a central part of history, there is also a complex but clearly articulated tension between content and skills and the need to teach skills is also seen as taking time away from content. Perceptions about generic skills are contradictory in that they are both considered important yet are resisted to a certain degree. What is important for all the historians in this study is that students develop the ability to question, and an interest and ability to go on learning after they leave university. Central to this is critical thinking, which is fundamentally about asking the right questions. So the growing knowledge students acquire in history, while important is also concerned with skills development. At one level there is no separation between content and skills but at another level there is a tension between content and skills. This is magnified because the historians in this study perceive that students often see themselves as learning information, rather than critical thinking, reading and writing skills. In addition generic skills are something that must be overtly stated in subject outlines, which signals a separation between generic skills and content knowledge.

6.3.1 Critical thinking in history

Critical thinking is viewed by the historians in this study as a complex and multilayered entity. It is conceptualised as having a number of dimensions that utilise a consideration of logic, evidence, difference, ambiguities, power, gaps and the nature of history itself. These dimensions will be examined separately although they are not necessarily separate activities but are merely different angles on the notion of critical thinking.

First, critical thinking is seen as an ability to examine the logic of an argument. While this is an important skill, it is not the most significant way in which critical thinking is understood. More important is the closely related ability to examine the evidence. This

means understanding and discussing it in its context. It also means the ability to take a text apart and explore its relevance, author, audience, purpose, the claims made on knowledge and truth and then to examine the significance of this. Further, critical thinking involves examining the biases of the text in question.

Next, critical thinking introduces an element of 'otherness'. This means first seeking other evidence, other voices and other perspectives. It is also a bigger project as it aims to develop students' openness to other ways of seeing the world and so is both directed at the evidence or task at hand but also directed at students' worldviews. History is always about otherness as it is about people who lived in times that were different to our own.

Critical thinking also involves exploring contradictions, ambiguities and ambivalence. This requires not only finding a way through contradictions but also being conscious that there may not be a definitive answer and hence understanding complexity. The historians argue that students need to learn to appreciate contradictions rather than aim to reduce them. They also see critical thinking as an ability to challenge one's own presuppositions and examine one's own biases. Hence it is an activity that is directed both inward and outward.

It is also seen to contain a political dimension, which comprises an understanding of the nature and structures of power and notions of ideology. This is in order to examine what has become established and why certain perspectives are current while others are marginalised and to explore better ways of 'telling the story'.

Critical thinking also involves an awareness of gaps and silences, the people who were not speaking, the things that were not said, the things assumed not to be important and the evidence that is difficult to find. The historians are aware of the unspoken and what that can tell us about what is important and valued both by past societies and contemporary historians.

The final form that critical thinking takes is related to the sense that historians are self conscious about their craft. Their awareness of the notion that historians 'make history' means that they are honest about the limits of their own theorising. Their eclectic practices and interdisciplinarity mean that there is a degree of examination of the nature of history, its power and its constraints.

So in short, critical thinking *is* the business of doing history. Everything that a historian does is infused by critical thinking of one form or another. To be a good historian is to be a good critical thinker and notions of critical thinking for a historian cannot be defined separately from notions of what a historian is.

While critical thinking is emphasised as central to understanding the nature of history and one of the key skills that students acquire in studying history, some historians claim that critical thinking is not transparent but implicit and embedded and so acquired by students as part of the overall process of learning. Others however, claim that they make the teaching of critical thinking explicit:

> In lectures I wank on about contentions. I will often say this is my contention. I am now going to take you through the process of the evidentiary basis for that contention. This is how I know what I know, this is the evidence it is based on.

In tutorials, particularly in first year, students are taught to use a primary source and to analyse it and then consider what historians have written and to think critically about the relationship between the primary sources and secondary commentary. Students are also taught the skills of document analysis in first year by being given small, focused, written document analysis tasks that encourage them to think about how one evaluates what is a reliable source and teaches students how to examine the context, relevance and purpose of a document. In tasks such as these, students are shown good evidence procedures and case shaping. Critical thinking is modelled in lectures, practised in tutorials and practised in formative assessment tasks.

The participants present students with alternative perspectives or interpretations, with cultural difference, historical difference, gender, class and so on for both explicit and implicit comparison: 'In lectures I try to say we could look at it this way and we could look at it that way.' Historians also make it clear that they point out disagreement or contrast to students: '…that x is arguing this way and y is arguing that and let's think about which we see as more convincing and examine their actual point of disagreement and the basis of that.'

Students are also presented with the controversial and the ambiguous. For example one historian shows students an image of a 'savage' from 1570 and discusses how it is more ambivalent than might be supposed. He also challenges students by advancing contentions that are 'a bit weird', for example that Native Americans actually allowed settlers to stay rather than being immediate victims. This is done in order to stimulate students to examine their own and other's assumptions. Another historian exposes students to a range of sources in order to encourage them to realise what the political investment in particular stories is and to examine for example why the Anzac story is central to Australian national identity and then to explore the Turkish perspective in order to encourage an awareness that the Turks were defending their homeland and hence the story is a very complex one.

The significance of historiography is also emphasised for latter year (third and fourth year) students. This is important because it makes students aware that what they are being presented with is not 'the facts' but an argument that uses facts in a particular way:

> I don't try to pretend that I don't read history in a particular way, that I have my own biases and my own subjectivity. I don't give lectures where I say 'this is the objective past'. I try to help them understand that I am making an argument and I will often say to them 'you may not agree with this but it is how I see it'.

Critical thinking is assessed largely through essays although small writing tasks, presentations and exams are also used. One person uses counterfactuals in which students role-play events leading up to the American Civil war in an attempt to 'prevent'

the war and in so doing examine the motivations and contradictions of the situation. The essay is seen as the best assessment tool because it is formative and because of the range of skills that it involves. It is particularly helpful for teaching and assessing critical thinking as students have to mount a case, come up with a contention, find and carefully examine the evidence and be aware of the complexities of the issue. Further, they need to express this in a clear and well-organised manner.

Analysis is understood as closely related to critical thinking. For the historians in this study it is the process of taking something apart in order to see how it works. One example of this is the process of taking apart an argument to examine its constituent elements. Another example is the process of examining a set of evidence and considering the various versions of a story and critically examining where the evidence is coming from. In order to effectively take something apart, it is sometimes necessary to categorise (for example identify three versions of a story or several different types of evidence or identify two opposing arguments). Another example of breaking something down in order to examine how it functions is to consider the use of language and how meanings are conveyed or how a writer is attempting to persuade. A further and very important aspect of analysis for the historian is document analysis, in which the historian examines a primary source, the 'raw material' and interrogates it in order to answer certain questions.

The skills of analysis are taught largely through document analysis or consideration of secondary sources. Students are asked what points are being made (in a particular text), how are they made, what is significant. The historians argue that this is akin to critical thinking, or more accurately a subset of it in that critical thinking often requires an exploration of constituent parts.

As analysis is part of critical thinking, so is synthesis since as one historian pointed out:

> While you are breaking things up when you are doing the analysis … there is also the question of bringing things together, providing an account in which there are a number of different points of view.

Synthesis involves bringing together bits of evidence or different interpretations. One example given was to provide a discussion of what the First World War was, which encompassed different points of view and different meanings in different places but at the same time reflected the broader way we think about the war, the changing nature of the world at that time and the place of the war in European history.

Teaching synthesis is seen as difficult and could really only be done by either modelling it for students or by giving them tasks that required them to attempt it. The historians in the study said they modelled it in lectures and that a good tutor drew the major themes together at the end of a tutorial. Students wrote reflective essays at the end of many subjects which were a synthesis of material from different parts of the subject and covered themes or broader 'sweeps' and required them to consider the subject as a whole, following through an idea or discussing a period of time, how things shifted and changed over that period. Students may also be required (particularly in latter years) to write historiographical essays such as 'Read the major works about A, map out the terrain and come to some conclusions, weighing up the various sources.' This requires students to come to an answer that synthesises the range of perspectives. Several historians argued that as with the other skills, it was a formative process and that it was only by attempting to do it (and sometimes not quite achieving it) that they learn.

6.3.2 Problem solving in history

There was some ambivalence amongst those interviewed as to whether problem solving was one of the skills that a historian needed. This was due to uncertainty as to how to define problem solving as some historians in the study associated it with mathematical or engineering exercises, in which case it was not part of the historian's set of skills. As one historian remarked:

> If you don't solve the problem in engineering, the bridge falls down. That is unlikely to happen in history. We are much more interested in why it fell down, maybe whose fault it was, who was responsible in the broader sense, what were the structural issues.

Problem solving in history is a consideration of an intellectual problem or a larger historical question such as the cause of the French revolution. For others, problem solving is a process-oriented skill, often done in groups, such as organising a group presentation, role-play or student conference. From this perspective, problem solving required students to prioritise, manage time, divide up tasks, bring the project together at the end, overcome obstacles. There is a paucity of ideas regarding problem solving and it is understood as either a synonym for critical thinking or as a very instrumental activity.

6.3.3 Communication in history

It was agreed that writing is a very important part of history and students need to communicate their ideas in written form since 'a lot of history is about good writing. If you can write well in the humanities, you can do well.' The historians pointed out that there is a distinct connection between the skill of communication and critical and analytical thinking. Communicating is part of the thinking process and one cannot be said to have thought critically unless one can communicate those ideas. The skill of constructing a sound argument is important.

> We are very conscious that history is a literary kind of discipline, we place a lot of emphasis on written communication, on the art that is involved so we will encourage students to use metaphors appropriately rather than to avoid them, to use concrete examples to back up the points they are making but to do so in a way that is interesting for the reader.

Thus there is an emphasis on writing beyond merely presenting ideas. Being persuasive in history is a literary skill and one historian referred to the importance of 'writerliness' or the ability to write both clearly *and* elegantly, without artifice, pretension or ugliness. As one historian remarked:

> Communication is not about wanking, not about showing off how clever you are. I encourage students to get normal people like their mum to read their work and mark it b for boring and w for wank.

Writing was taught principally through essays, which are the core of all assessment in history. However, while writing was seen as of great importance, the teaching of writing was highly problematic. Some historians in this study did not see it as their role to teach writing. Others did but found that it was very time consuming, especially since writing was taught most effectively by examining and commenting upon students' work and this was very difficult in large classes. Some said that they assumed that students came to university with the ability to write, even though they acknowledged that this was not actually the case, 'I think we just expect them to work out how to write.'

Many gave students a small (500 word) writing task early in their first semester at university. This gave staff an opportunity to identify students who had great difficulty writing. These students were then sometimes referred to external experts (such as Teaching and Learning centres). Many said that they talked to students in lectures or tutorials about the writing process, explaining what was required, how to choose a topic. Most gave out writing guides that outlined how to write introductions and conclusions and how to structure an argument. Some talked individually to each student about their essay plan, explaining where it appears as if the structure does not work or where the evidence looks insubstantial. The essays are seen as a valuable piece of formative assessment – 'Students learn to write by trial and error. You can tell students [how to write] but until you try it, you can't learn. Sometimes failure enables you to learn.' All aimed to give comprehensive feedback, both to the class and written feedback to individuals. One historian said that she wrote at least half a page to each student and asked her tutors to do the same.

Oral communication is also important, although to a lesser degree than writing but again, with limited contact time with students, teaching oral skills is difficult. Some strategies include tutorial presentations, debates and team presentations. However, tutorial

presentations are seen as often unsatisfactory by many of the participants – 'Sometimes they work and sometimes they don't. Sometimes students just read, then you need to talk to them about dot points, visual material.' Moreover, many agreed that tutorial presentations are 'painful for everyone.'

Another technique that was seen as more successful than formal tasks was encouraging ongoing and engaged participation in tutorials. In successful tutorials, students learn to frame and present an argument and to do so in an engaging way. They learn this by engaging in discussion and debate to develop 'mental agility'. However, there will always be quieter students who do not get involved in tutorial discussion.

6.4 Generic skills, disciplinary skills

Critical thinking and the ability to present a case in a clear and interesting manner are central to notions of what it is to be a historian. Critical thinking in history is a complex and multifaceted skill comprising a number of dimensions and other higher order skills such as analysis and synthesis. Critical thinking in history is understood to comprise an examination of evidence and context; an awareness of complexities and ambiguities; a consciousness of things left unsaid or undocumented; awareness of and ability to analyse political and ideological dimensions; and a critical examination of the theorising carried out by oneself and others. Problem solving in contrast is much less important and is limited in scope to explanations of why something happened; research skills such as the ability to seek out sources; and management skills such as time management, organising group work and project management. Written communication in history is central and is the expression of the other key skill, critical thinking. It takes the form of essays and clarity and elegance of expression and the clear presentation of a argument are highly valued. Oral communication is valued but is often implicit in teaching. The central features of problem solving, critical thinking and communication in history are outlined in Table 3 below.

Table 3: Generic skills in history

Generic skill or attribute	History
Problem solving	• Exploring causality • Management skills – time, groups, projects, research
Critical thinking	• Examining evidence and context • Discussing complexities and ambiguities • Awareness of gaps and silences • Awareness of political and ideological dimensions • Questioning of received wisdom
Communication	• Written – essays the central form of assessment • 'Writerliness' an essential skill for a historian • Some class discussion, presentation and debates

6.4.1 Espoused theory and theory-in-use

The notion of espoused theory (Argyris & Schon, 1974) is useful in considering the ways in which the participants describe their teaching. While the teaching of generic skills such as critical thinking, analysis and writing are important for historians and although these skills fit relatively seamlessly into the epistemology of the discipline itself there are tensions between what historians value and what they actually teach. The first tension is the conflict between content and skills discussed earlier and which exists despite the fact that these skills are part of the disciplinary culture. The second mitigating factor is the practical difficulty in actually teaching skills such as critical thinking or communication.

The teaching and assessment of critical thinking is acknowledged to be problematic and its complex nature means that students are not always taught in a systematic manner – 'I don't think I was ever taught in a systematic fashion how to read or think critically. It was something you picked up along the way.' Further, there is a prevalent argument that students are 'extraordinarily resistant' to being challenged and it is difficult to make students engage in a critical way with the fact that the history they are reading is not just about accumulated information but is actually an argument.

The tension between content and skill appears to be a consequence of the top down imposition of statements of generic skills onto subject outlines. Because these are not framed as part of the disciplinary content but are seen as external to it they are resisted, despite the fact that higher order skills such as critical thinking, analysis and communication are an integral part of history. One explanation for this may be that as Barrie (2006b) suggests, teaching staff are viewing generic skills as complements to the disciplinary understandings rather than as aptitudes that lie at the heart of scholarly knowledge.

The assessment of critical and analytical thinking is acknowledged by the historians in the study to be difficult for a number of reasons, first, because critical thinking is difficult to define and 'pin down' and so difficult to assess precisely. Secondly, large student numbers and lack of staff time to provide detailed feedback on essays mean that while academics see going through essay proposals as an important part of student learning, this is becoming increasingly difficult because of the sheer numbers of students, combined with an increase in other pressures. Others write extensive comments on student essays but this is very time consuming in large classes. Some worry that in large classes the lecturer does not do most of the marking and so loses control of the feedback process. So while they write guidelines for the tutors who are marking the essays they argue that postgraduate students have so much less experience and so may mark things differently and consequently there is a danger that assessment does not always fulfil its goals.

Many historians argued that it was only the students doing honours or postgraduate study who really learnt how to write because in that situation they got one-on-one teaching. Hence, although they saw writing as important, all worried that it was one of the casualties of a crowded curriculum and crowded lecture theatres. 'We don't have enough time to teach them these skills and teach history as well. This is one of the problems with mass tertiary education.' Another, referring to some of his colleagues, remarked:

> Some academics do not consider it to be their role to teach students to write. I understand the frustrations of people who spend their time reading work that is full of misspellings or is ungrammatical or poorly structured.

Similarly with oral communication, the historians argued that although speaking skills were a valued part of history, large classes and limited time meant that it was not always well taught. So there are pragmatic constraints to the teaching of generic skills.

This chapter shows that critical thinking, analysis and communication are an integral and central part of the epistemology of the discipline. While they are not always taught overtly (particularly in the case of writing), they are part of what it is to be a historian and are central to teaching and assessment practices, even if tacit. So although students may be expected to acquire some of these skills in the course of learning history rather than being taught the skills and attributes overtly, the expectation is that when they graduate they will be adept at critical thinking, certain forms of problem solving and communication, particularly writing. Moreover, because these skills are very much part of what it is to be a historian, they are shaped by understandings of what history is – these skills or attributes *are* history and mastering them is much of what it means to be a historian.

Paradoxically, generic skills are also seen as separate from the disciplinary context. These are entities which are referred to as generic skills and are seen as being generic and external to the discipline and so there is a tension between teaching history and teaching generic skills. This is because although historians have always taught critical thinking,

analysis and synthesis as *part of* history, there are, also 'generic' skills which are perceived as external to the discipline and introduced into teaching from outside (through directives from the Dean, Head of Department or teaching committees). As they are perceived as being external, they are resisted. They are given rather cursory attention since they are viewed as bolted on to subject outline in a way that demonstrates lip service rather than involving any substantive acknowledgement that these skills are part of the discipline itself. Thus there is no single way in which generic skills are viewed in history but rather they are seen in complex and often contradictory ways.

Chapter Seven
Physics

This chapter discusses the data gathered from physics. It begins by describing the context with a brief overview of the discipline. Following this there is an examination of participants' interpretations of their discipline. There is then an outline of their views of the structure of the physics curriculum and key issues in teaching physics. This is followed by an analysis of participants' perceptions of generic skills and attributes in physics.

All the physicists in the study had a long-term interest in science, dating back to childhood. They spoke of having been fascinated by taking apart the TV, building rockets or being interested in astronomy from an early age, of Little Golden Books about science and a fascination with the 'crystalline purity' of physics. One participant told the story of his mother buying rocket fuel for him as a small boy since she could get away with it but he would not have been able to. All knew from high school that they would go into physics/astrophysics or mathematics although some were waylaid from academic careers for short periods. The physicists in this study include theoretical physicists, experimental physicists, and astrophysicists[22].

7.1 The disciplinary landscape

Physics has been the subject of much investigation by those outside the discipline (see for example Becher, 1990; Donald, 2002; Doorman, 1989; Gallison, 1997; Traweek, 1988) as well as those within. Physics is among the oldest and most fundamental of the disciplines. It explores the building blocks of matter and examines questions that can be reduced to symbolic equations. Physics sets out to examine the ultimate nature of reality.

[22] Some would argue that astrophysics is in fact a separate discipline, however, since the participants in this study were either located within physics departments or teaching physics subjects or both, they were included in the study.

In many ways physics is an epistemologically powerful discipline since its worldview has shaped the whole way in which the modern world understands the nature of reality. As Wertheim (1995:5) points out:

> We have all been deeply affected by the mathematical world picture that physicists have constructed …Whatever private world picture individuals may hold, it is the physicists' mathematical world picture that is endorsed by the public institutions of our society.

In addition, the applications of physics means that technology has also changed the way we live and think. This is a physics that is founded upon mathematical models. Mathematics is central to the ways in which physicists describe and explore the world. Again, to invoke Wertheim (1995:5):

> It is increasingly in the language of mathematics that all scientists, not only in the natural sciences but also in the social sciences, seek to describe the world… In the official corridors of epistemological power, mathematics is king.

So not only has mathematics made physics a powerful discipline but it has influenced other disciplines to attempt to position themselves as 'scientific' and by implication rigorous by using mathematical (or statistical) methods of analysis.

However, paradoxically, physics is decreasing in power within the university and the broader community. The academics in this study bemoan the lack of resources and clout within the university in comparison to wealthy faculties such as business/commerce and medicine. Physics departments are small. Most graduates do not get jobs as research physicists. Many move into applied science, engineering or into finance, banking or computing as physicists' quantitative modelling skills are useful in these areas. However, for pure physicists there are relatively few openings.

Another distinguishing aspect of physics is its inaccessibility to non-physicists. Frontier physics is increasingly counter-intuitive and the mathematics so complex that it is beyond

the reach of non-physicists, even if explained without the mathematics. Physicists are not heard in the media commenting on the state of the world in the way that economists or doctors are.

Physics can be defined as a 'hard' discipline because it resides in the mechanistic-analytical domains rather than the behavioural-biological (van Gigch, 2002) and because it has a high degree of paradigm consensus and heavy reliance on quantitative modelling (Biglan, 1973a, 1973b; Smeby, 1996). However, viewing physics in this way overlooks much of the complexity in the way that physicists articulate their discipline. Knowledge in physics is acquired on the basis of two systems which work side by side; the empirical world where observations take place and the mathematical world where the researcher postulates mathematical models as representations of the real world (van Gigch, 2002). In modern physics (post Einstein) the empirical and the theoretical work together to develop knowledge about the physical world and there is a continual interplay between theoretical and experimental physicists[23]. Thus new knowledge can be developed through a transition from intuition to theory and only later tested empirically. The importance of this is the creative element as it means that, contrary to what positivists suggest, not all knowledge is derived from empirical observation. It is possible for the mathematical construct to precede the empirical evidence. A mathematical edifice is built upon axioms which are theoretical rather than abstracted empirically. A model is then built up of hypotheses, theorems and proofs. This model represents physical phenomenon but is a simplification and a symbolic representation.

There are a number of facets in the epistemology of physics which make it (at least for those engaged in research) more complex than might be assumed. First, as van Gigch (2002a) points out, there is much in modern physics that is difficult to observe. For example, in particle physics it was necessary to postulate the nature of the micro world

[23] The group of academics in this study was comprised of both theoretical and experimental physicists.

without initially being able to observe it other than indirectly[24]. Thus modern physics contains within it elements of supposition as well as observation.

Secondly, physics is based upon models which are abstractions. Thus there is a very complex relationship between 'reality' and the construct which aims to explain it. In other words an equation used to describe a physical phenomenon is both a physical model and abstract human knowledge.

Further complicating the nature of knowledge in physics is the idea of uncertainty. The Heisenberg Principle in quantum physics states that it is impossible to simultaneously measure the position and the momentum of atomic particles with an arbitrary degree of accuracy. At the atomic level any measuring process involves energy which by necessity interferes with the energy measured. Quantum physics destroyed the notion central to classical physics that the motion of a particle can be determined if its position and velocity at a certain time are known. In quantum theory, this did not apply as the accuracy with which position is measured depends on the velocity and both variables cannot be measured at the same time with the same accuracy. In other words, a phenomenon changes once it is observed and there cannot be separation between the observer and the observed. Another important aspect of uncertainty is Gödel's theorem which warns of the impossibility of guaranteeing a system's truth within its own logic. Gödel's theorem states that all formal systems are incomplete, meaning that formal, rule based systems (such as mathematics) contain true statements that cannot be proven via the system of formal proofs.

So, in short, elements such as the role of creativity and belief in theorising, a high level of abstraction and inherent uncertainty are aspects that modern research physicists have embedded in their understanding of knowledge in their discipline. This depth in the conceptualisation of knowledge is evident in the views held by the physicists in this study

[24] As van Gigch (2002a) points out, prior to Einstein and Shrödinger, positivism made some sense in physics since much of classical physics could be based upon the observable.

and has shaped the ways in which generic skills are understood, as will be discussed below.

The physicists interviewed for this study all describe physics as exciting because it is at the cutting edge or the forefront of knowledge. As a discipline it is described by the physicists as absolute because it examines the nature of the universe at the smallest subatomic and largest cosmological levels. They spoke of the elegance and beauty of physics and the 'buzz' one could get from reducing things to simple rules and an orderly understanding. Another fascination for the physicists in this study is the bizarre nature of physics, in particular quantum physics. They are excited by the non-intuitive nature of physics and by the fact that there are still areas of disagreement. The astrophysicists talked of the beauty and enormity of the things they are researching. Some talked of the pleasure of doing the mathematics – as one said simply 'it is fun!'

While there is a strong sense that the discipline is mature, the research tradition and methodologies well established and the findings stable, at the same time physicists were excited by the notion that there are new frontiers and that new findings could significantly alter the way physics is understood. In addition science is described as continually under construction, an imperfect description but 'the best we have'. Thus although it is an established discipline, it is not static.

The physicists in this study agree that there is a high level of consensus, even though there are different ways of getting a result. A model or theory that successfully accounts for what is going on must not conflict with other theories or empirical findings. Since it is possible in physics to explain where things come from mathematically, it is 'pretty clear cut' as it is possible to show how a result is obtained and hence there is little dissent. One participant argued that 'we believe in absolute truths and immutable laws' however, this is tempered by the notion that scientists are only approaching the truth and much is imperfectly explained. These areas of uncertainty in physics are aspects of the discipline that are enjoyable for participants, for instance '100 years after quantum mechanics was invented people are arguing about how it works and that is great!'.

Another referred to Gödel's Theorem when explaining that knowledge is fundamentally imperfect. The physicists in the study agree that while much of physics is now well established, this is a process that is arrived at through a considerable degree of dissent in which old theories are torn down and new knowledge arrived at and this had been a painful process. As one person remarked, 'well, they are not having inquisitions any more.'

Yet opposition to established wisdom has been an important part of the history of physics. Another commented that physicists would love the current edifice to crumble in order to show them what is beyond. They relish the unknown and the excitement of discovery and argue that one needs to be aware of the boundaries that are drawn and that as researchers their job is always to push these boundaries. As one physicist explained, 'we know that what we are presenting is always only an effective description and that something better may come along.' Another remarked that he liked 'to be jolted out of preconceived ideas'. Yet another pointed out that there are areas in which known physics just breaks down, for example Planck's error. However, there is agreement that new ideas would not negate the old, but build upon them or take them in new directions.

When asked if physicists share any common perspective on the world, the participants in the study thought that there is a certain predilection for reductionism, a desire to understand the universe by reducing it to its simplest parts. However, that in itself is seen as being an oversimplification as the world and the physical laws, while reductionist, recognised the complexity of the physical world. However, physicists acknowledge that they have some degree of luxury as they consider the fundamentals of existence unlike chemists who have further complexities, biologists more and social scientists more still.

All the physicists in the study agreed that physics is a discipline with porous boundaries in that it is difficult to define where physics ends and neighbouring disciplines begin, and there is a considerable amount of intellectual transaction between physics and other disciplines. The nearest disciplinary neighbours are mathematics, engineering and chemistry. Mathematics provides the central way of understanding the physical world for

physicists. Engineering is a significant neighbour in that much physics research is applied in engineering. Chemistry is a neighbour since both are concerned with atomic interactions, although chemistry is concerned with only the outer shell and is at another level of complexity. One physicist argued that chemistry is really a sub-discipline of physics although he conceded that the chemists would disagree. Many pointed out that in areas such as nanotechnology, quantum computers and materials engineering and medical research, much of the exciting work was being done in an interdisciplinary context. In addition the astrophysicists pointed out that astrophysics is often a separate discipline and at some universities resides in mathematics departments rather than physics departments.

7.2 The physics curriculum

Undergraduate physics is taught as part of a three year science degree with the possibility of a fourth (honours) year. Students studying physics are required to take mathematics as pre or co-requisites. Undergraduate (pre-honours) physics teaching is comprised of lectures, tutorials and laboratory classes.

All participants in this study agreed that physics is a highly sequential or cumulative discipline. Students could not move on to the next step until they had mastered the one before. This is because both the conceptual material and the mathematics require an understanding that is built up in layers. Students need the grounding in the fundamental principles before they can tackle issues of more complexity and each stage is essential. However, the curriculum is not simply stepwise as it is necessary to revisit concepts more than once throughout the degree. One physicist described the curriculum as a spiral with the major concepts on the outside, which are visited with increasing complexity over the course of the degree. Some ideas, quantum mechanics for example, are taught repeatedly at increasing levels of complexity, because students need more advanced mathematics in order to understand the ideas. It is necessary for students to simultaneously develop the mathematical skills and learn about how the fundamental principles are arrived at. The physicists in this study stress the importance of teaching the ideas in context. One

participant said that he attempts to give the 'big picture' so that students are able to get a sense of how everything fits together.

7.2.1 Teaching physics

The physicists emphasise the importance of presenting science to students as a 'work in progress'. They did not want it to be perceived as something that was perfect and complete but as something that was arrived at through considerable effort, dead-ends, trial and error. As one person explained, he does not want to present science to students as 'shrink wrapped'. Another said that he wants physics to be interactive. He does not want his students to look at 'manicured slides' but to be aware of the imperfect and constructed nature of science. This can be achieved by highlighting the dead-ends – 'Yes, we know all this stuff but how did we get here?' Another described a colleague who has given up the use of PowerPoint and gone back to chalk as he believes it allows students to see him thinking on his feet, making mistakes, thinking aloud rather than presenting completed slides. Another explains to students that in textbooks if you do a problem at the end of Chapter Three in quantum physics you can be fairly sure that all the information you need to answer that question is somewhere in the first three chapters. But when you are doing research or dealing with an industrial problem, it is not so clear. He says:

> We try to give our students a sense of how knowledge is acquired and all the pitfalls, the mistakes that were made, the complexity of the human endeavour rather than presenting it as totally processed, cleaned up.

Part of this is making undergraduates aware that their teachers are also front line researchers. This is important as it

> …helps show the students that not everything is known and there is still a lot of work to be done and people fumble around and hopefully eventually make progress, But there is typically a huge period of confusion in between.

7.3 Generic skills in physics

For the physicists in this study there is a tension between content and skills. While all argue that generic skills are important, they also argue that the volume of content material in physics is vast and so it is difficult to balance the teaching of skills with the material which must be covered. As it is, there are arguments within the departments about what should be included and what left off. The physicists in this study said that they aim to give students a broad base that covers the fundamental principles and that ultimately if they do not have the ability to 'do the physics' then problem solving, critical thinking and communication are meaningless. Some argue that generic skills such as critical thinking are not taught in any substantive way until the honours year since until fourth year students have not acquired the basic skills to enable them to really think critically. Some skills are also difficult to teach in large, lecture based classes. The skill that forms the backbone of physics is problem solving but that is not the only one which is emphasised. The physicists in the study acknowledge the interconnectedness of the higher order generic skills and of skills with content, arguing that problem solving, critical thinking and analysis are all closely linked to each other and to the subject matter under discussion.

One of the significant generic skills referred to by the physicists is creativity. All physicists in the study refer directly to the importance of creativity and define it as applying knowledge in new ways, thinking outside the narrow curriculum, making a leap from the current knowledge base, thinking of something in a new way. This is seen as difficult to teach but possible to nurture. It is encouraged by fostering students' curiosity, giving them a sense of the excitement of physics and through giving students laboratory exercises and open problems which allow them to 'follow an idea to see where it goes'. However, it is accepted that encouraging creativity does not become central until the honours year when students are in a smaller group and are able to do their own research project and have access to a supervisor, to postgraduate students and to the research group of which their supervisor is part.

A related idea is that learning to learn is one of the most important skills which can be imparted to students. The physicists in this study argue that what is of prime importance in order for students to extend their knowledge, is that they have a combination of skills, interest and enthusiasm as studying physics requires perseverance and determination. They point out that it is not possible to cover everything and so what they aim to do is to equip students with the skills to learn. This is achieved through a number of means depending on the personality of the academic – by infusing students with their own enthusiasm for the subject through showing them the counterintuitive, by entertaining students with demonstrations that explode or are otherwise spectacular, by giving examples from the real world, and by showing students that just because much of the knowledge is old does not mean that it is not exciting. Other ways of providing students with learning to learn skills is by making sure that students are confident with the fundamentals and are then able to 'unpackage a new piece of theory, build it up, draw material from elsewhere.' This means enabling students to make decisions for themselves in practical classes, giving them projects such as posters where there is an element of discovery and teaching in a way that gives students a broad enough foundation and strong conceptual and mathematical skills. However, they explain that it is not always easy to promote curiosity, enthusiasm and independent learning in large lecture based classes.

Another area that the physicists (from one university in particular) discussed was the need for professional skills. This is because the career pathways of the students are varied and as a consequence the university needs to make a particular effort to inform students of career options, professional bodies, the job application process, the employment destinations of recent graduates, postgraduate options and the research cycle. This had been done as a compulsory subject for third year physics majors at one of the universities in this study but it had become complicated by semesterisation and other factors and is now changing to a voluntary series of lunchtime sessions.

The following sections discuss each of the generic skills/attributes separately. This is a convenient way of examining the skills but is artificial since skills such as analysis,

problem solving and critical thinking are described by the participants as closely intertwined.

7.3.1 Problem solving in physics

Problem solving is the key generic skill in physics, in large part because the discipline is structured around problems. Problem solving in physics has been the subject of considerable research (Dawes, 2003; Gable, 1994; Maloney, 1994; Pollard et al., 2006a, 2006b; Trigwell et al., 2002). Much of problem solving in undergraduate physics generates a unique solution, however, this is not always the case and depends largely on the degree to which the problem is mathematically based. In addition, even if a unique solution is required, there may be more than one way to attain it.

Problem solving takes a number of forms, the most basic being to give students a formula and a written problem with a number of variables and ask them use the appropriate formula to find the answers. This very basic problem solving is used in first year as it familiarises students with the concept without confusing them with a large number of variables or unknowns. So the first step in problem solving involves simply being able to 'plug' numbers into a formula. A development of this is to know which formula to use in a particular situation. In addition, students should understand the workings of the mathematics. The problems increase in complexity and sophistication as students learn to understand concepts, application and mathematical manipulation. Participants referred to the importance of exposing students to both well-structured and ill-structured problems (Jonassen, 2000) although they did not all use these terms. Students should be exposed to less defined problems as early as first year, particularly in practical classes.

The steps involved in problem solving are outlined in the following way[25]:

1. Take a relatively complex situation;
2. Creatively sense what the essence of the problem might be;
3. Formulate a hypothesis about the fundamental principles;

[25] This is an amalgamation of explanations from a number of participants

4. Test the hypothesis trying to use these fundamental principles. This means take the problem and formulate it as a piece of mathematics or, in other words, turn a physical problem into a mathematical one. This process of modelling involves reducing a physical problem to its essence and in so doing one needs the ability to make judgements about approximations and about what is important enough to keep and what can be thrown out. This requires good physical/mathematical intuition in that the problem solver needs to know the fundamental principles that are operating in this situation and the most sensible way to begin to tackle this problem;
5. Solve the problem either analytically or numerically (or more commonly both);
6. Interpret the answer and use alternative methods to check it.

Students are inculcated into this process at increasing levels of complexity until they have the confidence to use it. This requires a good grounding in the known, before students can embark on research in which they can 'expand the envelope' to solve new problems.

Problem solving becomes more complex as students move from first to third year from 'cranking the handle' types of simple problems to more complex problems with a higher degree of uncertainty. The student is typically presented with a physical scenario, a certain set of initial conditions and asked to account for what happened or predict what is going to happen or calculate some property of the system on the basis of the data. In first year this is carefully controlled so students are given, for instance, six variables, told that x is in inverse proportion to y and so on, however, by third year there is a greater element of the unknown and so students need to know what is important and what to reject. By fourth year, students are embarking on their own small-scale research and so are expected to draw threads from a number of areas, and apply knowledge to a new situation.

Problem solving is taught in a range of ways. It is modelled in lectures and the lecturer will first go through the theory, present a scenario where the theory is applied and follow it with two or three examples. Students also practice problem solving in tutorials where the tutor will 'walk' students through a problem. Students are given problem sets to do in

their own time. In first year students are given more examples in the lecture and there are many worked examples in the text. By third year the onus is much more on the students. However, one staff member felt that there was insufficient time for problem solving and students needed more structured hands-on experience. At both universities staff (either full-time academic staff or postgraduates) are available at set times (for example lunchtime) for students to come in and ask questions.

Students are also exposed to more practical problem solving in laboratory classes. In first year the laboratory problems are highly structured and yet there is emphasis on students learning to think for themselves. One example done in first year was the bungy jumping egg. Students have a raw egg with a hook on it and a weight of 62.3g. They have to determine how high to hold the egg so that it gets as close to the floor as possible without cracking. Students work in groups of three and are given very little information. This is a very popular activity, however, some laboratory classes are more structured and students are given the apparatus, the instructions and the method. By third year, laboratory exercises are much less like a recipe to be followed and students are given ill-structured problems deficient in instructions and containing deliberate uncertainty. In the laboratory classes students are encouraged to talk to each other and to staff members so that they learn how to plan, how to think about what equipment is necessary. They are given the freedom to go off on a tangent so as to understand 'what scientists do'.

Some physicists make a deliberate attempt to use a problem based approach in their teaching of latter year (smaller) classes. One describes a colleague who gives students theoretical problems which are difficult but not 'death defying' yet require deeper thinking, different sets of theories, different sets of tools. These are problems that seem unrelated, however, the students may see the linkage between something they have done in particle theory, which splits off into something they have done in mechanics. Thus they are encouraged to make connections.

Most of the participants suggest that while there is a distinct change from first to third year, this is evolutionary rather than separate, clearly defined stages. By fourth year

students should have the independence of thought to tackle an individual project (although in one university this is also done by some students in third year).

Problem solving is the central focus of the assessment in physics although many physicists in this study are critical of the emphasis that exams place on problem solving while testing other skills less efficiently. Some people raised concerns about exam based assessment although suggesting that other options also had problems, such as plagiarism on assignments. The concerns are first, although problem solving was the central skill tested in exams, it is not necessarily the only skill that should be tested. Secondly, exams tend to test closed problems rather than more complex open problems. Thirdly, exams are an inadequate form of assessment as they test memorisation and speed rather than other skills. One participant said that he had given up trying to test students' ability to think in exams because they are under too much pressure in that kind of environment – he aimed to test understanding but not test thinking about problems that are too far from what students had seen previously.

Analysis is seen as part of the larger problem solving process. It is one facet in the process of taking a physical problem and identifying a solution. Analysis is seen as taking a number of forms in physics. It is understood as mathematical analysis, for example the ability to take the appropriate equations for the theory and manipulate them. It can be understood as the ability to quantify cause, effect and outcome. It is also understood as the ability to interpret experimental results, for example each has a certain error, or working out what data means, understanding the statistics, the relationships, reliability and significance. Further it can be understood as taking information, sorting it and structuring it and finally can be understood as the ability to read the literature and distil the main ideas.

These skills are assessed as part of problem solving in exams and assignments. They are also assessed in laboratory reports/log books, written assignments and posters.

7.3.2 Critical thinking in physics

There is a very strong interrelationship between critical thinking, analysis and problem solving. While problem solving is the most important skill, the participants argue that it is not possible to solve problems without thinking critically since it is not possible to begin to tackle a problem unless one thinks critically about it, nor to evaluate one's own or others' problem solving.

Critical thinking is the ability to identify the hidden assumptions in a physical model, elements that will cause the model to fail or be inappropriate. Critical thinking also includes understanding what model is appropriate to a particular situation, understanding what assumptions need to be made and whether they are appropriate.

Critical thinking is also defined as the ability to examine a principle and decide whether it is possible to quantify it, whether you can use it to predict what will happen, whether there are instances when it will not work and whether it is possible to determine if the principle is actually more complex than one had previously thought. Thus it is necessary to have the skill and persistence to really push an idea to see if it is accurate and determine its accuracy to a certain number of decimal places. Critical thinking also includes understanding whether the uncertainty is too great for a result to be accurate and the implications of that. Like problem solving, critical thinking requires one to think about what is important and what is not. Because physics involves a high degree of precision, one person characterised critical thinking as avoiding 'a that kind of fits, we will call it good enough way of thinking'.

Critical thinking is also understood as developing students' awareness of the areas of uncertainty or controversy in the discipline, such as a quantum theory of gravity and an awareness that there may be something fundamental that could turn all of physics upside down. It is about examining where the boundaries of a theory lie, what a theory's weaknesses are and what is missing.

The physicists in the study suggest that critical thinking is not taught overtly. Some suggest that despite this it is an integral part of teaching physics while others argue that it is an area in which physics is weaker and that serious critical thinking only occurs in the postgraduate years.

Some describe their teaching of critical thinking as encouraging students not to take a formula as it stands but to try to understand it and to ask questions of the lecturer. Many of the physicists who teach service courses[26] in other faculties such as engineering thought that physics students are different as they are interested in what they are doing and are motivated by the ideas themselves whereas students in other faculties are more instrumentalist and their prime questions are either 'is this going to be on the exam?' or 'do we need to know this?' The physicists maintained that their own students, even in first year often ask questions during lectures, frequently uncomfortable questions for which there is no answer or questions that are difficult to explain to students with limited knowledge, yet this is encouraged. One person thought that some of his colleagues are not comfortable with student questions but that is only because they had not adequately prepared the material they are teaching.

Critical thinking is also taught by giving undergraduates an idea of the thinking that advanced knowledge in the discipline, and the ways that the paradigm has changed. Students are also given essay questions and posters as assessment in order to encourage them to think more broadly although this is easier to do in some subjects than others. Students are also taught about where the frontiers of physics knowledge are.

Synthesis is part of the process of critical thinking and requires the drawing together of ideas from a range of areas. Most physicists thought that it is not taught to a great extent until the honours year because physics has become more and more compartmentalised. However, it is taught to some extent when students present posters and have to draw material together from a range of areas. One physicist stressed that he makes a point of

[26] Physics taught to students enrolled in other degrees, for example physics for engineering or medical students.

drawing connections for students and giving them a 'big picture' perspective so that they can see the connection between thermodynamics and quantum physics for example. In contrast, another argued that it is not possible to start off with the big picture and so students do not start making links at least until fourth year. One difficulty is that the exam system means that subjects are 'quarantined' or disconnected from each other, which encourages students to think that once they had passed an exam they would not have to think about that subject again. Another physicist argued that synthesis is not something that physicists did well because 'much of our thinking is reductive and aimed at reducing ideas to one equation rather than pulling stuff together'.

7.3.3 Communication in physics

Communication is a skill that is described as important, although its teaching is limited by large student numbers and by the amount of material to be covered in the pre-honours years. Written communication is taught through the writing of laboratory reports, essays, assignments and posters. Students are given extensive guidelines for writing laboratory reports and are also provided with a model of a well written laboratory report in first year. Oral communication is taught in a number of ways. In some classes students give talks in small groups and in these classes they are given clear guidelines about what is expected of a good presentation and peer assessment is also used. Other classes work in small groups to produce a poster which is then presented to the class. Other classes use debates with mixed success, some participants maintaining that class presentations are well done, others suggesting that they are 'absolutely appalling, it is embarrassing'.

The honours year provides much more opportunity for developing communication skills as students write a research paper, join their supervisor's research group where they present their findings more than once. At one of the universities a mini research project is offered in third year and this is both popular and successful. However, there are difficulties with this approach as it is labour intensive for staff and there still needs to be a balance between more formal acquisition of foundation knowledge and a research based approach.

7.4 Espoused theory and theory-in-use

As with other disciplines in this study, there is tension between the importance of generic skills and the need to teach subject specific content. Skills such as problem solving and analysis are relatively unproblematic as they are seen as being integral to the nature of the discipline. However, there was concern from some of the physicists in the study that students should be exposed to more open-ended problems, particularly in the early years. Critical thinking, synthesis and communication on the other hand are less straightforward to teach. This was in part a result of the assessment system, partly the segmentation of subjects and partly the nature of the subject matter itself.

The difficulties in teaching critical thinking are freely acknowledged. One person remarked, 'we are such traditionalists, we are probably awful! [at teaching critical thinking]'. Another thought that physicists are weak at teaching critical thinking since 'much of the material is presented as right because this is the physics we know, it is so well established. Even though we try not to do that'.

One physicist argued that unlike teachers in many other disciplines, he is not interested in students' opinions since physics is so counterintuitive. This is not to suggest that he did not welcome questions, but that in order to study physics it was necessary to put aside common sense views about the world – 'my aim is to change their preconceptions'. Another physicist argued that 'critical thinking is a challenge in a mature, sequential field like physics because a lot of things are fairly incontestable'.

As a consequence this can give students the impression that everything is known, which participants vigorously pointed out is not true. Others pointed to the tension between content and skills, arguing that physics is such a huge body of knowledge which takes years to work through, in addition to learning the mathematics so there is little space for critical thinking in the undergraduate years and that they are not teaching critical thinking specifically as most of their energy is taken up teaching students a set of mathematical skills.

Most suggest that it is not until students reach the honours year that they have the skills and knowledge to begin to think critically. At this stage they can be exposed to problems to which no one has answers or to material that is more complex or controversial. They suggest that it is only once people start to do research or are exposed to industrial problems that a physicist is faced with problems that are truly open, yet students are probably not aware of this unless they do honours or postgraduate study.

So while communication and critical thinking are seen as important, a combination of large classes and the technical complexity of the material means that students are not necessarily exposed to these skills to a great extent until the honours year (which most students do not do). This has changed to some extent in the case of communication as students are giving talks, presenting posters, writing laboratory reports and so on. However, the physicists in this study acknowledge that with large, lecture style classes this is not always easy. Critical thinking is integral to the discipline and the physicists are wary of presenting knowledge as uncontested yet acknowledge this as a challenge.

The physicists in this study referred to the constructed nature of knowledge, the bizarre, counter-intuitive and often highly contested nature of some of the frontier physics and the extent to which theorising and creative thought play a vital role in research. Yet when they discuss the role of generic skills in an undergraduate degree their concerns are evident. The key to this is the nature of the subject itself. Its technical difficulty combined with its maturity as a discipline and sheer size of the body of knowledge means that students need to put a great deal of time and effort into mastering the basics.

As the process of becoming a research physicist is one with a very long period of maturation, students with a pass degree in physics have only very basic skills. It is not until they reach honours and more particularly PhD level that students develop more sophisticated skills in presenting a paper, writing an extended piece, solving complex open problems, synthesising and thinking critically about the nature of the material they are examining.

7.5 Generic skills, disciplinary skills

Problem solving is the central skill in physics. It involves the use of both closed problems (those with a unique solution) and open-ended problems. Well-structured problems are used particularly in the early undergraduate years when students are familiarising themselves with basic techniques and theoretical concepts and the process of 'doing physics'. In later years students are often given increasingly ill-structured problems. Problem solving in physics is a stepwise (although by no means neat) process of intuitively understanding the nature of the problem, developing and testing hypotheses usually by turning a physical problem into an abstract mathematical one and finally checking the outcome. Critical thinking is a closely related skill and is understood in three different albeit connected ways: as the ability to examine accuracy, the degree of uncertainty and the ability of a model or theory to predict; the ability to examine the assumptions underlying the model that may cause it to fail and; an awareness of the areas of debate and uncertainty in physics. Communication is not the central focus of assessment in physics but is still considered important. Assessment includes laboratory reports, posters, class presentations, debates, essays and assignments. The central features of problem solving, critical thinking and communication in physics are outlined in Table 4 below.

There is a tension in the epistemology of physics. On the one hand there is an awareness of the 'constructed' and tentative nature of knowledge but this is tempered by the obvious certainties that physics provides. Elby and Hammer (2001) refer to this in their discussion of epistemology. They point out that while there is consensus about a 'sophisticated epistemology' (one that conceptualises knowledge as tentative and constructed) this is perhaps an unhelpful oversimplification as the usefulness of a particular epistemology is dependent upon context. For example some ideas are more certain than others, such as the world being flat as opposed to the idea that there is a theory of everything. In other words, they argue that not all scientific knowledge is equally uncertain and evolving and some is well established while other, usually at the forefront, is more tentative. In addition, context is important in that, for a student of introductory physics, viewing Newton's laws of motion (for macroscopic, slow objects)

as certain might not be problematic whereas for a graduate student, viewing knowledge as absolute might be problematic. Indeed Elby and Hammer (2001) argue that in fact for a student of introductory physics, seeing some theories as tentative might be a disadvantage since on first impression some seem to violate common sense and so if students view them as tentative they might see this as an instance of the laws breaking down.

Table 4 Generic skills in physics

Skill or attribute	Physics
Problem solving	• Closed and open-ended problems • Well and ill-structured problems • Hypothesis development and testing (solved either numerically or analytically) • Checking of accuracy, rigour • Stepwise process involving intuition, theorising, modelling, solving and checking • Use of mathematics as a tool of analysis
Critical thinking	• Examining accuracy, uncertainty, predictive powers • Examining assumptions • Discussion of areas of debate, uncertainty, the frontiers of physics
Communication	• Not the central form of assessment • Laboratory reports, posters, assignments • Some oral presentations, debates

Elby and Hammer (2001) also point to the differences in the disciplines, that knowledge is more clearly established in physics than, for example, in psychology and that introductory science courses tend to focus on knowledge that is most well established. They argue that a sophisticated epistemology is one which is both nuanced and contextual and is able to take into account the discipline, the particular knowledge under discussion and the intended use of the knowledge. For example knowledge in physics is more certain than knowledge in psychology and it is more certain that the earth is round than that there is life on Mars. In physics certain things may need to be memorised for the pragmatic purpose of passing exams.

Because physics admits both a high level of certainty and yet fundamental uncertainties within the epistemology of the discipline, this raises some very significant questions regarding the construction of generic skills, particularly for undergraduates. Much of the physics taught in the early years of an undergraduate degree is well established and so not open to challenge. However, at the same time those who teach physics want to make students aware of the dynamic and uncertain nature of knowledge. Moreover, there are a number of factors pertaining to the teaching of physics that influences the ways in which generic skills are conceptualised. First, learning physics requires mastery of a vast and technically difficult body of knowledge and mathematical skills and so a considerable amount of time and effort on the part of both students and teachers is occupied with coming to grips with this material in ways that constrain some forms of critical thinking in the undergraduate years. Further there are other constraining factors such as large class sizes and an examination system that works against some forms of critical thinking and open-ended problem solving. In physics there is no simple relationship between disciplinary epistemology and generic skills or more precisely how generic skills such as critical thinking and problem solving are conceptualised by research physicists and how they are taught is not always congruent. The construction of generic skills and the ways in which they are taught is highly complex.

Chapter Eight
Economics

This chapter begins with contextual background on the nature of economics, drawn largely from the literature both from economists and those outside the discipline. The chapter then provides a detailed discussion of participants' views of economics. This is followed by a consideration of participants' ideas about the economics curriculum and then an examination of their conceptualisation and teaching of generic skills.

The economists interviewed in this study entered the discipline for a range of reasons. Some had moved to economics from other disciplines, others chose it as undergraduates, albeit in a slightly roundabout way. Many had little idea before they went to university what economics entailed. Unlike some of the other disciplines in this study, the economists had not decided in childhood or adolescence that they wanted to pursue this field but rather had found their interest in it towards the end of their schooling or at university. In addition, at a time when funding for the humanities and sciences is scarce, some people found that economics provided better options for an academic career. Others were drawn to it because it is topical, has a broad reach or because of an interest in mathematics.

The economists involved in this study use a range of approaches, from the highly mathematical and theoretical to more qualitative and applied. They fall into two groups, those who are 'mainstream' and those who identify themselves as marginal. Those who are mainstream do not identify themselves as such but see their approach as standard, whereas those on the margins describe themselves as 'heretical' or 'soft'. Both groups describe economics in many of the same ways although those on the margins are much more critical. The participants in this study range from an almost entirely uncritical stance, claiming 'economists are right', to two who are highly critical of their discipline.

8.1 The disciplinary landscape

Economics is a discipline which at the present time is in a prominent position epistemologically, financially and socially. The opinions of economists are sought after for both public policy and private enterprise. Economists have a high public profile and senior economists from one of the big banks or from government are frequently called on by the media for comment. In universities, economics courses are often part of business or commerce degrees that are currently popular with students and economics departments are often comparatively wealthy. Despite ubiquitous humour along the lines of 'if you had five economists in a room you would have six pieces of advice', economics is a discipline in which there is a reasonably high level of consensus. Although there is dissent, the neo-classical paradigm[27] is central to modern economics.

Current economic theory is characterised by increasing mathematical sophistication. A number of writers (Mirowski, 1989; Ormerod, 1994; Toohey, 1994) have made the connection between physics and economics, arguing that economics 'hijacked' physics in the nineteenth century (Ormerod, 1994). Two significant economic theorists, Walras and Jevons were both physicists. The growth in the use of mathematics in economics has meant an increase in its perceived precision and an accompanying growth in status and prestige. Ormerod (1994) argues that in the nineteenth century, economics was keen to share in the prestige of the natural sciences and an increasing reliance on mathematics allowed that. As economics took on models from physics it began to see itself as a 'science'. Ormerod (1994) and Mirowski (1989) both argue that modern economics has retained the mechanistic models of nineteenth century physics which characterise the world as a smoothly operating machine.

The dominant perspective in modern economics is the neo-classical theory. Despite arguments between monetarists and Keynesians, Ormerod (1994) argues that there is a high level of consensus. Further, he argues that there is a large body of shared beliefs and a developing intellectual orthodoxy. Courses in universities are increasingly

[27] A detailed explanation of the central tenets of neo-classical theory can be found in Galbraith (1987). The Chicago School is most closely associated with neo-classical theory.

standardised and a standard static model is taught to students who then accept its conclusions as the received wisdom.

However, while this move toward mathematics may have given economics some of the status of a science, Ormerod (himself an economist) describes economics as an 'empty box'. He argues that the basis of conventional economics is deeply flawed. For example the assumption of Rational Economic Man flies in the face of much that we know about human nature and the complexity of the real world. An extensive critique of neo-classical economics is beyond the scope of this paper, however, much has been written (Fine, 2000; Hausman, 1992; Mirowski, 1989; Mulberg, 1995; Perelman, 1996). The mechanistic view of the world is based on outdated nineteenth century physics which is now seen as limited or less relevant by modern natural and physical scientists. In addition, economics has become increasingly isolated (Galbraith, 1987). Because of its increasing reliance upon mathematics, economists dismiss one of their closest disciplinary neighbours, sociology, for its lack of precision and certainty because sociologists have little or no mathematics. However, in dismissing the other social sciences, economics loses the richness which an acknowledgement of uncertainty, ambiguity and complexity bestow. Galbraith argues that economists lack humility and that their isolation from other social sciences is a weakness. He argues that economics in the time of Adam Smith took into account institutional, social, political and historical factors but modern economics fails to recognise that the whole is different from the sum of the parts and that human society is a complex, interacting and changing entity. Further, the classical or neo-classical tradition is silent on the subject of power, which Galbraith describes as the great black hole in mainstream economics.

The idea that economics sees itself as a science is significant for this study in terms of epistemology; if economics is founded upon nineteenth century physics then the assumptions are of knowledge as discoverable, an objective truth that can be uncovered in the positivist tradition. This confidence in an empirical truth is curious given the fact that much of economics seems to ignore empirical complexities. Economics seems to carry with it some of the confidence of nineteenth century science and few of the doubts

that entered the scientific community in the post-atomic age and as a result of modern philosophy of science.

Economics is imbued with a view of the world that sees the ability to quantify and build models as the means of analysis. Yet unlike the natural and physical sciences it is much less precise. As a social science it is tied to a complex and ambiguous world. In addition while, like a science, it aims to control the variables in order to separate cause from effect, in economics this is done using a series of assumptions that are sometimes questionable. A physicist would not assume that velocity or heat or some other variable were constant in order to facilitate an experiment. However, an economist makes a number of simplifying assumptions in order to examine the complex workings of the economy. To counter this, it is argued that economics is not an experimental science and so this comparison is unjust and that economics is more like meteorology or cosmology in which the scientist can only observe rather than manipulate.

Economics is described by the economists interviewed in this study as being logical, rational and as a discipline that should be approached in a scientific manner. Some participants liken it to physics because it uses mathematical modelling and has an 'unfeeling rigour which distinguishes it from any other social science'. However, one economist argues that only bad economics is like physics and that it is more like biology because it is about complex and interacting systems. It is seen as being more quantifiable and mathematical than other social sciences, in part because the things that economics is concerned with (price, tax, inflation rates are very simple examples) are easily quantifiable. It is also described as being abstract, concerned with order, a highly structured, fairly formal way of thinking. Importantly, it is described as a discipline that is not afraid of making assumptions.

Economics is seen as being a useful tool of analysis and is compared favourably with sociology, which is described by some of the participants as lacking formal models and as making associations that are tenuous or cannot be well established. Most economists see methodology as one of the defining features of economics.

Those who are most critical of their discipline identify themselves as at the 'softer' end of economics and are also those who started out in other disciplines – anthropology, history, and science. Their criticisms of economics centre on the dominance of the neo-classical paradigm and the nature of the models used. As one participant argues 'economics is ideological but this is not acknowledged…They (economists) have a basic belief that the standard neo-classical models are an actual reflection of reality'. Amongst those who are critical of their discipline, the concern is that most of the conclusions in neo-classical economics are dependent upon assumptions – 'if assumptions have to be simplistic and unrealistic to get to the maths, then how useful is it?' This however, is countered by the argument that critics misunderstand the nature and strength of modelling:

> The criticism that economists get of their models being simplified and stylised and unrealistic and that sort of stuff, maybe sometimes that is true but in general that just shows a lack of appreciation of what modelling is always about, which is developing simplified representations of things and you shouldn't criticise the model just because it is simplified, you should criticise the model if it doesn't work predicting behaviour.

One central idea is the notion that economics is an investigation into social coordination and the allocation of resources in the face of ubiquitous scarcity. Thus economics is about human behaviour or has social behavioural dimensions and as human beings are not automatons this cannot be a mechanical understanding. However, it is this which is the cause of much of the disagreement between economists in this study. While most argue that the mathematic modelling in economics provides methodological strength (lacking in some other social sciences), others argue that it is limiting or unrealistic in the face of the complexity and 'messiness' of human society. As one economist argued, 'the mathematics misses the human dimension and choice, humans are smarter than mechanical systems. *Homo economicus* would go off a cliff like a lemming'. Further, the self-image that economists have of being like physical scientists (with mathematical tools of analysis that enable one to come to a unique outcome or solution) is seen by some economists as problematic in a social setting, as mathematics does not adequately capture how people make decisions.

Consensus is an important issue for economists. All argue that there is a high level of consensus although opinions differ as to whether this is positive or negative. Those 'on the margins' argue that the level of consensus is too high, particularly regarding the neo-classical approach, which they describe as the dominant paradigm. Alternative or interdisciplinary approaches are seen as 'soft', not taken seriously and not publishable in prestigious journals. Even amongst those on the margins there is disagreement as to whether or not students are exposed to a range of approaches. Some of the staff interviewed at one university argue that there is some attempt to expose students to a range of economic approaches, whereas at the other university, there is a sense by all of the staff (whether they are critical of this position or not) that the only approach students are systematically exposed to is the neo-classical one. Whereas in the past students might have been taught Marxist or post-Keynesian economics, they no longer are and there is no serious debate about alternative ways of teaching economics. One economist argues that other paradigms have weakened with the collapse of socialist alternatives. However, others state that institutional, behavioural and evolutionist economics are gaining some ground.

Economists describe economics (particularly macroeconomics) as having been through a period of crisis. As one person describes, 'in macroeconomics they beat their brains out for twenty years and then got tired of the methodological arguments'. The debate had been vitriolic and a great deal of grief had been caused by the huge paradigm shifts in which people had been forced to either change or become sidelined. Others argue that the disagreements had brought the discipline into disrepute and that it is very important that the level of consensus be maintained. Mathematics had saved economics as a discipline and that strength must be preserved.

8.2 The economics curriculum

The important feature of the economics curriculum is that it is both hierarchical and spiral, in that students learn the basics then revisit them in ever increasing complexity. Economists refer to the importance of 'understanding the basics first' and 'needing a

solid foundation'. Thus in first year students will learn the basics of supply and demand in second year they will cover the same thing but with increasing mathematical sophistication and then in later years some of the assumptions are relaxed. The economists suggest that the reason for this structure is the technical difficulties of the subject, since it is not possible to capture the complexity satisfactorily at an elementary level and so the complexity is developed by adding successive layers but 'it is the same damn thing, just a progressively more competent insight into the multifariousness of the issues'.

The subjects in the economics curriculum can be divided into three categories – the basic subjects (micro and macroeconomics), the methodological subjects (quantitative/econometrics) and the 'topic' subjects, which are electives. Less mainstream approaches to economics are usually found in elective subjects.

8.3 Generic skills in economics

The use of economic theory rather than the development of generic skills is the central concept which economists aim to impart to their students. This is expressed as a love of economics, an understanding of the basic principles, functional economic literacy or an ability to apply economic approaches. Only one person identified their central goal as engendering the skill of 'critical analysis'. Acquiring the economics skills is so complex and time consuming that this becomes the central aim and without these technical skills, other things are peripheral or meaningless.

The key generic skills which are identified as important are critical thinking, analysis and problem solving. However, there is some equivocation as to the nature and importance of critical thinking, one person remarking that 'there is precious little critical thinking in economics'. There are concerns about generic skills and while they are important, they are thought about after the fact:

> You can't base a course on generic skills so you start off with the subject matter and then rationalise the generic skills after. You don't design a course so you teach communication skills, they are secondary.

8.3.1 Critical thinking in economics

The nature of economics has an influence upon the participants' ambivalence about critical thinking. The emphasis on economics as logical, the complex technical and mathematical skills that students need to acquire and the current wariness about past vitriolic debate in the discipline has an effect upon the ways in which notions of critical thinking are constructed. Skills such as analysis and problem solving are more significant although the central emphasis is on the use of economic tools.

Critical thinking in economics is seen as the use of the economic tools. Other forms of critical thinking such as a more fundamental critique of policy or assumptions is described by some participants but is not an agreed part of the nature of critical thinking in economics.

There is agreement that critical thinking is the application of logic although the nature of this logic is not problematised. This is also expressed as examining whether something is 'true' or not. However, the nature of truth is not examined. The implication for most participants is that truth is an objective and unitary concept. Included in this understanding of critical thinking is an examination and evaluation of policy or indeed the development of economic policy. However, this is criticised as a limited view by some participants in the study, particularly those on the margins:

> What they mean by critical thinking is logical analysis, so what you do is check the internal consistency of a particular model rather than whether the assumptions it is based on are right, so there is a fundamental difference in what is meant by critical thinking. We teach the assumptions such as profit maximising behaviour and initially we wave our hands and say of course these assumptions don't hold but we never take students back to critically analyse this. Which is a fundamental problem. Other disciplines would say lets not even worry about building this fantastic edifice,

> let's look at the foundations first. I think that is the real problem because after three years no one is talking about them [the assumptions] and students take it for granted that they must be right and then go out into the world and start making decisions.

In addition, critical thinking in the narrow, logical sense is just 'paring things down to their bare minimum. Clearly if you are in mathematics that is great but the world we live in is more complex than that'. Thus the concerns voiced about economics by a few participants also surface in the context of a discussion about critical thinking.

Alongside critical thinking as an application of logic is a broader notion encompassing scepticism. This comprises an ability to take a contrary or sceptical view of what is being expressed, 'thinking outside the frame', 'thinking outside the box' or 'thinking sideways'. Examples of the way this manifested itself is students thinking for themselves in tutorials or essays and being prepared to argue with the lecturer. However, some economists in the study suggest that this does not happen as much as they would like, students are resistant to this form of thinking and they are uncertain how to encourage it. A concrete example of critical thinking is:

> The lecturer writes a model up on the board and tells me the assumptions. The absence of critical thinking is writing it down and learning it. Critical thinking is asking where the assumptions come from, when might I apply it, when shouldn't I, how did he get the results, are there times when I get different results, if I wanted to destroy it what would I say was wrong with it?

One participant argued that critical thinking in any discipline should explore all the underpinnings, assumptions and evidence and subject it all to critical scrutiny. Another argued that the factors which drive human decision-making are contextual and so it is important to examine the societal context in which these decisions are being made. Yet in contrast to this, another economist in the study said that there are problems with criticism. He argued that up to the 1960s economics was taught in a 'very critical way' and that teachers would emphasise the unreality of the assumptions and so what happened was 'everyone thought economics was useless'.

There is agreement that teaching critical thinking is difficult, complex and problematic:

> A lot of us will talk about critical thinking and analysis and problem solving but they are like motherhood statements, we don't actually know how to do it or we think it sort of wears off on students. I guess to some extent if you expose them to enough of this, seeing other people doing it and force them to confront particular issues then eventually they will – but a lot don't. I am not sure how to do it directly.

In a similar way another remarked, 'I don't know if I teach it explicitly, you sort of imagine they would pick it up along the way perhaps'. The uncertainty regarding how to teach critical thinking is common and others are uncertain if it is in fact a priority – 'maybe it is not an explicit goal in my mind'.

The teaching of critical thinking in economics comprises teaching the application of the tools, teaching students to examine models and how they work and how to evaluate economic policies. This is taught by modelling in lectures, practice questions done at home and problem based questions in tutorials (often done in groups).

Scepticism is taught by presenting students with instances where, for example a model did not work. Yet not all participants described this as central to their teaching of undergraduates. One economist used the example of an exercise he had just given his macroeconomics students of the oil shocks in the 1970s where the models were not ideal. Others 'tossed examples into tutorials'. However, in this case the expectation is that only students 'with a predilection to do honours' will see the point. Some comment that they expose students to this sort of critical thinking but do not teach it more explicitly.

An examination of the underlying assumptions is something that is either consciously avoided or not taught because it is too difficult for undergraduates. One view is that critical thinking in economics requires a reasonable level of technical knowledge and so it is a difficult thing for first years to do. In order to think critically one needs a serious appreciation of economics and a breadth of analytic skills because without that 'one could end up making dumb criticisms of the analysis'. Another participant argues that he

does not ask students to look at whether a model is flawed 'because the models used are not flawed'. The examination of the use of assumptions in economics is a very difficult issue for students (in second year for example) to consider since 'you can't teach them something they can't do, they are not expected to know that this is a good model and that is a bad model'. It might be possible to tell students the standard criticisms of the model and 'they could regurgitate them'. However:

> In teaching it is important not to be negative because that destroys their motivation, students hate to have their time wasted so if you say 'this is a pretty useless model' they will say 'why did you teach it to us?'

One economist said that in his teaching he makes a very deliberate attempt to introduce students to a variety of approaches and theories and to look for alternative explanations to the standard economic ones – cultural explanations, development, a Marxist approach, environmental factors. However, this is only done with honours students because he would not be popular in the department if he did not follow the standard practice with earlier year students. In this subject honours students are taught in a seminar situation and are given big questions without a definitive answer. An essay is part of their assessment and students are given open-ended questions and required to develop an argument which carefully examines the evidence, not only the logical consistency but whether the assumptions are valid and whether the predictions the model makes are true. This sort of approach works with honours students because they were 'very good' but may not be appropriate in earlier years.

Critical thinking is assessed as part of content assessment, either through essays, assignments and exams, depending upon the nature of the subject. Exam and assignment questions focus on logic and analysis, evaluation of policy propositions and interpretation of the model or application of the theory. The subjects for which the importance of essays in teaching critical thinking is central, are (on the whole) taught by those who see themselves as on the margins in their discipline. Yet even these people, with one exception, see their central aim as teaching the skills of economic analysis.

Analysis is understood as a process of representing a situation in a way that can be examined using an economic approach. This required the students to 'identify which tool to use, how you go about it, decide which is the right approach and what is essential about the situation'. More simply, analysis is understood as taking a logical and systematic approach to a particular phenomenon or piece of evidence. Some, however, criticised the process of analysis in economics as being narrowly deductive:

> In [a first year subject] the rules of analysis are simple. You just need to learn basic supply and demand and the things that go with that, externalities, public good. Then the analysis becomes applying those tools. It is static analysis. Really that is the only type of analysis we do at that level.

Many of the economists in the study suggest that since analysis is an idea that is not clearly defined, it is, in consequence, difficult to teach. However, if analysis is understood as applying an economic approach to a situation then this is taught in a number of ways. First, students are taught the 'tools' and then how to apply these tools. This is a process that is carefully guided in first year. For example, students are given a case study based on newspaper articles. The teacher in one first year subject takes the articles apart for the students, explaining the economics. In tutorials in this subject students have an issue (for example an article about BOTOX) and they discuss the price of cosmetic surgery and quantity traded. This gives them the opportunity to practice applying the model to a real situation. In second year classes the lecturer might set up a scenario giving the rate of unemployment, the rate of inflation, the current account deficit and ask students what they would do. Students need to apply the logic of the model to work out the best policy response to a situation.

As with critical thinking, a view of analysis that encourages more interrogation is acknowledged to be difficult to teach. One participant said quite frankly:

> I don't know how students learn to do it. There are some who are naturally analytical, then there are some for whom it is not natural to be questioning and to ask 'why is this the case?' I don't know how this can be changed.

Another remarked that ‘students want diagrams that they can memorise’.

Some used small group problem solving in class with the aim of enabling students to ask each other questions (when they may be reluctant to ask the tutor). Some tried to ask questions in lectures but commented that this was difficult in large classes and often students have not done much reading and so the questions fall flat. Others were concerned that when they give assignments there were about thirty percent of students who merely regurgitated what is taught in lectures. Some felt that there was a great resistance on the part of students to ‘really think’. One asked, ‘How far do you go? We are not training students, this is not an apprenticeship. We are trying to put them in a situation where they are thinking’.

Assessment takes the form of assignments, exams and less frequently, essays. Assessment of analysis aims for an increasing complexity in understanding. For example, in first year students are given guided questions that apply the model of international trade, whereas in third year they are given a much more general statement such as ‘use a model to analyse the effect on US sugar producers’. In this case students are not told which model or what issues they should address.

Many economists in this study are doubtful as to the importance of synthesis. Some suggested that it is not important in undergraduate economics since it is not possible to synthesise approaches as they were so different. For some it was a skill that was only important in fourth year when students would have to bring together a wider variety of ideas. Others argued that it was important but that while some students could understand synthesis at a conceptual level, many want to compartmentalise, even within a subject. They did not have a good idea of the connections between ideas or the big picture, let alone the connections between subjects. One participant suggested:

> They [students] want to compartmentalise and a very common question is how much of this bit do we need to know for the assessment. Not even how much of the subject but which lectures.

The concern is that students learn each section in isolation but cannot connect ideas from previous lectures and certainly not from previous subjects. Some participants argued that the current system with separate, semesterised subjects encouraged this form of thinking.

8.3.2 Problem solving in economics

Problem solving is very similar to analysis in that it is an understanding of the basic principles or basic theories and applying these to a problem. However, for some participants, problem solving involves an further element of complexity, in that students may need to deal with larger questions, or questions with a number of elements such as 'what is hindering the development of this economy?'. To answer a question such as this requires students to consider a broad range of factors and the interaction between them. However, this question was part of an elective subject and the economist in question acknowledged that his approach may not apply as readily in the core subjects. Another, who suggested that his approach was non-standard, gave students complex problems with no unique solution. He asked them to use the theory but to be aware that the theory by itself may not answer all the dimensions of the problem and that they may have to use other approaches or resources. However, his students were honours students and he suggested (not uncritically) that in earlier years, problem solving would involve 'taking a particular model, applying it to an issue and you should have a nice clear answer at the end'.

The common approach to problem solving is, like analysis, to give students some data and ask them to interpret it. This is modelled in lectures, practiced in tutorials (sometimes in small groups) and students did examples from textbooks. In tutorials students could do more complex problems as there is a tutor there to assist them, however, in exams, the questions tend to be more straightforward. Another approach is to teach students 'decision frameworks' the sort of steps that need to be gone through to make decisions. For example, 'you are the CEO of Qantas and Virgin has come into the market, should you fight a price war with them or not?' Students need to consider the options and which economic approaches might guide their decision-making. Thus

problem solving is the concrete expression of analysis. In short, in economics, critical thinking, analysis and problem solving are all expressions for the same activity.

8.3.3 Communication in economics

It was generally agreed that communication skills were very important but not taught in economics degrees. Economists remarked that communication is 'important but peripheral' or 'very important but we don't teach it' or 'undervalued in economics degrees'.

One economist stated that:

> The standard of written communication is very different from [other] departments where you would expect a much higher degree of written and oral communication. We discourage students from writing attractively in economics and the writing is very bland. Maybe that is all they need if they are going to write reports once they leave university.

Another, referring to oral communication suggested:

> When you talk to them individually they communicate well but I get the feeling that there is something missing. I get the feeling that there are large numbers for whom talking would be a completely foreign idea. Not just those in the bottom fifty percent. They would not want to talk about the subject of the lecture. They might want to talk about whether the lecturer was crappy but they would not sit over a cup of coffee and argue about economics…It is so much go with the flow.

Some economists used essays and gave students guidelines on writing and explained to them the importance of structure, answering the question, avoiding description and use of the literature. One person remarked:

> I had a few students come and see me about the essay. They were in fourth year and they had never written an essay. They wanted me to tell them how to write. I spent some time going through the basics.

One asked students to present their essay to the class to get feedback from the group but he pointed out that he had a very small class in a latter year elective subject and so this was possible.

Some oral communication was encouraged in tutorials, especially ones that were based around small group problem solving. Some used class presentations or group presentations, some used debates. Many remarked that it was very difficult to encourage students to speak in class since 'students don't want to talk, they hide'.

Communication skills were not taught, in part because the teaching of them would take time away from content and in part because most of the economists did not see it as their role and possibly also because they were unsure how to teach skills such as writing:

> Teaching communication is more indirect than direct. We have written assignments and debates but we are probably not providing a lot of training in terms of developing those skills. We are saying it is important and we assess it but unlike analysis or problem solving, where I think we provide training. With communication we provide opportunities to practise and we tell students that it is important. But we are not getting up and giving lectures on how to communicate.

8.4 Generic skills, disciplinary skills

Problem solving is the key generic skill in economics and is inseparable from the theoretical knowledge of the discipline since problem solving in economics is the use of the economic toolkit. It is the understanding and application of economic theory. More specifically, problem solving in economics can be understood as an application of economic theory to 'real world' issues. Critical thinking in economics is indistinguishable from problem solving in that it requires the understanding and ability to

use economic theory. Communication is not a significant part of the undergraduate curriculum. There is some use of writing in essays and assignments. The central features of problem solving, critical thinking and communication in economics are outlined in Table 5 below.

Table 5: Generic skills in economics

Generic skill or attribute	Economics
Problem solving	• Use of economic theory or 'tools' • Application of economic theory to practical or policy issues
Critical Thinking	• Understanding and appropriate use of economic theory
Communication	• Not the central form of assessment • Some essays and assignments

Although the economists agree in theory that generic skills are important, and identified critical thinking and communication as among the skills that are important, what critical thinking actually involves is largely a problem based use of economic tools. There is an inherent tension in economics between disciplinary knowledge and generic skills and with the exception of technical problem solving, these are considered to be separate and in conflict in undergraduate teaching. As a consequence the need to focus on teaching the technical skills becomes paramount. If we return to Barrie's (2006b) analysis, we can consider that for many of the teaching staff in economics, generic skills are seen as separate from the disciplinary knowledge, either as precursory or complementary skills rather than as aptitudes that are central to the scholarly knowledge in the discipline. Economics does not appear, from this study, to engage with critique, either from within or outside of the discipline. While some of participants in this study had begun their academic lives in other disciplines, no one characterised it as a discipline which drew extensively on or collaborated closely with other disciplinary areas. Where there was

movement it was people from other disciplines migrating into economics for pragmatic reasons as it is better funded than other areas. Those who were critical of the discipline considered themselves to be outsiders. Although like physics, a considerable amount of time must be devoted to teaching students the fundamentals, active criticism was not part of espoused theory.

Chapter Nine
Law

This chapter examines the data gathered from law. Like the earlier chapters it begins with an overview of the discipline. Following this there is a discussion of academic law from the perspective of the participants in this study and then an examination of the conceptualisation and teaching of generic skills. At the outset it is important to point out that this chapter is based on the reported perceptions of those in academic law rather than the perceptions of legal practitioners.

Some of the participants in the study went into law knowing from an early age that this was what they wanted to do. Most however, entered the field in a less determined manner, many because they enjoyed the humanities, politics and language but felt that a law degree or combined degree gave them more options. Some had practised as lawyers and then moved into academia, others had not practised. What they enjoyed was the currency, argumentation, the human element, the examination of the way the world works and the flexibility of law as an academic discipline. Many people pointed out that they were able to follow their research interests in a relatively unfettered way and that they could foster their interest in politics, history, philosophy or business in order to pursue research.

9.1 The disciplinary landscape

As a discipline, law has been the subject of much discussion both within the discipline and from outside (see for example Cownie, 2004). Law is an applied discipline in that it is focused on the application of legal theory or an examination of law in the form of statutes and cases and their interpretation, although there are sub-disciplines within law, in particular jurisprudence, that are pure in the sense that they are theoretical as opposed to applied, in the way that much of philosophy is. However, the law exists as a response

to practical social problems and the necessity of managing social relations. Further, most of the work of legal practitioners is in response to concrete legal issues. However, there is a distinction between the epistemology of practitioners and academic lawyers (Samuel, 2003). While practitioners are concerned with problem solving in a practical sense, the academic lawyer has the scope to be more concerned with theoretical, critical or philosophical issues.

As an academic discipline, there is little consensus regarding the epistemological foundations of law (Becher & Trowler, 2001). Some law academics take a positivist view, arguing that legal knowledge consists of normative propositions whose validity is not dependent upon the moral or social context in which they exist (Samuel, 2003). From this position, knowledge of the law is knowledge of this body of rules, irrespective of context. The two key assumptions here are that legal knowledge consists of rules and secondly, that these rules exist independently of social norms. In the common law system this body of rules is found in statutes and cases.

However, there are a number of critiques of this position. First, this body of rules must be interpreted, by judges and practicing lawyers and in commentaries and textbooks. This interpretation cannot be done without recourse to theory, to various understandings of language, analysis and so on. Thus the idea that language can provide a fixed meaning has been critiqued (Dworkin, 1985).

Samuel (2003) argues that the positivist stance cannot explain the reasoning process in which lawyers must engage. Instead law should be seen in a similar way to a laboratory experiment, in which the situations are controlled. As science creates abstract models that inform us about the physical world, so law creates models of the social world. Yet as with scientific models, these legal models are simplifications and abstractions.

A central feature of legal thinking is that it is schematic (Samuel, 2003). While laws may be enacted in response to particular problems, the lawyer interprets them as part of a coherent system. In order to make sense of this system lawyers categorise in various

ways, for example ideas of concepts such as 'contract', 'tort', 'property' and 'institutions'. Samuel then argues that ideas such as rights and interests can then be used as a framework for addressing problems. Thus legal thinking involves a pattern of legal systems and concepts. Bell (2004) gives the example of 'facts'. Lawyers may address a question by relating social information into legal categories. So a fact becomes a 'fact in law' through interpretation. An important aspect of law, according to Samuel is the use of taxonomies or the hierarchical relationship between categories. The example he gives is the idea that 'contracts' and 'torts' make more sense within the broader category of 'obligations' rather than as distinct fields. Thus ideas are systematised and interpreted rather than objective categories.

However, even within universities there will be a range of epistemologies from the black letter[28] specialists to legal philosophers and legal theorists. Legal epistemology merges into or is a formalised version of social science (Samuel, 2003). However, law is axiomatic in that there is a body of law (case and statute) which can be referred to. So law can be understood as a set of axioms or legal 'facts'. Legal interpretation can be understood as a 'science' in which the positive law emanates from the legislature. In this understanding, in order to find solutions to particular cases, one only needs to apply the rules to the facts in question. Or, on the other hand, law can also be understood as a model of interrelated, systematised rules and principles. In this case the rules are insufficient and one needs to explore the structures underpinning systems of legal thought. There are many critiques of positive law from areas such as Marxism, hermaneutics, critical theory and post-structuralism. Hence the epistemic culture of law leaves space for quite radical critique. While may not always translate into the professional area, law is a discipline which, in the academy at least, is able to examine the legal framework, social context and professional role from a number of perspectives. Whether or not legal practitioners choose to do this when faced with the immediacy of practical issues is another matter.

[28] Black letter law is the term used to describe the basic principles accepted by courts and/or embodied in statutes.

The law academics interviewed in this study identify law as a distinct discipline with a tradition, an identifiable content that has been generated by law-makers, courts and commentators. As a discipline it focuses on things that are peculiar to the law, which is what courts do, what legislatures do and how people interact with and are affected by the decisions of courts and legislatures. Law has a corpus, a body of text – the text of a judgement or legislation and any interaction regarding it and thus it has a tangible element. Law can be defined as a study of the law and legal system, which is a system based upon certain norms and the interpretation and application of those norms. The two main types of law central to the common law system (statutes passed by parliament and common law decided by judges in previous cases) means that a historical approach is very important in Australian law and lawyers need the ability to track a case back (sometimes hundreds of years) to the United Kingdom if necessary.

Another related and very important feature of law identified by the participants in the study is that it is always changing. The importance of this constant change is that lawyers need to continually update their knowledge at a relatively rapid pace and yet retain the old. Thus law is an evolving and dynamic discipline. Yet in other ways it is conservative because there is always the need to justify something against what has happened in the past. Another aspect of the law is that because it is both changing and closely tied to social and political life there are always contemporary issues and hence the participants in this study describe it as a very lively and topical discipline. The law academics talk of the impact of the law on the community, its ubiquitous nature in terms of governing our relationships, our interactions with governments, its all encompassing reach, its inescapable nature and immediate social impact. Further, the law gives rise to important practical, social, economic, political and philosophical questions and hence a study of law allows for deeper questions. One of the overriding themes in the discussions with the law academics was the human element in law. They argued that law is about how people interact with complex societal issues, competing political and economic concerns that are shaping what courts do, what legislatures do, how and where to allocate recourses, where sacrifices will be made. As one participant pointed out, this reflects what we value. Thus law is about rules and process but it is also, very importantly about norms and values.

Yet they acknowledge that amongst some of their colleagues there is also a belief that law is objective and about 'facts' rather than interpretation.

Lawyers and law academics need the skills of precision, ability to utilise source material, reasoning and interpretation skills. Precision in terms of words, concepts and arguments is highly valued. What lawyers must be able to do is to identify the issue and harness the arguments and do this by drawing on existing text, either legislation or case law. Yet on the other hand, because law is language based, precision is complex as words and phrases are open to multiple interpretations. Law is characterised by an emphasis on source material, the exercise of government authority, concern with governance, regulation, rules, power, accountability. For some, law is also about an examination of the exercise and structure of power. Lawyers need to be able to use reasoning and logic to develop an argument. In addition they need to be able to interpret, to write in a way that is persuasive and to do that within very technical rules. So they need the capacity to locate, interpret and advise. The key to this is to identify what the law is, how this is interpreted it and what implications that has.

Despite the importance of precision, law academics in the study also point out that in law there is 'a good deal of murkiness' and that often there is no single, clear answer. For example a four to three decision in the High Court suggests that there is some room for doubt[29]. There are also inconsistencies, for example something might be right in Victoria and yet wrong in New South Wales. Case law in particular is often ambiguous, open to multiple interpretations and reliant upon values as well as logic. There are controversial decisions, competing theories about norms. This ambiguity makes law interesting for those engaged in academic research (and some suggested that it makes it lucrative for those engaged in practice).

Law is normative and is essentially about justice (a vastly complex idea in itself). As one law academic explained, 'we are animated by the idea that society can be just'. However,

[29] The High Court of Australia is the final court of appeal. The full bench of the High Court is composed of seven judges. A four to three decision refers to four in favour, three against on a particular decision.

the complexity of the social world means that law also recognises the plurality of conceptions of justice and part of the business of law is having structures that allow that diversity to be expressed, contained and addressed.

There is some variation in the extent to which law is seen as distinct from other disciplines. Professional law is quite separate; practising lawyers require special qualifications, there are certain subjects that must be covered in order for students to be admitted to practise law in Australia. One participant referred to Bourdieu, arguing that law was a form of social capital in that information, principles, applications and strategies had been aggregated over time and segmented off by professionals in to an area which is less approachable to other groups. He argued that it had become a tool of a particular class, as opposed to something that ensures justice for all. Furthermore, he suggested it was naïve to think of it as simply a knowledge base. Yet he agreed that this position is perhaps not one shared by all his colleagues. He argued that in law the interest in precise definitions has become pedantic and has turned knowledge into social capital since there are some distinctions without real substance yet there is money attached to the distinction for both lawyer and client.

The professional nature of the degree means that there is a desire for law to mark itself off as distinct from other areas. However, in other ways law is closely connected to disciplines such as political science and sociology and this is a productive relationship as law is enriched by the methodologies and theoretical frameworks of other disciplines. Because law is interpreted by the participants of this study as interdisciplinary, the nearest neighbours varied depending upon the area of law. The law academics in the study suggested that if they were working in international law for example they would have more in common with someone in politics and international relations than with another lawyer in corporate law. So while law has its own technical ways of understanding and interpreting the law, and its own 'grammar of problem solving' this is seen to be only 'one slice of the truth'. Law is not seen as a 'watertight compartment'.
The participants agreed that there is little consensus about epistemology or methodology within academic law. One participant, when asked about the level of consensus

regarding methodology replied, 'Methodology? Count how many people in the building and multiply by two. There are as many methodologies as you can poke a stick at'. Within a law faculty, some people are concerned with black letter law, some with underlying structural issues, others with legal theory or philosophy. Some do case analysis and use methods similar to approaches in English literature, taking a text apart word by word, looking at images, sources of reason, implications. Some try to build overarching theory, others do comparative law, some consider marginalised groups and others are empiricists doing work that is indistinguishable from work done by sociologists. The academics in this study identified either themselves or their colleagues as coming from socialist, post-colonialist, critical theorist, Foucaultian, feminist, Lacanian perspectives as well as from traditional or 'old-fashioned' positions (depending on one's perspective). So law is 'complicated, ambiguous and unclear, there are uncertainties and room to manoeuvre'.

For most participants, the lack of consensus is not a problem within their law school, and the faculties allow people to follow their interests and a wide range of disciplinary research behaviour is seen as legitimate. Some suggest that there are some law schools that seriously cultivate having a balance of staff from a range of perspectives but that this is not a priority for law schools in Australia. They suggest that in the US there are many big law schools which have a wider range of agendas but they are privately funded and so can afford to employ people with a variety of views and the notion of intellectual and political difference is seen in a more positive light than it is in Australia. Other academics paint a somewhat different picture and claim that there are law schools in the US that are deeply divided between rival philosophical schools. A further group claim there is a good range of perspectives in Australian law schools.

A final aspect of law as a discipline is the concern with values. While the participants in the study acknowledge that there are members of the profession who are self interested or even corrupt, as a discipline there is a deep normative agenda and that a central concern is justice (however that is conceived). This is due the nature of the subject matter and because of the professional nature of the discipline.

9.2 The law curriculum

One important factor in the structure of the law curriculum is that the degree is governed by the Council of Legal Education which requires certain things of law schools, for example there are a number of subjects which law schools must teach and other subjects which students are required to do if they wish to practice. However, within this, law schools are free to organise their curriculum as they see fit.

The curriculum is not hierarchical or tightly sequenced. In fact much of the structure of the curriculum is as much a function of history as of deliberate pedagogy. Students in both universities do introductory first year subjects which cover the basic framework and history of the legal system, the basic concepts, tools of reasoning, the ways in which courts reason through a problem, the sorts of arguments that can be put to a court, the sorts of evidence and the techniques that are used. In latter years, subjects are sequenced in part on the basis of perceived difficulty, however, the law academics in this study argue that there is no particular reason why some subjects are taught before others and indeed in one of the universities, a curriculum review was actually considering this issue at the time these interviews were conducted. Since many students do law as part of combined degrees they do not necessarily do subjects in a particular order. Each subject is relatively discrete and the content is not sequential and in fact in one of the universities the graduate law degree has a completely different structure from the Bachelor of Laws (LLB).

A curriculum review at one of the universities is causing academics to consider whether students should begin with broader concepts and move to the particular or vice versa. This prompted discussions about how lawyers think in the 'real world'. As one person explained:

> Lawyers and law firms don't think in tort and contract categories, they approach a problem as a complex entity, categorise it and gradually get to the tort and contract answer.

This law school is considering a more problem based form of learning – not in the highly structured, all encompassing form used in medicine but a modified version.

At present, first year has a sharp focus on practical skills such as legal research skills so that in first year students learn how to find journal articles, statutes and case law on a particular issue. First year students learn to identify the legal principle and to consider some of the key debates in the discipline. By fourth or fifth year, the expectation is that students are much more confident in identifying key issues and hence more sophisticated in their analysis.

9.3 Generic skills in law

As with other disciplines there is an ongoing tension between content and skills. As one person remarked, 'you want to teach skills but you get bogged down in content'.
It is acknowledged that too much content is 'silly'. As one law academic points out:

> In first year they learn about negligence but by the time they finish it will have changed. Anyone who would look at their old notes to figure out what to do about a certain problem is mad. Things change. But we still feel uncomfortable not teaching yet another case.

The law academics argue that an understanding of the law is inextricably linked with the ability to analyse and think critically about it. Students need to understand the legal system and the methods of the system in order to answer legal problems. However, what is important is that they are equipped with the skills to do this no matter where they may be in the future and regardless of changes in the law. Thus an understanding of systems, processes and principles is crucial. However:

> The big picture is sometimes best taught through the particular. Students' knowledge should not be static but should be a combination of reasoning abilities and knowledge that equip them to deal with the law as it changes into the future.

Another recurring theme from interviews with academics at both universities is that students should be able to recognise and accept the complexity and uncertainty of the law. The notion that there is no absolute answer is something which undergraduates often struggled with. The uncertainty combined with the vast amount of material means that it is essential for students to identify the relevant issue, work out which issues were resolved and which unresolved, be able to harness the pertinent arguments and have a thesis which supports their selection. This requires an integration of knowledge and skill.

Another broad aim of the law academics is that students have a social perspective. This is expressed as a sense of responsibility, having their consciousnesses raised or an understanding of questions of justice, public policy, philosophic questions about the relationship between law and justice and an understanding of where law fits into and impacts upon society. This is engendered through challenging assumptions, questioning a black and white worldview and examining what is important.

9.3.1 Critical thinking in law

There are five ways in which critical thinking is conceived: as argument evaluation, challenging assumptions, consideration of the social context, examination of law as a profession and thinking creatively. These are not separated hierarchically but for ease of analysis and the assumption underlying this separation is that these notions are actually interconnected.

The first form of critical thinking, argument evaluation is understood as the application of information, developing an argument, examining an argument or solving a problem. This involves 'going beyond the what to the why' as one person expressed it. This means examining the following:

- Where something comes from;
- Whether is it consistent;
- Whether it is logical;
- Whether it is well founded;
- What the evidence is;

- What the assumptions are and where the assumptions come from;
- Whether the assumptions are articulated;
- Whether they are consistent;
- The implications of the argument.

Taking this one step further, critical thinking also requires one not to accept something for what it claims to be but to examine the underpinnings, be they normative, ideological or philosophical and to examine what has been left unsaid.

Secondly, critical thinking involves challenging assumptions, thinking outside traditional boundaries, questioning received wisdom, challenging the status quo or the social structure. The law academics acknowledge that law tends to be a conservative profession but suggest that there is no need for them to be conservative as there is plenty of time for students to be inculcated into this aspect of their profession once they start working and that it is their responsibility to introduce a deeper level of critical thought to students.

The next dimension of critical thinking is seeing law in its policy and social context. This means exploring where the law was unjust or not operating efficiently or causing great public inconvenience or expense. This is seen as an important aspect of law since the basis of law is its social function.

Critical thinking also means carefully examining the legal profession, thinking about one's individual and the profession's responsibility to clients and to society. This involves consideration of ethical questions and the role of the profession.

Finally critical thinking in law involves thinking creatively, pushing the boundaries, taking what you know and applying it in different ways or doing sophisticated things with what is known or applying it in different ways. Critical thinking and creativity are linked because understanding, challenging and application of legal principles should ideally be linked. However, creativity is not seen as easy to teach.

Critical thinking is taught in a number of ways. It is modelled by teaching staff, encouraged through discussion in class, practiced using small group exercises in the seminar or tutorial groups and then executed in assignments and research essays. One of the coordinators of an introductory first year subject said that her subject was designed to introduce the dominant narratives of our legal history and philosophical tradition. The subject then explored counter histories (for example by problematising the white history of Australia). The class then examined law through a range of critiques, such as realism, feminism, Marxism and post-modernism. She suggested that students began with a blind faith in the system and academic staff spent the year knocking that down:

> The students are unimpressed at first, it is about unsettling everything, it is messy, chaotic and they are being taught in other subjects about the need for order but by the end not a single one is batting for the traditional view of anything.

Another idea which is emphasised, particularly in first year is that when studying cases, someone's edited version of a sixty-page case (either the teacher or another scholar) was an interpretation, there had been editorial choice and so it was sometimes important to go back to the full case. As one person said, 'I remind them about the dot dot dots and what they actually mean' and so the role of interpretation is emphasised.

Critical thinking is modelled in class. Law academics show students how to question by taking a piece of conventional wisdom and demonstrating how it does not stand up to scrutiny. All suggest that it is very important for students to see that their teachers are prepared to criticise judgements or styles of reasoning and encourage students not to be too in awe of, for example the High Court but to examine a decision on its merits. Many argue that it is important for students to learn to challenge their teachers but that this is difficult in larger classes as to do this there needs to be a certain level of trust and rapport. However, the participants in this study strongly agree that it is important for students to be able to challenge their teacher's interpretation. One participant said that she is very wary of giving her opinion too strongly as it became 'the' opinion and instead she wants students to formulate their own.

Critical thinking is taught by giving students class exercises that encourage discussion. However, those interviewed suggested that the best way in which critical thinking can be practiced and assessed is through writing tasks, in particular research essays. This is done, for example, by evaluating a case on its merits, finding which legal principles are relevant, finding recent material, examining the implications of the decision, which stakeholders are affected by the decision and whether that is appropriate. Others give tasks that encourage students to see that there are many contentious issues created by the law. Students are then required to engage in these critical debates.

Critical thinking and analysis are understood as being very closely related, with analysis being the questions one asks which form the grounding for critical thinking. In other words it is the mechanism by which critical thinking (as a broader idea) occurs. Analysis has a number of elements. Primarily it is how to read a case or a statute and usually begins by considering what the legal principal is. Analysis also requires an understanding of the ways the legal system is constantly evolving and so it is essential to have an understanding of the history behind the law as what now constitutes the law depends upon what has happened previously. In addition analysis involves exploring ambiguity and interrogating an issue to determine what is obviously unclear and what is potentially unclear.

In short, for the academics interviewed who teach undergraduate law, analysis is the questions that one asks of a text. Good analysis involves a series of nested layers. One participant outlined the process of analysis as he sees it:

1. What rule comes out of this text?
2. Where does this text come from, what does it mean, what are its implications, where might it go in the future, is it right or wrong, is it well supported in policy, well supported in history, well supported in its practical outcomes, if not why?
3. What is the basis of that critique, what are your assumptions, for example that the world is full of hyper-rational economic actors or that the world needs to be fair.
4. Why are you adopting that stance?

Since reading cases is a fundamental legal skill, teaching analysis usually begins by teaching students how to determine how judgements are set up, what are the facts, what is the legal issue, how previous cases have been used. One first year teacher gives students an assignment that provides a model for the questions that they should ask every time they consider a case. These questions are:

1. Who decided the case and when was it decided, what were the facts and what was the result?
2. What did the judges rely on in reaching their decision?
3. What are the implications (for example is this consistent or practical)?

Analysis is seen as moving step by step into deeper levels of understanding and thus there is a clear relationship between knowledge and skill. Analysis also involves teaching students to understand why they are reading a case, for example for the evolution of a principle or to see what the principle was at that time. It also involves teaching students to examine something by categorising. For teachers of first year subjects, analysis requires teaching students to navigate their way through the language of statutes which one person describes as 'just awful' but is the first step in being able to understand the full structure and statutory interpretation. For others, analysis is taught by starting with the big themes and motivating questions and using them as organising principles. Law academics aim to be explicit about the principles that are inherent in an issue and point out to students, for example, 'here is another example of rule of law, remember we have seen six of those already, look what it is doing here, remember how the others were different'.

One law academic suggested that students do not like the ambiguity that he felt is inherent in law, 'they want clarity, they want a set of bullet points, they want to know exactly where to find information'. He realised that his notes were getting more and more elaborate and he was providing more detailed information and as a consequence students were starting to see his notes as 'the answer' and were becoming more passive in their learning. Recently he has stripped his notes right back in an attempt to create an environment in which students are more autonomous and more analytical.

Analytical skills are assessed as an integral part of content assessment. Students are given a range of tasks depending upon the subject and year level. These include analysis of full decisions as well as edited versions. First year students identify the material facts, the legal issue, judicial reasoning, underlying principle, give an opinion. Another example of a task involves a case that the High Court is considering. Students read the original case, examine transcripts on the appeal proceedings, look at journal articles, what the court has said in its reasoning, provide a critique and 'sensible speculation' which draws on previous reasoning. Other assignments that are popular with law academics at both universities are research essays, which provide the opportunity to reflect on broader issues. Exams are often a mix of problem and essay type questions.

9.3.2 Problem solving in law

Participants in the study describe problem solving as 'classic law school stuff' and students are exposed to hypothetical problems from the very first day. Problem solving is understood as providing imaginary real life issues which test knowledge of the law, methods of reasoning and interpretation, in other words, the skills that a competent lawyer would be expected to have in order to give a clear answer to a client and to explain what is clear and what is not. So problem solving has an applied focus. Again, it is very closely related to critical thinking and analysis and is the more structured or outcome focused application of these skills. One participant identified what he refers to as a 'grammar of problem solving in law'. This is based on the two important elements of law, rules and facts. Thus being able to solve problems in law involves reading the source material (statutes and cases), drawing the rules out of that source material, understanding the structure of that material. He suggested that the first year of a law degree drew students attention to that 'grammar' and then the next stage explores the relationship between rules and facts, learning to distinguish important from unimportant facts, comparing the facts you have with the facts from the case from which the rule derives. Additionally students learn about the sentence structure which judges or commentators use, the logic, when they use reason based on rules, how they construct an argument from historical information or authority or policy.

In some subjects tutorials are structured around problem solving and students do problems in small groups. In others, problems are done as part of assignments and form the basis of exams. One participant said that he aims for his problem questions to develop through the semester so that students moved towards multi-issue questions.

9.3.3 Communication in law

The law academics agree that communication skills are very important, regardless of the career pathway once the student left university. All are certain that writing skills are very important and only one is uncertain about the importance of oral communication skills (he suggested that it was important but that the over emphasis of the public or performance aspects of oral communication could cause students much distress). However, while communication is considered important, the law academics acknowledge that it is not particularly well taught. Students are either left to acquire the skills by trial and error or assumed to possess them despite evidence to the contrary.

Essays are considered to be a good formative assessment tool for critical thinking and writing skills. Yet essays are not used in all subjects as marking essays takes a huge amount of time and some academics argue that they are under-staffed and under-resourced and so it is not practical to have essays in large classes. Some staff make the mid-semester essay optional and so reduce marking pressure but this means that only a proportion of the students then gain the benefits from researching and writing, usually those who self-identify as confident writers.

Some participants are concerned that it is possible to get through a law degree with very little extended writing. Others argue that students do quite a lot of writing but it is not done well and that it is necessary to devise ways of teaching persuasive writing. All acknowledge that while writing is a vital skill for law graduates as law is all about language, it is not something that they taught or knew how to teach and many said they assume that students come to university knowing how to write even though their writing is ‘simply appalling’. Some participants in the study provide students with essay guidelines, some discuss the structure of an essay with students before it is handed in, and

one of the law schools has employed someone to work with students on their writing. Yet the central way in which students learn to write is simply by doing it and receiving feedback on their essays.

Teaching oral communication is also problematic. As classes become larger it becomes more and more difficult to provide students with opportunities for learning speaking skills. In one of the first year subjects they used to have an oral participation mark but it was dropped because the large classes mean there is too much pressure on students, on academics and too much time pressure on everyone. Law academics argued that students do not like giving oral presentations in large classes or being graded on their level of participation because some do not feel comfortable speaking in large groups. In addition, in large classes it is difficult to find the time to enable all students to contribute. In latter years much of the opportunity which students have to develop oral communication skills is through the law students' society or association and hence not part of formal assessment. Tasks such as mooting[30] which used to be part of the assessment are now run by the law students' society as are competitions on negotiating, interviewing, client advice. In some subjects there are optional presentations of papers – one law academic with a very small class runs negotiations as part of assessment. Teaching staff encourage pair and small group work in class and whole class discussion but they acknowledge that in larger classes discussion usually only involves a small percentage of the class.

9.4 Espoused theory and theory-in-use

Like the other disciplines investigated in this study, although the generic skills identified are perceived as important, the difficulty in teaching them is acknowledged. As several people point out, it is difficult to teach skills without assessment and the assessment of complex skills such as critical thinking is problematic. While exams are a satisfactory way of assessing problem solving, they do not assess critical thinking well – they do not give time for research or reflection and it is difficult to come up with questions that test critical skills that students could not guess in advance. Essays are seen as a much better

[30] Mooting or a moot court is an activity in law schools in which participants take part in a simulated court.

way of both teaching and assessing critical thinking yet there are practical problems associated with marking large numbers of essays with limited staff time.

Another problem identified by some of the law academics is that students are assessment-driven and so are only interested in material that is going to be 'on the exam'. Unless critical thinking can be overtly tested, it is argued that students see presenting too much critical material in class as a waste of time and are resistant to it. Some law academics felt that students are very passive and wait for the teacher to provide the answer. As one person commented:

> Getting [students] to focus on the problem rather than the answer would be nice. In a perfect world they would love problems and think the answers were secondary but it doesn't really work like that. I want to teach them the value of the question, to revel in the question, to play. That is so important but hard to do, really really hard to do, to get them off the sample answer, that there has to be a right answer. They don't like ambiguity.

She told a joke about law students (told to her by a student), 'How many law students does it take to change a light bulb? None, it is not on the exam'. However, she did then wonder whether in fact all students were like that, regardless of discipline. While it is important to have the ability to solve problems laterally and across boundaries, the silo nature of the subjects worked against this, as did large classes, time-pressured academic staff and also, possibly the changing student population and the meaning to them of a university education.

9.5 Skills in a professional context

There is little consensus regarding the centrality of professional skills in law. Some participants argue that law is increasingly a generalist degree and while most students wish to be admitted to practise law, only around fifty percent actually go into traditional legal practice. Certain subjects in the law degree are identified as compulsory professional subjects. The generalist aspect of a law degree is seen by many law

academics in this study as positive and means that it is crucial to give students a broad base and to enable them to understand law within the context of society since many will go on to work in other fields. As one person remarked:

> I am not teaching them for a career, I am teaching either someone who is curious about comparing legal systems, who is curious about law and its wider ramifications and who may not end up in practice, or they might end up in practice internationally or in another jurisdiction.

Even those who argue that law is principally a professional degree maintain that it is important to give students as broad an understanding of the profession as possible. As one person said:

> [Once they join a law firm] they quickly become enculturated into the ethos of their particular branch of the profession. The law has historically been very conservative politically and socially as well as legally but we are not in the business of imparting that to students.

In contrast, others view the professional goal of a law degree as critical. As one person argued:

> The professional nature of the degree pervades everything. Our primary obligation is to teach good professional lawyers and so the bottom line for me is can I responsibly pass this student, given that they will eventually be out there in the world with the potential to screw up people's lives if they are not competent professionals. So there is a moral responsibility that perhaps teachers of philosophy don't have because if they graduate bad philosophers, I don't think anyone is going to suffer.

This moral responsibility means that law academics teach professional and social ethics, an understanding of what it means to be a professional and the responsibility this entails. One law academic argued that the notion of professionalism is contested and that the

legal profession has done much to damage its own reputation. However, he maintained that professions are one of the last remaining institutions in society that retain any credibility and so it is important that students learn the responsibility that being a professional entails. Professional responsibility involves self-regulation in addition to being aware of the trust clients place in lawyers. Further, professional responsibility requires an awareness of the place of the law in society, awareness of issues of social justice and access to justice and the ways in which it fails some people. Self-regulation is important but it is equally important to examine how professions decide what conforming behaviour entails. A number of law academics point out that they are very cautious about making their students conform to very narrow conceptions of what studying law or being a lawyer entails.

In terms of generic skills, those skills that are directly related to law as a profession are both practical and attitudinal. Thus it is difficult to know whether the attitudes are in fact 'skills' although they are identified as generic skills in discussion with the academics. Discussion of ethics is overt as part of law subjects and is built into the structure of the curriculum. For example, in first year, students in both universities are taught about plagiarism and this is used as an example of the importance of honesty both in their academic lives and their professional careers. One law academic said that she felt that students have a somewhat 'fluid' sense of morality. She talks to students about not stealing from the library, not hiding books in the stairwell, not razoring out the important sections. She said that she relates this to their responsibilities as future professionals and points out to students that the Supreme Court of Queensland refused to admit anyone to the bar who had plagiarism on their record. She said that she felt that students have a good understanding of this, but are less clear about broader notions of honesty. One first year subject devotes two weeks to professional ethics that encourages students to examine issues that are current and controversial.

The professional aspect of the degree is introduced in different ways at the two universities. At one university, the participants describe the degree as reasonably general until fourth and fifth year. At the other, students are taught professional skills using

simulations from first year. These are hypotheticals which students work through in law firm teams. In fourth year students have the option of participating in the clinical program, which is a double credit subject and students spend time working in a legal centre run by the university. Students are assessed for their understanding of client needs, their technical proficiency, understanding of strategy, their ability to negotiate with other lawyers, whether they get the outcome that the client is satisfied with, their performance in court (clarity of diction, logical nature of argument, rapport with magistrate, appearance of sincerity). A lot of emphasis is placed on the relationship which they have with the client. Thus many of the generic skills identified as important in a law degree are part of the practical experience and assessment of the students in the clinical program.

9.6 Generic skills, disciplinary skills

Critical thinking and problem solving are closely interconnected in law and problem solving, in many cases, is a more practical or outcomes based manifestation of critical thinking. Critical thinking includes the evaluation of an argument, its evidence and logic; an evaluation of assumptions; careful consideration of social context and implications; and examination of the role of the professional and, for some, creative thinking that enables new theorising. Problem solving is the systematic approach to real or hypothetical legal problems using critical thinking as well as a clear understanding of legal principles and conventions. For some, problem solving also includes professional and ethical considerations such as dealing with clients. Communication, although considered important, is implicit. The central features of problem solving, critical thinking and communication in law are outlined in Table 6 below.

Law has some of the interpretive flexibility of history, but within a much more constrained, systematised framework. In addition, the interpretation of law is more formalised. Students spend a great deal of time understanding the organising principles of law, the basic concepts and the rules of interpretation. Generic skills are embedded within this, in particular problem solving and critical/analytic thinking.

Table 6: Generic skills in law

Generic skill or attribute	Law
Problem solving	• Closely related to critical thinking • Responding to hypothetical or 'real world' problems • Concerned with outcomes and application • Some concern with professional skills such as dealing with clients
Critical thinking	• Examination of argument, evidence, logic • Examination of assumptions • Awareness of social context • Awareness of ethical issues • Creative thinking • Questioning of received wisdom
Communication	• Written – essays and assignments • Oral communication is considered important but is not systematically included in teaching or assessment

The law academics interviewed in this study conceptualise knowledge as open to multiple interpretations rather than discovered through an objective process. Thus skills such as problem solving analysis and critical thinking are important parts of understanding the complexity of law and its social and professional context and in developing the skills of interpretation. Because the epistemology of law is multiple and interpretative, the ways in which generic skills are understood are also multiple. Knowing about the law and thinking critically about the law are inextricably linked. Critical and analytical thinking is an essential part of thinking about the law and solving legal problems. Law is a

dynamic and ever changing field and one which impacts upon almost every area of life. Legal problem solving and analysis requires students to be adept at the identification of basic principles, the examination of evidence and reasoning and in the construction of an argument within the technical conventions of the field. Yet in addition to this there is a strong sense that students are exposed to subjects that require them to examine the social and political context of law and the assumptions underpinning the discipline and the practice of professionals.

Chapter Ten
Medicine

This is the final chapter that presents and analyses the data for this study. The discipline considered here is medicine. The chapter begins with the overview of the discipline and it then presents participants' perceptions of their discipline. Next the chapter considers medicine as a profession and then considers the issue of medical education from the perspective of the participants. Finally the chapter examines the issue of generic skills and attributes in medicine.

Many doctors in this study entered the profession because they had a parent who was a doctor and so they had been exposed to the culture from an early age. One person remembered going on rounds with her father, especially at Christmas time. Another, from a medical family, remembered operating on the soap in the bath as a very small child. Medicine attracted people because of its scientific nature, because it was mobile, flexible and diverse and because it offered autonomy. Participants refer to the importance of the 'people side' of medicine, the opportunity to be part of a professional community, the ability to help people and the intimacy with people's lives. The enthusiasm for medicine as a career was palpable, participants referring to it with enthusiasm as a 'wonderful career' and that they did not regret the decision to become doctors, despite sacrifices in terms of time and hard work and early doubts in medical school for some. Most of the doctors in this study almost sparkled when discussing medicine. Although they were critical of much about their profession and critical of medical education (perhaps more so than many of the other academics in this study) they are animated, confident and clearly absorbed by their profession and by the education of their students.

10.1 The disciplinary landscape

Medicine is a discipline with a highly complex epistemology. While the dominant perspective is biomedical science, medicine comprises elements of the social sciences. Its complexity lies in the interrelationship between science and clinical practice, in the push for evidence and rigour combined with the uncertainties and human focus of practice. The epistemology of medicine has four interwoven, connected and at times competing elements, first, the scientific, secondly, the psychosocial, thirdly, the moral or normative and fourthly the professional.

The scientific perspective is one which has been important, at least for the last hundred years and the current move to evidence based medicine (EMB) has strengthened the push towards an emphasis on clinical trials. Evidence based medicine encourages practitioners to draw on rigorous studies rather than rely on anecdotal experience and to be more reflective regarding treatment. Evidence based medicine was a response to the growing awareness in the profession that much of medicine was based on belief rather than evidence and that there were many examples of procedures that were accepted before there was adequate evidence. As a consequence, practitioners are now encouraged to consider a hierarchy of sources with randomised control trials at the top, observational or non-randomised studies considered next and anecdotal evidence last. However, while evidence based medicine is important, it may not have fundamentally changed the epistemology of medicine (Noah, 2002). There are a number of reasons for this, not the least being the dubious nature of some of the evidence, the fact that cultural change happens slowly and that it is difficult for practitioners to keep up-to-date with the research (Noah 2002). A further consideration is that medicine is more complex than controlled research trials. While bioscience can provide an important basis for medicine it is only the start. As Tauber (2005) points out, the laboratory finding or anatomical description is only the beginning of building integrated clinical practice.

The question of the relationship between medicine and science is a complex one. Harari (2001) points to the inadequacies of empiricism as a scientific foundation for evidence based medicine as it does not consider the complexities of medicine and offers a very

naïve model of science. He argues instead for a more intellectually flexible tolerance of ambiguity and a willingness to obtain information from differing viewpoints and conceptual levels.

Hence, the growing importance of clinical science has been accompanied by a growing awareness (at least amongst practitioners) of the psychosocial. While evidence based medicine has sought certainties, it has also highlighted the uncertainties. As Noah (2002) suggests, in medicine, uncertainty is both 'inevitable and disquieting'. These uncertainties are found in the inability of the practitioner to 'know' everything, the gaps in disciplinary knowledge, failures in technology, the individuality of disease and the importance of the psychosocial context. In addition, technology levels, increased patient autonomy and change in attitudes towards the doctor as the infallible source of all knowledge has meant that the patient has moved to a more central position in the doctor-patient relationship.

This tension between the increasing emphasis on evidence and the awareness of uncertainty and needs of the patient is heightened by an awareness of the contingent nature of 'facts'. If medicine once rode upon positivist confidence (and that in itself is not certain), it is now more difficult to do so. There is an awareness, if at times a grudging admission, of the position much discussed in philosophy of science that the notion of objective 'facts' is a complex one as facts require theory, hypothesis building, sorting, selection and interpretation. Medicine has constructions of health and disease which require levels of complexity and abstraction beyond those of the biological sciences. They are not givens but reflect the relationship between scientific interpretation and socially constructed reality (Harari, 2001). Muir Gray (1999) argues that medicine currently straddles the modernist optimism about objective truths and post-modern scepticism.

The fact that medicine is a profession with a high level of responsibility makes this epistemological angst more acute. Doctors are under pressure legally, socially and

professionally to defend their decisions, to be accountable and are punishable in the case of failure.

While medicine has a very important scientific element, the moral dimension of medical epistemology is very important. What one does as a practitioner (or even a pure researcher) is understood very much in terms of what one should do as well as what one can do. And what one should do is intensely complex. So issues of money, quality of life, patient as human being, patient choice and so on impact on decisions as much as evidence from clinical trials or knowledge about disease. Tauber (2005:42) argues that medicine has a 'relaxed view of objectivity' that arises from the importance of individual judgement and the individuality of disease expression. This in combination with clinical care, which must incorporate judgements about patients' social and psychological realm means that medicine has (or should have) a bio-psychosocial understanding of knowledge.

Another important dimension of medical epistemology could be termed the 'cultural'. Medicine has a powerful socialisation and enculturation process and a strong professional identity and this shapes the ways in which knowledge is understood. Medicine has a high social status and people attach symbolic importance to the therapeutic relationship (Marshall, 1997) and although prominent cases (such as the Shipman case in the UK and Patel in Australia) influence public opinion, doctors are still viewed with respect. This social position, combined with a professional culture that emphasises the importance of individualism and the strength of individual clinical decision making (even since the rise of evidence based medicine) has meant that the notion that 'the doctor is always right' both from the perspective of the patient and the doctor him/herself is still powerful (Marshall 1997, Noah 2002). Marshall (1997) argues that the dominance of evidence based or 'scientific' medicine poses a challenge to the professional culture of medicine which is based on a 'person culture'. He suggests that in the traditional culture of medicine, knowledge is identified with individuals or experts and epistemic power is vested in status or charismatic authority. Evidence based medicine challenges this, as the

evidence is accessible to all practitioners, to students and to the general public, shifting the power relationship.

Medicine has been described as both a science and an art. As Harari (2001:725) states: 'It is the doctor's burden to leave certainty behind; the art of medicine rather than its science is the means to resolve the inconsistencies and unpredictability of clinical reality.' Medical epistemology is a highly complex relationship of action, knowledge, purpose, ethics, contingency, risk and skill (Squires, 2002; 2005).

This is echoed by the medical academics[31] in this study, who refer to medicine as an interaction between science and art, but that this interaction is in different balance depending upon the specialty. While it is a very disparate discipline, macro discipline or family of disciplines, most participants from medicine argue very strongly that there is something quite distinct, though intangible which unifies it. The primary focus is on health, as medical practitioners are concerned with some aspect of organic or mental health and in trying to help the patient (directly in clinical practice, or indirectly in either teaching or research). Thus the applied or clinical nature of the profession is a unifying feature. Moreover, the culture of medicine is very powerful. The education of medical students is a strong socialisation process and is a pathway through which all students pass. Medical faculties are relatively small, students know each other, are treated as a group, do a common course and their enculturation and values-based education is overt. Students have a body of knowledge in common and a shared hospital experience.

Most participants in this study argue strongly that medicine is a discipline, however, one person questioned the very idea of disciplines, arguing that 'any barrier between disciplines is really just a construct in our minds, we should be looking for interconnections'. Another argued strongly that medicine was not a discipline but a 'minestrone soup'. He tells a joke:

[31] While most of the participants were clinical practitioners, two were originally from non-medical backgrounds but were chosen for their pivotal role in medical education in their respective faculties.

> What is the difference between medicine and minestrone soup? One is a whole lot of bits and pieces all chopped up, served up in a broth of indeterminate nutritional value in no particular order and with no particular recipe. The other comes in a can.

All acknowledge that the specialties are very different, with distinct knowledge and cultures and that now with the explosion of medical knowledge it is impossible for one person to encompass the entire knowledge base. Yet despite this there is a strong sense of unity within the medical profession.

There is some disagreement regarding the characteristics of medicine as a discipline. Some of the medical academics argue that it is essentially a biomedical science and is underpinned by strong science, others question the scientific nature of medicine, suggesting that while there is a scientific element to medicine, this is not the entirety and that evidence based medicine has some flaws, 'medicine has to be based in science, on evidence and if something works it has to be demonstrated that it works. But some of the evidence is pretty suspect'. Others argue that even with evidence based medicine there are things that are done with little strong evidence or even contrary evidence and much of medical practice is just 'what seems like a good idea at the time'. For some in the study the psychosocial is key:

> Only half of a particular outcome of any illness relates to things we understand, the other half relates to the psychosocial context. If you are not thoughtful in that context, you are not a very good doctor.

Thus the essential features of medicine are the biomedical knowledge, communication skills, the human contact[32], the interaction between the doctor, patient and the environment, the importance of the service role. For most of the participants in this study, medicine is an interaction between biomedical knowledge, clinical skills, therapeutic reasoning, an understanding of human interaction and the social context.

[32] They pointed out that some (for example those in pathology, radiology and in some cases surgery) were able to divorce themselves from this. It is worth noting, however, that pathologists and radiologists were not represented in this study, although surgeons were.

The participants commented that the idea of a doctor is changing in both positive and negative ways. Modern medicine is much more holistic and patient-centred, the idea of the all-knowing, all-seeing 'doctor as deity' is changing to health care that is much more inclusive of the patient and less hierarchical. There is an interesting tension between the shift towards evidence based medicine, which has meant a greater push towards the basic sciences and at the same time an emphasis in education towards the person-centred. Yet while there is a growing vitality in both the 'art' and the 'science' of medicine, other things are being lost. There is a strong sense of nostalgia for an older, more selfless profession. The old ethic of paying your dues and self-sacrifice were moving towards what one doctor characterised as 'we want life, we want balance, we don't want to work too hard but we still want to be paid a lot'. Medicine is increasingly moving towards a business model and health is often part of the 'illness industry', which is regretted by the participants.

The Hippocratic oath (which begins 'first do no harm') is referred to by the participants in this study as important, if problematic. It is important because doing good rather than harm, both to individual patients and to the broader community is important, yet it is acknowledged that much of medicine did in fact cause some harm (either directly or indirectly), for example breaking bad news, the side effects and complications of treatment, the uncertainties regarding costs and benefits (for example HRT), difficult questions regarding the treatment of the elderly and neonatal. Time constraints and the business model into which medicine is moving, the ways in which research, government and pharmaceutical money is allocated and questions of utility mean that 'do no harm' is an inherently difficult ideal.

Yet patients inspire great enthusiasm from the medical practitioners in this study. One referred to the 'immediacy' of the patients, another remarked:

> Medicine is so central to people's lives, I love being able to help people and have people say that I have really made a difference. Forget the money, that is what really makes my day, seeing people get better.

Yet another says:

> It is the most unbelievably privileged career, and not the financial privilege, not the community esteem it is just the incredible privilege of being involved in people's lives and making a difference, the feedback you get from patients is extraordinary.

For some it is the combination of the human and the problem solving:

> I still love my patients, it is fascinating, I love the problem solving, the mysteries of it. I love looking at new studies and learning new things and if something comes up with one of my patients I will look up the best things to do if I am not sure.

The issue of consensus is interesting, given the diverse cultures of medicine. The participants argue that the cultures of the sub-specialties are quite distinct, the culture of radiology, for example, is characterised as 'rich and uninterested' all about technology, money and lifestyle, whereas the culture of paediatrics is about child advocacy and is 'warm and fuzzy', while psychiatrists are 'thoughtful but time limited', the surgeons are hierarchical and 'rode in on their horse to fix things', and physicians and general practitioners are holistic. They acknowledge that it is easy to stereotype but that people tend to specialise because they enjoy the culture of the particular specialty. There are cultural clashes both between specialties and between ways of viewing knowledge. As one person explained:

> The biomedical sciences have a way of thinking about things that comes back to the physical process, what you can see down a microscope or measure in a test-tube. This is valid within its scope but then there are the psychological sciences, the social sciences, different ways of seeing and experiencing the world. You need to look at research that connects psychology with immunology or cardiology and see the interconnections rather than competing forms of knowledge. But ideologically there are some significant hurdles… it takes generations for thinking to change.

Thus medicine is comprised of a powerful sense of 'medical' cohesion and yet contains cultural diversity, differing knowledge and skill systems and some antagonism between the specialties.

The boundaries between medicine and other disciplines are both loose and very tight. Professionally medicine is protectionist and guards its territory very fiercely and yet medicine has very close links with the biological and biomedical sciences. In terms of practice and clinical skills there are also close links with other health professionals and in countries such as the UK with the advent of nurse practitioners this is loosening still further. Increasingly doctors are working in interdisciplinary teams that include not only other medical practitioners but other health professionals.

10.2 Medicine as a profession

The identity of medicine as a discipline is tied to professional and clinical identity rather than as a body of researchers. While some of the doctors teaching in universities are involved in research, this is not always the case and many do not have higher degrees. For many their role is as clinicians first, educators second and researchers a possible third. This is not to say that research does not occur, but that for the participants in this study it is not central, in the way it is for participants in other disciplines. Thus the professional role is key to an understanding of the discipline.

The participants in this study appear to have given a great deal of thought to the professional aspects of their discipline. This is due to the internal cultural strength and the external pressures for accountability. All taught students with the view that they would be professionals with a high level of responsibility, both practical and moral. Participants also discussed the changing nature of medicine and what that means for notions of professionality. Doctors have a unique range of skills and knowledge which entails a level of privilege and self-regulation but also gives doctors a number of societal responsibilities. However, these responsibilities are reducing with the advent of a harder business model of medicine. Thus things such as social good and altruism, which had

been important in the past, are receding. Responsibilities such as honesty, trustworthiness, fitness to practice, confidentiality, privacy, recognising boundaries and the importance of the therapeutic relationship remain important. These are attributes that are valued by all but the 'mad and the bad'. Yet the change in the importance of social good is regretted. As one person remarked:

> We have lost sight of the difference between a profession and a job. There is the ability to self regulate and make choices and function independently within an area of expertise. That also entails a duty of care – not only for yourself but for patients and colleagues. People forget about this.

Another commented that 'sometimes people forget that it is a service position; for some it is about position, power and money or solving problems and being right all the time'. Or in a similar way, another medical academic pointed out that:

> Medicine is essentially about service, it is not about self-aggrandisement. We need to recognise and follow through and think about what that entails. It isn't always about doing what someone else wants you to do, it isn't about wiping yourself out in the pursuit of serving people but I think you have to be able to think about the part you have played, the consequences, to look at the bigger picture.

10.3 Medical education

Medical education has undergone a fundamental change in the last few years, with the move to problem based learning in many schools. In the past students did a preclinical period (usually three years in Australia) in which subjects such as anatomy, physiology, biochemistry were entirely separate from each other and usually taught in a formal lecture/tutorial/laboratory mode. Following this, students did another three years in a hospital setting, often on rotation within different specialties. This has now changed to a problem based curriculum, which will be discussed in detail in the following section.

The participants interviewed for this study demonstrate a high level of interest in education and in the strengths and weaknesses of their system. This is probably a result of a combination of factors, including the drastic changes in medical education, the characteristics of the people who were chosen to be part of this study, money allocated to medical education (each of the faculties in this study have an influential medical education unit) the strong culture of the discipline, the unified nature of the curriculum, the emphasis on practice rather than research, the professional responsibilities and the need to report to a medical education body.

The current medical courses in both universities used in this study aim for integration of all the elements – the biomedical, clinical, professional, research/evidence and societal. The new courses aim to teach knowledge and skills in context, to be more patient-centred, to explicitly teach the clinical skills (both physical and communicative), to use a research based approach to medicine and to be aware of the social and political context of medicine. The people in this study acknowledge that this is the aim and that they did not always succeed and that this change had not come without painful (and ongoing) battles and that the change would not have come about without prestigious universities such as Harvard paving the way.

Medicine is now taught by a very diverse group of people. It is still taught by clinicians and biomedical scientists but also people with sociological, anthropological and historical backgrounds are also involved in teaching, albeit often teaching of lower status. Teaching in a medical degree is done by a very large number of people. This has strengths and weaknesses. Students are exposed to a diversity of skills and perspectives but many of the participants in the study argue that there are problems as people only teach fragments and so do not really see themselves as educators. Despite the high level of interest shown in education by the participants in this study, they argue that teaching in medical education was ‘very unprofessional’ and one person (involved in medical education) saw his role as ‘creating some professionals from a bunch of amateurs attempting to teach’. Another commented that ‘no one has any theoretical understanding, it is not a valued activity, we don’t talk to education academics’. Arguably this position

is not very different from other disciplines except that that it was actually raised by many of the medical participants as an area for concern.

10.3.1 Structure of the medical curriculum

The traditional mode of teaching was based in the disciplines (such as anatomy or physiology) whereas the problem based learning (PBL) mode bases all the teaching around cases (for example one per week). The current medical curriculum is described as a spiral at one university and as an integrated whole at the other. One participant described the old curriculum as:

> A cluster of knowledge trees, very straight Huon pines that didn't branch out until the end and there was no intermingling at all, it was very hierarchical. Now it is interwoven and it cycles but it is still hierarchical.

The new curriculum is described as staggered and recursive and as building from year to year. Assessment is also integrated with oral OSCEs[33] which test content knowledge, clinical skills, communication skills and social context understanding. Written exams comprise cases with questions, for example, that tackle the biochemistry, students' knowledge of the condition, the action a doctor might take, the social factors that lead the patient to be in this condition, the psychosocial factors that might be aggravating the problem.

Medical degrees are overseen by the Australian Medical Council and so there is a certain level of coherence between degrees since every university has to have their degrees approved and inspected by a group of peers. Within universities, the medical curriculum is managed by the education sections of the faculties, giving it a high level of internal unity. Medicine is described as 'hugely dynamic' and many things are going on in different places. Aside from the campus based and hospital based teaching, students may

[33] OSCE (pronounced "osky"). This is an abbreviation for 'objective structured clinical examination'. It is a task based oral exam where students undertake a number of practical simulated situations.

be doing research projects, community placements, rural placements, general practice placements and so on.

The aspect of the degree that is emphasised most strongly is the integrated nature (both horizontal and vertical) of content and skills and the careful way in which medical educators had attempted to deconstruct important skills, so for example with clinical skills the complex tasks are built up over the course of the degree and the knowledge base is developing alongside the skills.

The medical degree is the longest of the degrees in this study. One participant explained the length of the degree as in part a result of the quantity of material to be covered and the level of responsibility which doctors had, but also because students needed to build it in layers, to see the application in different situations and to practice – 'you have to learn something and then apply it and then say, okay when I applied it I didn't know this so I have got to find out and then see another case'.

In medicine there is a definite attempt to overtly integrate content and skills in the curriculum. There is some debate regarding the generic nature of the skills even within medicine and certainly clinical skills are not generic as understood in the broader context of this study. However, skills such as critical thinking and problem solving are seen as part of clinical skills and as such an integral element of the degree. Unlike other disciplines, content knowledge and skills are not seen as competing but as connected. The participants in this study argue that using the PBL approach, it is much easier to integrate skills and knowledge since in the traditional approach to learning students are learning material in a discipline context and then trying to put it together in changing contexts. For example, they might have to take something out of biochemistry and integrate it with physiology and with practical clinical skills.

10.4 Generic skills in medicine

The notion of generic skills has clearly been given some consideration by the participants in the study. Many in fact suggest that in medicine the skills are not generic even beyond groups of cases (let alone from medicine into other areas). Some participants in this study argue that skills like analysis, problem solving and synthesis are so anchored in the type of clinical problem that one is dealing with that they are not generalisable[34]. So although students can be taught various approaches to problem solving, it is argued that problem solving skills are specific to groups of cases because the skills are integrated with the knowledge. Surgical problem solving requires different skills and knowledge from problem solving in psychiatry, which is different again from obstetrics. In addition it is acknowledged that students have difficulty generalising unless they are able to reflect on what they did or what the message was or what situation it would be applied in.

The skills that are seen as important are communication and critical thinking, although many people point out that critical thinking, problem solving analysis and synthesis are in fact bundled together. Other skills which are important include tolerating and operating in uncertainty (this is perhaps an attitude rather than a skill), the ability to be confident team workers and the ability to reflect. Acceptance of uncertainty is seen as important because in medicine there is so little certainty:

> We don't want them to think that they will come up with a certain outcome because there is so much uncertainty, how you operate in uncertainty is so important. And students do want certainty. The have difficulty dealing with uncertainty.

This difficulty in dealing with uncertainty is attributed to lack of maturity, to anxiety when the stakes are high or to students viewing medicine as a 'meal ticket'. Teamwork is important as doctors are required to work in multidisciplinary teams. The ability to reflect is seen as very important and is discussed further in the section on critical thinking.

[34] This issue was raised in the medical education literature some time ago (Elstein et al.., 1978).

However, the most important or central skill that students could leave their degree with is clinical reasoning or clinical problem solving. This is an amalgam of knowledge, the ability to communicate, the ability to organise knowledge and a holistic understanding of medicine in its biomedical and social context. The medical academics emphasise the holistic notion of medical knowledge. Ideally, this requires training that is based both in the scientific and the humanities and aims to generate the capacity to work in complex and flexible ways and to appreciate the interrelationship between the biological, psychological and social. Central to a medical education is the need for students to understand clinical problems through talking to the patient, examination skills, integrating information from the basic and clinical sciences, coming to an initial diagnosis, knowing how to manage the condition. This requires an integration of knowledge and a range of skills. Thus students need to learn to actively acquire the appropriate information, know what to look for and organise that information. This in turn requires the ability to formulate a problem, identify what is missing, systematise and interpret.

10.4.1 Critical thinking in medicine

Critical thinking is seen as very important. One participant in the study said that he introduces students to the importance of critical thinking from his very first lecture. Some said they try to avoid dogmatic statements and instead leave students with something to reflect on.

Central to critical thinking in medicine is the questions one asks, as one participant explains, ‘What are the questions, how would you explore them, where would you go with the evidence, how would you confirm something?’. In medicine critical thinking has five manifestations. The first is clinical reasoning, the second evidence based medicine, the third consideration of ethical questions, the fourth reflection and the fifth questioning of the status quo or received wisdom. Of course these five are not discrete entities and overlap in many ways. However, it is helpful to examine each separately.

Critical thinking in a clinical context or clinical reasoning is probably the most fundamental and is also referred to as problem solving. As one participant said:

> It is something that we have to do on a daily, hourly basis. When a patient comes in with a problem you have to be able to hypothesise about the probable cause, do a problem oriented history and examination, draw that information together, synthesise it and decide what the next step will be. Then you need reflective skills to examine your own diagnosis.

Thus critical thinking is the construction of a clinical argument and the weighing of evidence. It can be used in diagnostic or therapeutic thinking. It is highly complex as there are so many variables, including the psychosocial context and every symptom is subjective. In clinical reasoning, critical thinking is an integration of communication, analysis, synthesis and problem solving. Because this aspect of critical thinking is so important it will be discussed separately in the section on problem solving.

Although evidence based medicine is now central to the discipline, participants are aware of the ambiguities of much of the evidence. However, all considered that it is important for students to learn to examine evidence and to be aware that medicine has its basis in research. Thus students are exposed to cases where things that are standard practice have little evidence to support them or cases in which the evidence actually refutes the efficacy of the practice but it is still standard. As one participant pointed out:

> Understanding the research enables students to see how flawed evidence can be – just because something is published in the Medical Journal of Australia doesn't mean it is a 'truth'.

Students are taught how to read research papers, to decide whether the aim has been achieved and what the strengths and weaknesses of the study are. They are taught about research methods so that they can examine study design, methodology etc. It is important that students became aware that:

> You can do all sorts of things with statistics, as drug companies do par excellence. Evidence based medicine is a big thing now but some of the evidence is pretty jolly shaky so we teach students to examine the evidence, look critically at papers, see how information can be presented selectively.

Ethics is considered a very important aspect of medical education. Students are explicitly given the opportunity to consider difficult, usually open-ended problems. Ethical questions are raised in relation to the cases being examined, tricky issues are deliberately written into cases students considered from first year on. For example students are given a hypothetical case and asked what the best course of action is, what is the balance between one argument and others, what are the arguments in favour and those against. The questions compel them into a situation where they have to take action on the best possible evidence.

Reflection is another way of conceptualising critical thinking and is perhaps a more personal approach. It requires one to examine one's own diagnosis – 'Putting yourself on the spot, analysing what you have done and could have done better'. In addition students are encouraged to reflect on their own health care, for example the difficulties of changing behaviours (for example eating habits or exercise) and to reflect on the implications this has for their patients. Reflection is considered an important professional skill, in part because it is part of the autonomy and self-regulation of the profession and in part because doctors were often the 'more obsessive members of the community' and so medical students needed to learn constructive ways of critique. As one person remarked, 'they need to do the sort of Donald Schön stuff and be able to look at what happened'. Reflection is taught through reflective writing exercises, for example following community placements or field trips, or as part of communication skills training. The important factor is that the reflection is analytical rather than seen as a purely descriptive exercise.

The final way in which critical thinking is conceptualised is a questioning of the status quo or received wisdom. Although many of the medical academics in this study remark

that medicine is slow to change and is in some ways a conservative profession, all are very definite in their belief that it is crucial to teach students to question at a fundamental level. Critical thinking requires one to examine assumptions (one's own as well as those of others) to dispense with false assumptions and to aim to discriminate between ideas and practices. It requires one to 'ask the hard questions, especially when the answer seems obvious'.

The participants in this study acknowledge that questioning received wisdom can be confronting both to students and to staff and is difficult in a hospital environment but is a very important part of the profession. One example of this type of critical thinking is students are given a project in which they are asked to critically examine health promotion and to consider why one would be engaged in this exercise, who it is aimed at, who is likely to listen, what are the difficulties in changing behaviour. One participant said that he makes it clear to students that he believes that there are some questions that cannot be answered by the physical sciences and that while physical sciences are an important form of knowledge, it is not the only way in which they should be thinking.

Analysis is seen as part of the critical thinking/problem solving bundle. It is an organisational process of taking data, understanding how it can be reorganised and reframed and this process is informed by knowledge. This involves seeing the interconnections and links, implications and meanings. Importantly it also involves 'knowing what you don't know'.

10.4.2 Problem solving in medicine

Problem solving is critical thinking with a narrower, strictly clinical focus. It is also referred to as clinical reasoning and is one of the central foci of medical education. However, the participants are doubtful about the generic nature of problem solving. While students can be taught a fairly standard approach, this is only of value as an initial tool. Problem solving is so complex and so embedded in the content knowledge and specific skills of a particular area that the extent of its generalisability is questioned:

> Problem solving is so grounded in terms of knowledge. People can learn processes but they can apply it without the knowledge. We say our course is a lot more about learning the concepts than factual knowledge but concepts don't exist in a vacuum without the conceptual knowledge.

Another pointed out that 'you have to have content knowledge, deductive knowledge is predicated on having sufficient information to create a reasonable hypothesis'.

Problem solving is referred to in terms of mazes but disciplinary knowledge is still important – 'even if you look at problem solving in terms of mazes, there is still content knowledge that you need in order to find the pathways'.

Yet despite these concerns, the medical academics in this study discussed problem solving or clinical reasoning at great length. It is understood as the process of identifying a problem, identifying what is known and what is not, what the answerable question is and where the evidence is, the process of reaching an outcome and how to then distinguish between outcomes. For example:

> A patient comes in with a problem (for example they can't sleep), you apply the knowledge you already have, see if there are any physical examinations you should do, do I know enough to try a treatment, negotiate with the patient around what will best help them. So it is investigative skills, skill of organising information in a way that is medically sensible to help you formulate the problem, apply evidence based medicine.

However, problem solving also has another dimension, described by one doctor as the 'art of medicine'. This is the understanding of the complex and the nuanced nature of medicine – how to communicate with a patient to obtain the required information, how to make the consultation as pleasant as possible for a patient, how to negotiate treatments, how to personalise the treatment to the particular person, how to understand the emotional and social context in which the patient exists.

Critical thinking in a clinical setting is taught through case based or problem based learning in a campus and hospital setting. Problem based learning or inquiry based education is seen as a good way for students to learn the hypothetico-deductive or 'clinico-deductive' reasoning required for clinical problem solving. When considering problem solving, many of the medical academics in this study refer to the difference between expert and novice problem solving and the different types of reasoning involved.[35] Problem solving is taught from the first week and students are taught a generic approach to problem solving, despite doubts regarding its generic nature. Students are solving problems in order to do their learning and the curriculum aims to model a particular way of thinking, the clinico-deductive way of thinking. The aim is to teach pattern recognition but it is acknowledged that students need a lot of experience to see the pattern and then to be aware when the pattern is inadequate. For each case students are given a set of questions that aim to embed a particular way of thinking. For example problems are often structured in the following way: an opening statement providing information on the case, a question that asks what this could possibly be, what mechanisms could have caused this, what history questions could I ask, what examinations will I do. Students are encouraged to articulate their reasoning and consider the evidence.

In a hospital setting problem solving is taught largely by modelling and is only rarely explicitly taught. Some teachers will ask students questions that help them think about their own reasoning processes. One person argued that the best teaching often came from the registrars and interns because developmentally they are much closer to the novice and so their models of thinking and their patterns are much more explicit and more deductive,

[35] There has been some important work done in this area (Bordage, 1994; Bordage & Lemieux, 1991; Elstein & Schwarz, 2002; Elstein & Bordage, 1988) which suggests that the novice has simple, superficial, disorganised and split patterns of clinical reasoning whereas the expert has layered, prioritised, clumped reasoning and is adept at pattern recognition. Expert clinical reasoners have specialised knowledge structures, which are referred to as illness scripts and have meaningful connections and networks. However, experts revert to a much less elaborated hypothetico-deductive form of reasoning in unfamiliar situations. For this reason students are taught the basic form of reasoning as a starting point and then given opportunities (over an extended period of time) to develop more complex patterns of problem solving.

the thinking process for the registrars is still familiar and so they were better able to explain things to students:

> Sometimes the very brightest are not the best teachers – to have a PhD in respiratory physiology and be an expert in pulmonary fibrosis doesn't mean you can teach anything – they just get irritated.

Students are encouraged to think critically in a clinical environment about the approaches other doctors might be using, to consider how it might be different from what they have been taught and to consider the pressures, constraints and cultural influences in the hospital setting and to acknowledge that not all of it is ideal. Participants argue that students need to think critically in order to extract learning from a range of (less than perfect) situations. For the academics in this study it is valuable for students to see vigorous debate, for example on the grand rounds in hospitals. However, one suggested that some of her colleagues felt that this kind of open disagreement should not happen in front of students.

10.4.3 Communication in medicine

Communication is seen as a highly important skill in medicine and is taught in a deliberate and overt manner and is perhaps more generic than some of the other skills. Communication is important because of the patient focus, because of the sensitivity of much of the doctor/patient contact and because there is an awareness that it had not been well taught in the past. As one person argues:

> Communication is the key to medical education, it is one of the most important things that doctors working in the field do. If you can't get to the point where you have understood the patient's problem then you can't formulate it.

Written and oral communication skills are both described as important by medical academics at both universities. At one of the universities in this study, students are interviewed for entry and their communication skills are considered to be as important as academic performance for admission into the degree.

Students are taught communication in a variety of ways. Very early in their degree they learn clinical interview skills and are given a clear framework that (initially at least) is almost scripted. For example they learn to introduce themselves to the patient, establish rapport, ask about the presenting complaint, allow the patient to describe it in their own words and then take a focused history. They learn about active listening, body language, eye contact and questioning technique. In addition they learn about the sociocultural context, so they are expected to understand cultural differences, how to communicate with people from other language backgrounds, using interpreters, communicating with the old, with children, with the visually and the hearing impaired. One person argued that the skill that students find most difficult is listening. She suggested that this was in part because they are nervous and in part because they still do not understand the importance of the patient. Her students are exposed in the early years to a range of guest speakers (for example someone with a disability, HIV positive people) so that students hear a range of perspectives. Students are also encouraged to think about the role that power and hierarchy has in communication and so critical thinking is integrated with communication skills.

Students in a campus based setting learn by being given clear guidelines, doing role-plays, fishbowl exercises and video recorded exercises. In addition, because problem based tutorials require active participation, students are learning in an ongoing classroom context. However, this could be difficult for quieter students. In a hospital setting students are learning by observing practitioners and by talking to patients. However, many remarked that in hospitals students did not always have positive role models.

The central features of problem solving, critical thinking and communication in medicine are outlined in Table 7 below.

Table 7: Generic skills in medicine

Generic skills and attributes	Medicine
Problem solving	• Clinical reasoning • Diagnostic and therapeutic skills • Communication skills • Need for contextual understanding • Based on deductive and/or pattern based thinking
Critical thinking	• Clinical reasoning • Use of evidence based medicine • Awareness of ethical issues • Reflection on one's role and responsibilities as a professional • Questioning of received wisdom
Communication	• Oral communication central to assessment • Key to clinical skills • Overtly taught • Written communication

10.4.4 Learning to learn

Another skill which medical academics consider important is the ability for students to examine and take responsibility for their own learning. This is important because the undergraduate medical degree is only the beginning of a very long apprenticeship. In addition, medicine is changing so rapidly that doctors need to have the skills to go on learning and changing:

> Students need to be able to deal with a situation in which, after graduation, much of the knowledge will be redundant. They need the capacity to go on learning, to understand the research, to add and modify.

Further, medical education needs to recognise that there were multiple contexts for practice, both within Australia and overseas. One person remarked that she is not always sure that they are successful in making the meta-learning aspects of medical training overt:

> I suspect one of the things we do with education is that we have this nice black velvet box which has got things in it that the students need to know but they don't actually know why it is in the box and how it is all put together and so their ability to use it is limited.

10.5 Espoused theory and theory-in-use

While the medical academics in this study have a keen interest in the role of generic skills in medical education they argue that there are many within medicine, both in clinical and university settings who may view matters differently and hence would teach students in a very different manner.

A number of difficulties in teaching critical thinking are acknowledged. First, the pressure of course content because 'the curriculum gets packed with factual knowledge and practical skills'. As one person remarked, 'We haven't got time to debate too much and think too much and reflect too much because you have to cram this amount in and get through the content'. Another concern is that some students are resistant to thinking critically, a concern allied to the concern regarding students' need for certainty. As one participant stated:

> For some students, science and education is 'tell me what I need to know, what I need to regurgitate, tell me what the facts are and I will spit them back at you during the exam, that is knowledge for them'.

However, he acknowledged that it was up to teachers to encourage critical thinking and that 'students cannot be expected to have minds that are any more open than the minds of their teachers'. He remarked that universities are not always as good as they could be at encouraging debate, challenging students to think and presenting them with different models and ways of thinking, of examining the evidence and thinking for themselves. Another problem is that while critical thinking is important, teachers are reluctant to destroy students' idealism or their sense of agency. As one participant pointed out, it is acceptable for sociologists to examine and critique in detail but medical students will be in a situation where they have to take action, often in less than perfect situations. While it is important for them to be aware of the imperfections, they still need to operate within them and hence they are reluctant for students to become 'paralysed post-structuralists'. Critical thinking requires doctors to take action and to engage. As part of this process teachers are concerned that they do not just 'knock down their sense of certainty and leave them with a total sense of uncertainty without a way of exploring and understanding'. A further issue was that the hierarchy and the socialisation puts pressure on students' critical thinking, particularly in a hospital setting where 'a direct challenge to authority gets stamped on, sometimes in a very nasty way'. Many of the doctors in this study argue that while they consider it as crucial to admit that they did not know something, this was not the traditional culture of medicine and sometimes they risked their professional reputations by doing this.

Critical thinking is acknowledged to be difficult to assess. It is assessed through the OSCEs and reflective journals and in the case questions on examinations. Yet these are seen as imperfect assessment tools for critical thinking. Further, it is acknowledged that sometimes assessment is driven by 'what is convenient or easy, things you can put in simple questions'.

10.6 Generic skills, disciplinary skills, professional skills

It would be very tempting to assume, if one considered matters superficially, that medicine is simply an applied science. However, medicine is a discipline with an

epistemology that operates at a number of dimensions. At one level it is a science, at another it has elements of social science, at others it is a craft requiring (at its best) a subtle understanding of and sympathy for human nature. At yet another level it is a discipline with a range of highly varied specialties. Further, it is a discipline with a strong professional culture and powerful socialisation process. So in fact, medicine has a patchwork of epistemologies that both integrate and conflict. The impact which this has on teaching is immense. The participants in this study argue that there is considerable discord between those who have a narrow bioscience approach and others. Yet the debate is out in the open. There is an interest in medical education and an analytic self-consciousness amongst those interviewed. While they claimed that there were many of their colleagues who would disagree with them, certainly the debates are current, dynamic and taken seriously.

There is an active interest in education from the medical academics. The participants in this study are prepared to critique their own and others' teaching, are familiar with current research in medical education and referred to references that might be of interest. Teaching of skills and content are integrated. However, this is a relatively new position and the medical academics interviewed in this study argue that although they are confident that this is educationally sound, they have colleagues who they believe would disagree with them and there is still a feeling, particularly amongst older and more traditional doctors that the new curriculum is *not* a step forward. In contrast, some in the study argue that the curriculum changes have not gone far enough and that students are not sufficiently critical nor sufficiently autonomous.

Unlike the other disciplines in this study, there is much less tension between teaching skills and teaching content. Skills are closely integrated into content and this is a result of the new curriculum, which has an overt emphasis on skills, in particular clinical problem solving, practical clinical skills and communication skills. These are taught as part of teaching content and the two are not seen as separate. Moreover, generic skills have a very particular understanding in medicine because of the clinical component. However, practical difficulties in assessing some forms of critical thinking, such as

critique of the status quo is acknowledged. Despite this the problem based learning system, the dual campus and hospital based system and assessment which includes oral based problems means that students are given the opportunity to learn in a range of styles and settings.

Chapter Eleven
Generic skills in context

The previous five chapters outlined the ways in which generic skills are conceptualised in the context of the separate disciplines. This chapter will now bring together the findings from the five disciplines in order to examine the patterns which emerge from the data. By discussing the findings in the context of pre-existing research, this chapter proposes a new understanding of generic skills and attributes.

The central theme to emerge is the importance of disciplinary epistemology in the construction and teaching of generic skills and this points clearly to the close links between generic skills and the knowledge base. The present study argues that generic skills have become de-disciplined because in the minds of policy-makers they have become separated from the disciplinary context within which they reside. The disciplines have a central place in both scholarship and teaching and yet generic skills are seen as external to disciplinary knowledge and so are consequently are undervalued by teaching staff. This chapter explores these issues in detail. It begins by examining the ways in which generic skills are constructed in the five disciplines considered in this study and in particular will consider the ways in which an examination of two professional disciplines revealed the importance of the interrelationship between epistemology and skills. It then explores the gap between espoused theory and teaching practice and the implications for understanding the ambivalence of teaching staff to generic skills. This underlines the importance of scholarship of teaching and learning that is located in the disciplinary context. Finally, this chapter presents a re-theorising of generic skills and hence a way forward in the thinking about generic skills and attributes in higher education.

11.1 Overview of findings

There are clear differences in the ways in which generic skills are conceptualised in the five disciplines in this study. There are differences in emphasis, for example problem

solving is the central skill in economics and physics whereas critical thinking is the central skill in history. In medicine and law, both critical thinking and problem solving are important. More significantly, however, are the qualitative differences in the ways in which generic skills are conceptualised. The findings suggest that while skills such as critical thinking and problem solving are of central importance in the five disciplines studied, the meanings attached to them are fluid. The findings are consistent across both institutions, which indicates that this has more to do with disciplinary rather than institutional culture. Further, the way knowledge itself is conceptualised, sought and validated in the disciplines shapes the ways in which critical thinking is understood.

The dimensions of difference in the ways in which generic skills and attributes are conceptualised in the disciplines in this study can be summarised as:

- Variation between disciplines in the definition of terms such as critical thinking, analysis, problem solving;
- Variation between disciplines regarding the relative importance of each skill to the discipline;
- Degree to which each generic skill is integrated into the content of the discipline;
- Degree of interconnection between generic skills in the discipline;
- Degree to which the importance of each generic skill is made explicit to students;
- Degree to which generic skills are important in early undergraduate years;
- The extent to which content is integrated with skills as students move from the beginning to the end of their undergraduate years; and
- The ways in which generic skills are taught and assessed.

Table 8 illustrates the ways in which the key skills of problem solving, critical thinking and communication are conceptualised in the five disciplines. It highlights the different ways in which critical thinking, problem solving and communication are constructed. What is apparent is that in the case of problem solving, the way in which it is understood is shaped by disciplinary purpose and technical or knowledge based skills such as historical research, use of economic tools, use of mathematics or clinical skills. In the

case of critical thinking, there are some similarities across the disciplines, however, a careful examination shows that there are some significant differences.

Critical thinking and problem solving were identified as the central skills in this study although these can be seen to encompass a number of other skills such as analysis and synthesis. There is a close relationship between critical thinking and problem solving, and problem solving can be understood as one form of critical thinking. However, this is not to conflate the two, but rather to suggest that there is a relationship between them. Moreover, there is a close relationship between communication and both problem solving and critical thinking. The two key skills, problem solving and critical thinking will be considered separately.

11.1.1 Problem solving in the disciplines

As Table 8 shows, the nature of problem solving is viewed quite differently in each of the disciplines. The idea of problem solving is shaped by the subject area, methodology, assumptions about knowledge and verification conventions. In physics for example, problem solving is influenced by the need for abstract modelling and the use of mathematics as a means of analysis, and is influenced by experimental technique and conventions and by an in-depth understanding of theoretical physics. Problem solving in economics on the other hand focuses on the development of economic models and the use of economic theory. In law it is based on an understanding of the principles and conventions of law and the particular reference to case and statute law. Problem solving in medicine is driven by the interface between biomedical knowledge, the therapeutic relationship and the need for clinical outcomes and so problem solving is clinical in focus. In history, problem solving is largely subsumed by critical thinking. There are some generic features to problem solving, which include the importance of outcomes (in many forms, including solutions or recommendations), the use of a stepwise process involving the need to re-organise material or to gather information and the importance of checking the validity of the outcome.

Table 8: Overview of generic skills

	History	Physics	Economics	Law	Medicine
Problem solving	Exploring causality Management skills – time, groups, projects, research	Closed and open-ended problems Well and ill-structured problems Hypothesis development testing (solved either numerically or analytically) Use of mathematics as a tool of analysis Checking of accuracy, rigour.	Use of economic tools Application of theory to practical or policy issues	Closely related to critical thinking Responding to hypothetical or 'real world' problems Concerned with outcomes and application Some concern with professional skills – dealing with clients, understanding of the professional role	Clinical reasoning Diagnostic and therapeutic skills Communication skills Based on deductive and /or pattern based thinking Requires contextual understanding
Critical thinking	Examining evidence and context Discussing complexities and ambiguities Awareness of gaps and silences Awareness of political and ideological dimensions Questioning of received wisdom	Examining rigour, accuracy, uncertainty, predictive powers Examining assumptions Discussion areas of debate, uncertainty, the frontiers of knowledge	Use of economic theory or 'tools' Understood in the same way as problem solving	Examination of argument, evidence, logic Examination of assumptions Awareness of social context Awareness of ethical issues Questioning of received wisdom	Clinical reasoning Use of evidence based medicine Awareness of ethical issues Reflection Questioning of received wisdom
Communication	Written – essays the central form of assessment Some class discussion, presentation, debates	Not the central form of assessment, laboratory reports, posters, assignments Some oral presentations	Not the central form of assessment Some essays, assignments	Written – essays, assignments Oral communication is considered important but is not systematically included in teaching or assessment	Oral communication is central to assessment – clinical skills, part of problem solving Clinical communication is overly taught Written communication – some assignments, essays, research reports

However, although these generic features of problem solving are significant, the ways in which problem solving is shaped by the disciplinary knowledge structures, epistemology and methodology mean that problem solving in medicine is quite different from problem solving in economics for example.

Problem solving is one facet of critical thinking and an examination of this across disciplines makes the importance of disciplinary knowledge apparent. Problem solving is seen in some cases as the practical manifestation of critical thinking, it is critical thinking applied to the 'real world' or to hypothetical cases with the aim of reaching an outcome or recommendation. In other disciplines, problem solving is understood as a separate skill that either does (for example medicine) or does not (some undergraduate physics and economics) require examination of received wisdom or any broader notion of critique. However, this depends on how critical thinking and problem solving are defined. Problem solving can be the use of the technical skills of the discipline or it can be a broader and more critical concept.

One of the features of problem solving is that it often utilises hypothetico-deductive reasoning. However, this is not the only form of reasoning, since participants in medicine spoke of the importance of pattern recognition for expert reasoners and physicists spoke of the importance of mathematical or physical intuition (again for experts). However, both these forms of problem solving require an almost 'second nature' understanding of the knowledge base in order for the problem solver to make connections or consider what might work or be reasonable. Moreover, problem solving often requires the use of particular tools of analysis. In medicine, this includes clinical skills such as the skills of physical examination and history taking as well as an understanding of testing and therapeutic options. In economics it requires an understanding of economic tools of analysis such as modelling and econometrics. Problem solving in physics requires an understanding of mathematics as the central tool of analysis. Another feature of problem solving is that it is outcomes focused. However, the nature of that outcome varies greatly between disciplines, for example in physics it is often possible to find a unique solution although there may be a number of ways of

reaching it whereas in medicine the outcome depends upon a number of factors (physiological, psychosocial, contextual etc.) and is often negotiated with the patient. In law problem solving requires an understanding of legal principles and reasoning and the outcome is interpretative rather than unique. Notions of legal problem solving in the academy and that which is carried out in the context of a legal practice are likely to be different because of the constraints of practice. This difference in the ways in which problem solving is conceptualised points to the centrality of disciplinary knowledge. So while one may have skills in hypothetico-deductive reasoning, this is insufficient without knowledge and understanding of the end-point required in the discipline and the methodological frameworks used in reaching that point.

11.1.1 Critical thinking in the disciplines

It can be seen from Table 8 that critical thinking is conceived quite differently in each of the disciplines studied. Like problem solving, there are some generic similarities in that an examination of reasoning, consideration of assumptions and a questioning of received wisdom is part of critical thinking in most disciplines. However, as described in the more detailed discussion presented in Chapters Six to Ten, it is clear that when the context in which critical thinking exists is examined, disciplinary differences become apparent. In each discipline the combination, emphasis or expression of critical thinking is different. For example, critical thinking is fundamental to the epistemology and disciplinary culture of history. Critical thinking for a historian is about examining the evidence, about understanding, context, acknowledging ambiguity, having an awareness of the ideological dimensions of a situation and putting all these elements together to construct an argument. For a physicist it is an examination of the logic, accuracy and predictive powers of a model or solution as well as an awareness of the areas of uncertainty in physics. In economics (for undergraduate students at least), critical thinking and problem solving are interchangeable and are the use of the theoretical toolkit of the discipline. Critical thinking in academic law is understood as a careful examination of evidence and logic and an examination of assumptions. It addition it encompasses an awareness of social context and of ethics. In medicine, critical thinking requires, most importantly, good clinical reasoning. It also requires understanding of evidence based medicine and

an awareness of ethical issues. So while the broad term 'critical thinking' may apply to all disciplines in this study, the way in which critical thinking is expressed is quite different.

This section discusses the relationship between the disciplinary epistemology and notions of critical thinking. The most obvious difference in the ways in which critical thinking is conceptualised between disciplines is whether it is multilayered or whether it is understood as problem solving alone, or in other words, simply as a use of the technical skills of the discipline. The strands of critical thinking outlined in Chapter Two are critical thinking as problem solving, critical thinking as argument and critical thinking as transformation. Considered in this way, critical thinking in economics is one dimensional for all but those who identify themselves as 'heretics' as critical thinking in economics is largely based around problem solving. For the other disciplines, critical thinking is multidimensional as the conceptions include argument and for some an element of transformation. Argument includes an examination of logical structure, predictive powers, accuracy, evidence, appropriacy of the model (depending on the discipline in question). Transformation includes an awareness of the political or ideological dimension. It also includes Barnett's (1997) idea of interdisciplinarity or a metacritique of the discipline itself.

This understanding of critical thinking, however, misses the very important *disciplinary* element identified in this study. It misses first, the nuanced differences between the ways in which critical thinking is shaped by and embedded in the disciplinary culture, secondly, it ignores the importance of discipline knowledge in critical thinking. So although there are similarities between the disciplines, in that for most of the disciplines, critical thinking is multidimensional and comprises some of the same elements, the differences between them are clear.

Historians see knowledge as multiple and contested and so do not seek a single and replicable outcome in the way that a physicist might. As a consequence, problem solving becomes either the reflective analytic 'What are the causes of the French Revolution?'

type questions or more practical 'detective work' questions about seeking out sources. Critical thinking is multidimensional since knowledge is viewed as contested and hence open to challenge, from the first year of an undergraduate degree onwards. All dimensions of critical thinking (with the possible exception of problem solving) are present in history to some extent. Historians consider the validity of an argument, they aim to examine assumptions and further, include an understanding of political, structural, ideological or cultural factors in their analysis. The approach to critical thinking undertaken by history is much more political in the broad sense of the term in that it is concerned with power relationships. History has been influenced by recent social theory (such as post-structuralism, post-colonialism, cultural studies) and so has a number of angles for critique and internal debate. Because history is an eclectic discipline, there is also an element of interdisciplinarity and hence of metacritique since historians are able to view their own theorising through a number of lenses and hence turn their critical gaze upon themselves. Barnett (1994:28) argues that the humanities and social sciences have a broader notion of critical reason than the technological and natural sciences:

> The cognitive intent of different curricula towards the wider society differs. Some disciplines – being concerned with social institutions, practices and values – bear directly on society in their fields of attention. As such they present opportunities for critiquing society since their students will be encouraged to assess the gap between the potential of their concepts and their reflection in society. To invite a student to unpick the concept of democracy is an implicitly critical practice since the concept will come to be a standard against which the claims of society (to be 'democratic') can be tested.

Physics, unlike history, has a duality between certainty and uncertainty in that there are many ideas that can be demonstrated with certainty and yet there is inherent uncertainty. Although physics has a history of positivism, van Gigch (2002) argues that few physicists now claim to be positivists. Modern science has been influenced by theorists such as Popper, Kuhn, Lakatos and Feyerabend and so the idea that absolute truths are 'out there' waiting to be discovered through empirical observation is tempered by notions that there can never be definitive answers, only supporting evidence and that paradigms will change

and are influenced by the social values of the time. Although these ideas are only implicit in the ideas outlined by the participants in this study, it is clear that they influence the epistemology of physics. This means that notions of critical thinking are shaped by an interest in examining the evidence, accuracy and uncertainty with great precision but in also exploring the frontiers, the areas of uncertainty and controversy.

In contrast, economics in the two universities in this study appears to be relatively untouched either by recent developments in the history and philosophy of science or by developments in social science. With the exception of a few people who identified themselves as 'marginal', economics is reliant upon a theoretical system that is not open to challenge (Mulberg, 1995; Perelman, 1996). There was little attempt to introduce undergraduate students to debates that had raged in the discipline in the past or those that currently simmered. Economic knowledge was not characterised as contested and those who did challenge the dominant paradigm agued that they would not get published in the more prestigious journals and that research other than the neo-classical and highly mathematical was viewed as 'soft'. Thus critical thinking becomes an exercise in logic and analysis within the established theoretical view. There is little consideration of a political dimension (despite economics being a social science) and apparently little internal critique of the discipline.

History and economics have quite different notions of critical thinking, even though they share, at least to some extent, a common ancestry and are concerned with some of the same issues (Galbraith, 1987). There are fundamental differences in the ways in which knowledge is understood in the two disciplines and this goes some way towards explaining the different conceptualisations of critical thinking. In history the social context is central whereas neo-classical economics separates the economy from society and culture (Block, 1990). Economic theory is assumed to be universal and ahistorical and so the social and cultural context is of limited importance.

Although both history and physics are disciplines with long and well-established traditions, both have very fruitful relationships with other disciplines. This study found

that historians use ideas, theories and techniques from other disciplines ranging from economics to literature, cultural studies and philosophy. In a similar way, the physicists see their discipline as having close and active relationships with mathematics, computer science, chemistry and engineering, finance and banking. In part for both disciplines this is pragmatic as departments in both these areas have shrunk and so graduates must be prepared to move into other related disciplines and because research funding is often more readily available in more applied areas. However, it is also because the ideas and techniques of other disciplines are useful and interesting and in the case of physics, there can be very fruitful practical collaboration. Medicine and law also have close research and professional contact with other disciplines. The professional disciplines (discussed in the following section) have a high level of interdisciplinarity while maintaining professional and disciplinary identity and this influences the ways in which they engage in self-critique.

Communication and cross-fertilisation between disciplines is one aspect of critical thinking. Barnett (1997) argues that critical thinking can be understood in several different ways – as problem solving, as an examination of debates within a discipline and as metacriticism which is a consideration of the discipline itself, preferably from an extra disciplinary perspective. Some degree of interdisciplinarity, then, may require practitioners of a discipline to consider both the debates within their own discipline and the ways in which others (even from related disciplines) may view ideas which are otherwise taken for granted. It adds a reflexive dimension to critical thinking. In addition, interdisciplinarity means that a discipline becomes cross-fertilised with new ideas.

11.2 Professional skills and generic skills

The professional nature of both medicine and law give these disciplines particular characteristics. Unlike some professions, however, medicine and law both have a long tradition in the academy and so have an identity grounded both in the disciplinary base as well as professional identity and practice. Yet the professional brings with it a number of

imperatives. There are external controls and scrutiny, there is the need to produce graduates who fulfil certain criteria and there is the need for action. These aspects of the professional epistemology shape the ways in which generic skills are conceptualised in these two disciplines. The most profound difference is the emphasis on practice, although it is arguable that this is less significant in law than it is in medicine since many of the participants viewed undergraduate law as primarily a generalist degree.

This section examines the particular relationship between generic skills and professional disciplines. Squires (2005) outlines a number of characteristics of professions that are relevant in discussing the relationship between disciplinary epistemology and generic skills. The first is structural as the curriculum and teaching are often subject to external requirements and are often only the first stage of preparation. Thus there is a relationship between professional bodies and the educational institutions. Other important features of a profession are: the knowledge base, professional expertise, craft or skills base, the behavioural aspect and outcome orientation (Squires, 2005). Professions are complex and require practitioners to have the abilities of interpretation, intuition, judgement and decision-making. While the knowledge base is important, because professions are outcome focused (for example solving a medical or legal problem), knowledge informs an action, rather than being an end in itself. Likewise, the importance of the repertoire of methods, techniques, technology and skills means that the balance between 'knowing that' and 'knowing how' (Ryle, 1949) is tipped towards the latter. Yet the relationship between these two forms of knowledge is complex and interconnected and there is no simple distinction between the two. Another aspect of the professional disciplines is that because they are engaged in a very particular relationship with the external world and accountable to it, ethical questions become central. In addition the world of the profession is contingent and requires balancing and juggling to deal with unpredictability. This reflects Schön's (1983) notion of the complexities of practice and hence the need for reflection. Further, professional decisions are constrained by pragmatic constraints such as time, money, information, the circumstances of the client/patient and so outcomes are the best under the circumstances. The professional needs to make decisions based on the

pragmatic as well as the ideal. Another aspect of professionalism is the presence of risk, which requires knowledge, judgement, skills and preparedness for action.

In the two professional disciplines in this study, medicine and law, generic skills such as critical thinking and problem solving are infused not only with the disciplinary culture but with the demands of the profession. The professional disciplines, law and medicine, are characterised by a mixed epistemology in the sense that there is disciplinary epistemology and epistemology of practice and these are interconnected, particularly in the case of medicine since in medical education, clinical practice is closely integrated with theoretical knowledge. There are both positivist and non-positivist strands in law but while law is axiomatic, the idea that law is interpreted and hence open to a range of possibilities means that knowledge is contested. Yet the practical necessity of an outcome focus means that there is an emphasis on problem solving. However, law in the schools involved in this study is currently a more generalist degree than medicine and so the professional is less an integral part of teaching. There is a level of interdisciplinarity in academic law that means, like history, that academics are able to utilise a number of approaches from other areas, some of which in turn are used to critique both the discipline and the profession. In addition, like history, law is grounded in the social world and considers political and ideological dimensions. Thus critical thinking and problem solving are multilayered and reflexive in undergraduate law education.

Medicine operates in a world of multiple epistemologies, meaning that critical thinking is also multi-dimensional. The dominance of bioscience and an emphasis on evidence based medicine means that much of critical thinking is based on an empirical consideration of clinical research. However, there is also an acknowledgement that the evidence is complex and fallible. There is an awareness of the highly complicated and sometimes tenuous link between science and medicine. Further, there is a tension between bioscience and its emphasis on experimentation and largely quantitative clinical trials and the humanist focus on the psychosocial context, the individual experience and on the importance of communication skills. In addition, medicine includes some reference to the political or cultural, particularly since medical education now includes

teaching staff from other disciplines, including the humanities and social sciences. Thus medical education includes at least a nod towards a sociocultural worldview. Medicine is, by its very nature multidisciplinary. The sub-disciplines or specialties all have a distinct research focus and professional culture. There is a relationship between the scientific research base and clinical practice but each have differing epistemologies. There are close relationships with related fields, such as other health professions. And the increasing involvement of disciplines outside the health sciences in medical education means that there is some scope for what Barnett (1997) refers to as interdisciplinary metacritique, or the ability to examine the discipline from without and so engage in another layer of critique less bounded by the assumptions of the discipline.

11.2.1 Wading into the swamp: complexities of professional epistemology

This section examines the ways in which disciplinary epistemology, the epistemology of practice and 'on the spot' professional action are enmeshed in ways that make the idea of generic skills extremely problematic. The argument is not that professional disciplines are drastically different from generalist ones, rather that the demands of a profession heightens the particular relationship of generic skills to the knowledge base and hence is a clear illustration of the ways in which generic skills and disciplinary knowledge are enmeshed.

In examining the relationship between disciplinary epistemology and generic skills in medicine and law, it is necessary to consider the notion of practice. Schön (1987) argues that when examining the epistemology of practice, there is the hard, high ground where practitioners can make effective use of the (relatively) clearly formulated research based theory and technique and then there is the swampy lowland where situations create a confusing mess. For example, in the case of medicine there is knowledge about human anatomy and physiology and the research evidence regarding treatment of a particular condition, and then there is the complex clinical situation involving individual symptoms or reactions to treatment, individual presentation of a condition, the context, the need for communicating with the patient and negotiating treatment, time factors, cultural factors and so on. In these situations, the distinction between theory and practice or between

propositional and practical knowledge becomes blurred as does the distinction between generic and disciplinary skills. Critical thinking, problem solving and communication are essential in these situations and are taught in a way that means the discipline, professional skills and generic skills are enmeshed. Generic skills are central to teaching in medicine but they are the discipline based generic skills such as good clinical reasoning and the ability to critically examine the evidence when considering treatment options.

The issue of what is meant by generic skills in professional disciplines is significant because notions of generic skills become intertwined with professional skills. In professional disciplines the idea of professional and generic skills are closely interrelated and so students learn a set of skills which have a very particular professional application. Some of these skills may be applicable in a range of contexts within the profession, others to a very limited context. This is because while theory can be codified and generalisable, knowledge in practice is often implicit and contextualised. Yet professional skills are interlinked with skills such as critical thinking and problem solving. This, once again draws attention to the importance of the contextual nature of generic skills. So for clinical skills for example, one needs a combination of knowledge and problem solving skills (including critical thinking and analysis) as well as good communication skills. An understanding of physiology, anatomy pathology and biochemistry are enmeshed in problem solving.

Bowden and Marton (1998) point out that generic skills can be understood as preparation for the unknown. They argue that one of the key questions in higher education research is, given the situated nature of learning, how people can be equipped or equip themselves to cope with a wide range of situations, many of which are very difficult to predict. Taking this a step further, Beckett and Hager (2002) refer to the idea of 'hot action', in other words, in the heat of the professional moment, people make decisions about how to act. For Beckett and Hager this is the ability to discriminate appropriately in the midst of flux. Thus in the 'hot action' of professional practice, generic skills are one attribute that can be drawn upon. However, if one considers a professional situation, what a doctor will draw on are critical thinking, analytical or communication skills *and* disciplinary

knowledge and the two are integrated. The doctor cannot communicate anything to a patient other than common sense, nor make diagnostic decisions, without knowledge of pathology, anatomy, physiology, practical clinical skills, a clinician's professional responsibilities and so on. Hence there is a close relationship between generic skills and disciplinary knowledge. The generic skills are unfounded without a knowledge base within which they operate and of which they are part. Beckett and Hager (2002) use Aristotle's idea of *phronesis* to describe the practical wisdom in a professional or workplace context that determines the appropriate action for a specific circumstance and is derived from experience. It is highly contextualised, tacit and action based knowledged. They argue that skills such as problem solving make no sense if they are decontextualised. In contrast, it is more useful to make context-sensitive judgements which allow one to choose the appropriate behaviour in various professional (or social) contexts.

It may be possible to assume that professionals simply use their command of disciplinary knowledge to analyse the problems presented in their professional life and that theoretical disciplinary knowledge can translate directly into applied professional knowledge and action. However, the situation is more complex as ready-made problems do not present themselves to the practitioner but are often more ambiguous, uncertain and frequently need to be made with insufficient information and often under pressure (Schön, 1987). Thus there is a need for action (Squires, 2005), often in stressful and public situations. Practitioners need to be able to draw on the combination of theoretical, practical and conceptual skills on the spot, under observation and in situations where the stakes are high.

Thus there is a complex interplay between knowledge, skill and judgement and this develops with experience. Learning knowledge and using knowledge are not separate processes (Eraut, 1994). However, the process of using knowledge transforms it so that it is no longer the same knowledge. Knowledge is shaped by the context in which it has been and is intended to be used. This again calls into question the global nature of generic skills. One of the assumptions about generic skills is that in some way they 'rise

above' both context and content. However, this is where the difficulty lies, since this research shows that they are bound up with content and shaped by context.

What is important in the context of this study is the centrality and interconnectedness of the disciplinary and professional knowledge base to generic skills. Eraut (1994) defines a profession as grounded in the primacy of the knowledge base, having social control over the expertise and a degree of self-regulation. In association with this, professions have codes of ethics and notions of trustworthiness that help to define and give validity to the profession and its autonomy. The knowledge base is very important as it gives the profession an aura of certainty (scientific or technical knowledge for example). The long period of training in combination with the knowledge base give an air of erudition that separates the profession, defining it and drawing clear boundaries. Eraut argues that professions need to be grounded in established disciplines in order to uphold their academic (and hence professional) status. Moreover, the professions separate themselves, using their cultural capital to create and reproduce their positions of power. This is done through control of the knowledge base and through enculturation (Bourdieu, 1990). Thus the professional knowledge and skills have not only practical but symbolic application.

However, while the profession may be situated within a disciplinary knowledge base, there is some tension between disciplinary knowledge and practice. This is in part because much professional knowledge cannot be represented in propositional form since it is tacit. In addition, professional knowledge cannot be characterised independently of how it is learnt and how it is used. Eraut (1994) argues that it is inappropriate to think of knowledge as first learnt and then used. This tension between disciplinary knowledge and practice is mediated in the case of the two medical schools used in this study. There is a clearly stated aim to integrate skills (both practical and intellectual) with the knowledge base by teaching students through integrated problem based learning and through the explicit teaching of clinical skills. Thus generic skills are part of disciplinary knowledge rather than in conflict with it.

Generic skills have become important because of the perception amongst policy-makers, employers and some educators that they are skills that can transcend narrow disciplinary boundaries and enable employees to thrive and adapt in a rapidly changing, high pressure, service-focused economy (Candy et al., 1994). The growth in the knowledge economy has meant that knowledge has become a commodity (Symes & McIntyre, 2000). Knowledge now has economic value and hence applied knowledge is valued because its economic purpose is immediately recognisable. Because of the vocational slant with which generic skills have been invested, there is an assumption that generic skills should be about what students can 'do' rather than what they know and that these skills are independent of the disciplinary knowledge. In other words, notions of generic skills reflect a polarity between mode one or culturally concentrated knowledge and mode two or socially distributed knowledge (Gibbons et al., 1994). Mode one knowledge is disciplinary and requires certain social and cognitive norms to be followed in knowledge production. Mode two knowledge is applied, heterogeneous and commodifiable. However, this may well be an artificial divide as university research has always shifted between the pure and applied (Usher, 2000). While the distinction is important, one of the central contentions of this study is that in the context of the skills considered here, generic skills are profoundly influenced by disciplinary knowledge.

11.3 Generic skills as espoused theory

Another issue identified by this study is the gap between espoused theory described by the participants and their teaching practice. The notion of espoused theory arises from Argyris and Schon (1974) and encompasses the world view and values upon which people *believe* their behaviour to be based. This contrasts with theories-in-use, which are the worldviews and values implied by action. Thus there can be a gap between espoused theories and theories-in-use and hence the potential for incongruities between the two. (Argyris & Schon, 1974) postulate that people hold maps in their heads about how to plan, implement and review their action but are not always aware that the maps used to take action are not formulated upon their explicitly espoused theories.

While skills such as critical thinking and communication are highly valued by academics and seen as part of the structure of their discipline, they are often only implicit in teaching. The three reasons for this identified by participants across all disciplines are:

- Tension between content and skill, and the priority given to technical competence;
- Practical difficulties (i.e. large classes, time constraints);
- Resistance on the part of students to uncertainty and ambiguity.

There are a number of possible explanations for the incongruity between belief in the idea of generic skills and an absence of systematic teaching and assessment of these skills. As Schommer and Walker (1995) and Beers (1988) point out, teachers can believe one thing about knowledge and teach in ways that imply another. One reason is that with regard to teaching, generic skills have become separated from notions of scholarly pursuit of the discipline and so have become de-disciplined. When academic staff consider the nature of their discipline and their own research practices they consider skills such as critical thinking, analysis, problem solving and communication to be central. However, in their teaching, generic skills are often viewed as separate from the central business of the discipline. The only discipline in which this is not the case is medicine, and here skills such as critical thinking and communication are considered not as generic but as central and integral to the discipline. This is also the case for problem solving, which is taught in subjects such as physics, economics and law and is seen as a key part of the disciplinary content.

The notion of generic skills as separated from disciplinary thinking has lead to a tension between skills and content that has been identified in a number of studies (Assiter, 1995; Bath et al., 2004; Edwards & King, 2002). Edwards and King (2002) found that generic skills were seen as a competitor to content and the way of managing this tension was to embed the skills within content. The consequence of this was that generic skills disappeared into disciplinary knowledge and so were not given any explicit attention even though academic staff argued that their discipline was founded upon these skills. When generic skills are seen as integral to the subject they are often not overt. For this

reason they are either tacitly included in teaching or are assumed to be skills which students already possess. Thus, even when these skills are taught, they are not always articulated.

A further issue is the lack of clarity regarding the nature of generic skills, which means that there is uncertainty on the part of teaching staff as to what is referred to by the terms analysis or critical thinking or problem solving at undergraduate level. In addition, as this study has shown, these concepts have multiple interpretations and so the meanings are different both within and across disciplines.

Practical difficulties such as large classes and time pressured academic staff also work against the teaching of skills such as writing, speaking and critical thinking. This is because these skills require formative assessment such as essays, open-ended problems or class presentations that often require considerable input from teaching staff. In addition, given that these skills are difficult to teach and assess, when there are few rewards for good teaching, the teaching of generic skills and attributes may be over-ridden by the teaching of more concrete aspects of the subject. However, this study shows that the practical impediments to the inclusion of generic skills are probably secondary to the notion that generic skills are overlayed onto the subject matter, without regard to the ways in which the skills already exist within disciplinary knowledge. Further, there is a deeper resistance to the overt inclusion of generic skills in teaching as they are perceived to be part of the bureaucratisation of universities and the erosion of disciplinary and teacher authority. Generic skills are viewed by some teaching staff as irrelevant checklists, which are imposed upon the 'real' (disciplinary) content.

The reported resistance on the part of students to conceptual skills such as critical thinking is a very complex issue. The present study did not examine student perceptions and so any discussion of student views of generic skills and the tasks that engender them is beyond the scope of this study. However, there is evidence in the literature (McInnis, 2001) which suggests that students are spending longer hours in paid employment, less time on campus and are increasingly strategic in their approach to study. If this is the

case, and if the more complex and ambiguous skills such as critical thinking are not rewarded by assessment then any resistance to the acquisition of complex conceptual skills and attributes will be magnified. While there are many factors that may be working against the teaching of skills such as communication (in various forms) and critical and analytical thinking, if these are skills that are truly valued by the community (at a societal as well as employment level) then universities may need to consider ways in which to create an environment where these skills are taught and rewarded.

One of the problems with generic skills identified by participants in this study is that they can be viewed as either generalised statements without substance or they can be overly prescriptive. Lists of generic skills were added to subject outlines by some academic staff in response to departmental policy rather than because they were seen as having intrinsic value. Clegg and Ashworth (2004), writing about the pressures for accountability, argue that notions of transparency assume that teaching practice can be made readily accessible to staff, students and administrators. Hussey and Smith (2002) make the point that descriptors of learning outcomes cannot adequately capture the complexity of teaching and learning in the classroom. They argue that learning outcomes are based on a fundamental epistemological confusion between Rylian notions of 'knowing how' and 'knowing that' since the attempt to specify learning outcomes involves translating the knowing how of teaching practice into knowing that type statements. Hussey and Smith (2002) found that the oversimplification which is implicit in statements of generic skills and their inclusion in subject outlines as learning objectives is part of the reason why academics are resistant to them. This resonates in the present study as several participants referred to the fact that generic skills had become mere checklists which they added to their subject outlines because this was a requirement rather than because they saw any educational value for their students. These lists are perceived as oversimplifying the very complex nature of the skills. Yet at the same time academics spoke with enthusiasm about the role of critical thinking and problem solving (in a disciplinary context) as part of the subjects that they taught and as part of the knowledge structure of their discipline.

So while attempts to make generic skills clear are valuable, a detailed understanding of the subtleties of disciplinary culture avoids making generic skills too prescriptive and prevents the creation of something that is so simplistic that it does not capture what is really happening in teaching and learning. For competent practitioners 'knowing in practice' is mostly tacit and professionals engage in 'reflection-in-action'(Schön, 1983). This refers to the process by which professionals make judgements, for which they cannot state the criteria, using skills for which they cannot state procedures. Discursive consciousness contrasts with practical consciousness, the former being stated, the latter tacit (Giddens, 1979). One of the problems with the current notion of generic skills is that it assumes that generic skills are observable and measurable (Holmes, 2000). Yet if generic skills are tacit and inherently bound up with knowledge then the idea of measuring or mapping these skills is more complex than much of the discussion of generic skills in the literature would suggest.

One explanation for the degree of resistance to the notion of generic skills is that they have become associated with a managerialist culture of measurement and control. Morley (2003) describes this in terms of the 'quality' movement and the requirement to describe complex practices such as teaching and learning in terms of simple classifications which then become tools of evaluation of quality and performance. Ball (2000; Ball, 2003) describes this phenomenon in terms of performativity (a term derived from Lyotard). He defines performativity as:

> … a culture and mode of regulation that employs judgements, comparisons and displays as a means of incentive, control, attrition and change – based on rewards and sanctions (both material and symbolic). The performances (of individual subjects or organizations) serve as measures of productivity or output or displays of quality or moments of promotion or inspection (Ball, 2003:216).

Thus performativity becomes a culture of control. Lyotard (1984) wrote of the 'terrors of performativity' and Ball suggests that increasingly teaching is influenced by surveillance and monitoring systems which create continual uncertainty and make one 'continually

accountable and constantly recorded' (Ball, 2003:220). If generic skills are perceived as instruments of control rather than integral to the discipline they may be resisted.

11.4 The way forward

Rather than a set of technical skills, generic 'attributes' can be understood as social practice, as part of the social meanings that are produced collectively. In this way, individuals act and respond according to their understandings of the meanings others attribute to and in anticipation of the effects of our actions (Blumer, 1969). In other words, we reproduce patterns of meaning and construct a certain degree of predictability about social life. If generic skills are understood in this way, then it is possible to consider the ways in which we are aiming to engender certain types of behaviour, to promote certain attitudes and practices in students. Holmes (1995) writes of the graduate identity and argues that because graduates need to operate in a social setting, it is necessary to examine what is required of them in the environment within which they will operate as professionals. This means examining the social relations which are both implicit and explicit. Rather than a super-disciplinary list of skills, generic attributes become a fine-grained examination of disciplinary and professional practice.

Communities of practice (Lave & Wenger, 1991; Wenger, 1998) are one useful way of understanding generic skills since rather than seeing them as discrete, measurable skills that transcend disciplines, generic skills can instead be seen as a non-overt social practice (Atkinson, 1997). Communities of practice are groups of people who share a concern or set of problems and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger et al., 2002). These communities are engaged in constructing a meaningful reality and over time a group constructs its own way of describing and explaining the reality in which their practice is embedded. There are connections here with Gee's explanation of discourse. Gee (1996) defines discourse as a socially accepted association among ways of using language, other symbolic expressions and 'artefacts' of thinking, feeling, believing, valuing and action that can be used to identify oneself as a member of a socially meaningful group or 'social network' or to

signal (that one is playing) a socially meaningful 'role'. Thus members come to view phenomena and their own roles in similar ways and use similar words and actions to express this understanding. Social practice is based in tacit and often non-conscious actions. Edwards and King (2002) found that although staff argued that generic skills were important, they also suggested that students were expected to acquire these skills in the course of learning disciplinary skills rather than being taught them overtly. Further, Edwards and King found that definitions of generic skills were unstable and yet there was an assumption amongst the staff that understandings were common. If generic skills and attributes are understood as social practice then Edwards and King's findings are not surprising. Because the skills are part of the discourse they are tacit and 'given' and so not subject to scrutiny but are assumed to 'go without saying' and so assumed to be shared.

Disciplines can be seen as communities of practice although this involves acknowledging that they are complex, shifting, with often ill-defined boundaries and possibly with a number of competing or contradictory communities. As Trowler and Cooper (2002) point out, communities of practice are not as homogeneous as Wenger suggests. Yet disciplines are communities of practice in that it is the interaction which is important – conferences, seminars, departmental meetings, teaching, informal interaction, friendships and very importantly the enculturation that academic staff have had as part of their undergraduate and postgraduate apprenticeship. Generic skills, as part of the social practice of each discourse community are often not explicitly taught but rather are picked up through the knowledge or concepts under instruction. So while it is possible to be more transparent about the 'rules of the game' it is difficult to describe them in detail because they are internalised. As Gee remarks, students learn 'inside the procedures, rather than overtly about them' (Gee 1996:136).

Trowler and Cooper (2002) outline the notion of teaching and learning regimes (TLRs) in which culture and practices are internalised during undergraduate and postgraduate studies in an apprentice-like process. Departments and the sub-groups within them are the primary location for TLRs because the interactions within departments construct and

enact culture. Trowler and Cooper's notion of TLR is not the same as notions of discipline as the TLR resides in the department rather than the discipline. TLRs encompass notions of rules, assumptions, practices and relationships related to teaching and learning in higher education and acknowledges factors such as the identity of teaching staff, power relations, the meanings attached to particular practices, the tacit assumptions, rules of appropriate teaching practices, the recurrent practices. Like the notion of discourse, TLRs are social practice and so are not specifically formulated and become internalised as part of in individual's identity. What is important in the context of the current study is first, the notion that teaching is a complex social practice and second, that there are influences upon teaching other than the disciplinary. The present study acknowledges that there are factors other than the discipline which are at work in the construction and teaching of generic skills. So the disiplinary epistemology, disciplinary traditions, university and departmental culture combine to create a community of practice in which much that is important is also unspoken. Thus generic skills are interwoven with the culture and content of the discipline and shaped by the practices of a particular TLR and so the forms that generic skills and attributes take are structured accordingly.

However, while acknowledging factors other than the discipline, it is through examining the epistemological culture of each discipline that this study has examined the ways in which generic skills or attributes are understood. While in this study there are commonalities across disciplines, the particular ways in which attributes are defined and taught vary across disciplines. This is not to imply that disciplines are monocultural as this study shows that there is variation within disciplines. Perhaps what is required is not the expectation that all graduates will be homogeneous and will leave university with a similar set of graduate attributes but rather that the disciplines themselves may best explore how particular skills are constructed and taught. This is happening is some areas such as medicine and physics, yet there is still much to be explored.

11.5 A reframing of generic skills

One way of understanding generic skills is as discipline knowledge in action. Generic skills can be seen as the relationship between knowledge and the world, the application of knowledge to theoretical or practical problems and the organised expression of that understanding. They are tacit because they complex and subtle and moreover, because they are integral to the discourse of the discipline and so central to the expert knowledge of practitioners with the discipline.

This study shows that the central features of generic skills are multiplicity, connectedness and transformation. Multiplicity refers to the multiple dimensions of each skill, of the range of ways in which the terms can be interpreted and the variety of ways in which they can be taught. All the generic skills examined in this study exist in a number of forms both within each discipline and across disciplines. Connectedness refers to the ways in which the skills and attributes are integral to the disciplines and it also refers to the inter-relationships between the skills themselves. Transformation refers to the transformation that occurs through the process of thinking critically, solving a problem and communicating that process. It is the move from unexamined information to a more considered position. In addition, it is the personal transformation that occurs as someone learns.

11.5.1 Re-disciplining generic skills

One very complex issue raised by this study is the extent to which there is any such thing as generic skills. This study demonstrates that there are some fundamental differences in the ways in which skills or attributes such as critical thinking, problem solving and communication are constructed and that these differences are largely a result of the ways in which knowledge creation and transmission is conceptualised. The epistemologies of the disciplinary tribes influence these concepts which had previously been thought to be generic. However, while this study has emphasised the differences, there remain some aspects of generic skills which can be seen to transcend disciplinary boundaries. In terms of critical thinking and analysis, elements that run across most of the disciplines are: first, a concern with evidence, be that contextual, experimental, clinical, theoretical or

technical; secondly, a concern with argumentation or logic in various forms, such as informal logic, mathematical logic and the ability to use a model within its boundaries. Thirdly, critical thinking in most disciplines is concerned with questions involving disciplinary theorising, assumptions, methodological questions, the frontiers of the discipline and areas of serious controversy within the discipline. Associated with this for some disciplines is the notion of a questioning of received wisdom. This can be either internal or extra-disciplinary critique and the extent to which this is accepted varies widely across disciplines. A final element of critical thinking that runs across disciplines to varying degrees is the concern with ethical questions. However, this is much more overt in the professional disciplines and in history. So the emphasis is quite different in each discipline, as is the way it is expressed and taught. Yet there are some common themes.

Problem solving, in contrast, is highly discipline specific and is tied to the technical or content knowledge of the discipline. As a consequence the exact form that problem solving takes in each discipline is quite different. For example in physics it will be problems to do with the physical world, will use mathematics and physics theory and may be experimental or theoretical. These forms of problem solving can be used in related fields, such as engineering for example. In contrast, problem solving in law requires the understanding of legal principles, and the conventions of legal problem solving. Each form of problem solving requires particular disciplinary knowledge and an understanding of the problem solving methods utilised by that discipline.

Communication had some commonalities across the disciplines, in that there was an expectation that students would learn to express their ideas in a clear and well organised manner. However, the forms of communication varied between disciplines as disciplines such as physics required mastery of a laboratory report for example whereas history and law may require essays. Even then the term ‘essay’ is a vague term and the requirements of an essay in history are different from an essay in law.

If Barnett (2003) is correct and ontology trumps epistemology then maybe this is the key to notions of generic skills. The specifics of the skills sit within epistemology and with how knowledge is structured and the ways in which this allows us to think critically, the means it gives us and the ideas it enables us to think critically about. Yet ontology or a way of being is more about attributes, the way of being critical or what Ennis (1987) refers to as dispositions – the *willingness* to think, to challenge and to dig underneath the surface, to seek out frameworks or complex knowledge systems in order to solve a problem.

Barrie's (2006b) fourth conception of generic skills, the enabling conception, provides one way around the question of the ways in which generic skills transcend the disciplinary context. He argues that in the third or translating level of generic attributes, these skills or attributes are adapted to the learning outcomes of different fields of study whereas in the fourth conception generic skills are integral to disciplinary knowledge. However, this study argues that this separation is artificial since generic skills are both adapted to the needs of the discipline and integral to it. Barrie argues that generic attributes are the core that provides the form and function of disciplinary knowledge but are more long lasting than the discipline knowledge they support and hence transcend the disciplinary boundaries. This study suggests that rather than separate and hierarchically organised conceptions, generic attributes can be both embedded in the disciplinary context and in some ways able to transcend it. It is a preparedness and a confidence to ask analytical questions, to categorise, to interpret, to see systems, to provide explanations, to theorise and to reflect. And these are dispositions that can perhaps be carried from one body of knowledge to another. Yet to do this meaningfully, in other words to do it in a deeper way then mere bluster requires a good understanding of the complex knowledge systems, language, methods, conventions and structures of a knowledge base.

Communities of practice are important and hence it is necessary to consider the disciplinary community of practice in considering the conceptualisation and teaching of generic skills. A generic approach to generic skills is limiting as it assumes 'one size fits

all' and ignores the importance of the disciplinary culture both in academic staff conceptions of themselves and their teaching and in the ways in which generic attributes are understood. Shulman (1993) argues that teaching is treated as a generic and technical activity which removes it from the community of scholars, which is the most valued form of scholarship. In this way teaching becomes a general activity which is layered on top of the discipline rather than an integral part of it. In the same way treating skills such as critical thinking, problem solving, analysis or communication as generic robs them of their power. They become simply additions to the 'real' curriculum rather than an integral part of the discipline into which students are becoming inducted. This may explain some of the resistance to generic skills by teaching staff, for the very reason that they are labelled 'generic' rather than disciplinary. Instead skills such as critical thinking and communication should be viewed as integral to the very nature of the discipline itself, and are part of what academics do and what students are learning to do.

Work on the development of a disciplinary understanding of generic skills and attributes requires acknowledgement within the scholarship of teaching, learning and academic development of the influence of disciplinary cultures. McGuiness (1997) argues that academic development resources often fail to take into account the discipline when recommending teaching and learning practices and do not take into account a fine grained analysis of the learning outcomes of different disciplines and different courses. Healy and Jenkins (2003) argue strongly for a discipline based approach to academic development. They argue for this on a number of grounds including the strength of an academic's allegiance to the subject, the distinctive forms of teaching that characterise the disciplines (such as laboratory classes in physics, work based experience in medicine, and so on), the particular conceptions of knowledge in each discipline, and the ways in which teaching needs to be translated into the culture of each discipline.

The results of this study indicate that there is a need for a focus on generic skills and attributes as an integral part of each discipline. There is a need for a careful examination of where and how the skills or attributes exist and how they are taught and assessed. But it also recommends interdisciplinarity as there is much to be learnt from other disciplines.

It does not suggest an isolated disciplinary self-reliance. Medicine, at least in the two schools involved in this study, has made a decision to include educators from other disciplines and so has injected the curriculum with a broader and more critical perspective. Other disciplines involve academic developers (who often come from other disciplinary backgrounds) in curriculum development. While this study argues that there is a strong relationship between generic skills and the disciplines within which they reside, it does not suggest that this become a static or limiting position. Generic skills should not be conceptualised as 'one size fits all' however, there is much that disciplines can gain from each other, particularly in the area of teaching, learning and academic development. So this study is not proposing an isolationist model bound entirely in the culture of each discipline. There is much that can be gained from metacritique, from critically examining the ways in which graduate attributes are conceptualised in each discipline and imagining how this can be extended.

Chapter Twelve
Conclusion

12.1 Overview

This examination of generic skills has explored the disciplinary underpinnings of these skills and attributes and the ways in which they are part of the epistemic culture of the disciplines. The study began with a discussion of the idea of generic skills and the ways in which they have been constructed in policy and pedagogical terms. Following this it examined the work that has been done into disciplinary cultures. This captured the importance of the disciplinary context in shaping pedagogy and provided a background in which to situate this research. A contextual framework was then developed which brought together three strands of work on theories of teaching and learning, generic skills and epistemology. The contention was that there is a need for a detailed and contextual re-examination of the nature of generic skills. It was proposed that generic skills have their fundamental roots in the epistemology of the disciplines.

The ways in which academic staff conceptualise the epistemology of their discipline shapes the understanding and teaching of generic skills. This idea was positioned in terms of both policy and pedagogy since currently generic skills sit at the intersection of the two as they are promoted through policy and enacted through pedagogy. To date the policy has driven the pedagogy without a detailed critical examination of either. Generic skills policy has been implemented without a careful consideration of the contextual basis within which it is positioned. The findings presented here clearly demonstrate the centrality of disciplinary knowledge in that there are differences in the ways in which generic skills/graduate attributes are constructed in each discipline. These differences are apparent in the skills which are emphasised, in the definition of skills, in the integration into the discipline and in the means by which they are taught and assessed. It was found that the idea of generic skills is highly problematic – these skills are under-theorised and

are at best symbolic attempts to concretise a poorly theorised economic and managerialist agenda.

Research into disciplinary differences is an important antecedent to this study, yet is treated with some caution to avoid the boundaries drawn between disciplines becoming artificially delineated. Instead a more dynamic cultural model is used for examining disciplines which acknowledges the complexities, movement and cross-border interchange that is present in disciplines. However, the discipline, in particular disciplinary epistemology remains the most significant unit of analysis in this study. Disciplines are central in the identity of academic staff, and this can be understood in the ways in which they construct their teaching at a broad conceptual level and at a more specific level of enactment (McAlpine et al., 2006).

Analysis of previous work on generic skills and the disciplinary territory provided the basis for this study and it is the nexus between these two areas which is the central point of focus. From a consideration of previous research on both generic skills and disciplinary culture, it was then possible to formulate a theory of generic skills based on the intersection of three factors – notions of epistemology, theories of teaching and learning and notions of skills and attributes. This theory proposed that if we are to assume that learning and teaching are situated and if we also accept that the discipline is central to teaching and learning and epistemology is integral to disciplinary culture, then it follows that teaching is influenced by the disciplinary epistemology, even teaching of skills which are assumed to be generic and hence to transcend disciplinary boundaries. This theory also argued that on close inspection, higher order generic skills are in fact highly complex and worthy of more detailed scrutiny than they have received in the past.

Although epistemic culture is the central unit of analysis, it is acknowledged here that there are complexities in defining the culture of a discipline and in separating the disciplinary epistemology from other factors such as departmental and institutional culture. It is also acknowledged that there are tensions between espoused theory and theory-in-use and as a consequence the significance of both the epistemological structure

out of which teaching practice emerges, and the practical considerations which influence the construction of generic skills are examined. This contextual analysis has revealed the inadequacies of much of the current thinking on generic skills. It demonstrates how a situated learning perspective based on the ways in which teaching and learning occur in the disciplines can provide a more robust theorising of generic skills. This analysis points to the multiple dimensions of generic skills and in doing this provides the interpretive space within which these dimensions can be explored and hence outlines a new structure for the theorising of generic skills.

The three main findings are:

- That ideas of critical thinking, analysis, problem solving and communication are highly complex, multiple and varied;
- That there are significant differences in the ways in which generic skills are conceptualised across disciplines;
- That there is a relationship between disciplinary epistemology and the construction of generic skills.

This reframing of generic skills takes into account the multiple dimensions, the dangers of oversimplification, issues of transferability and interdisciplinarity and the disciplinary epistemologies which underpin these skills or attributes. Generic skills (or more accurately attributes) are part of disciplinary epistemologies. They are not appendages but are in and of disciplinary knowledge. A binary separation between skills and content or between disciplinary and generic skills is unhelpful. Instead the central contention of this research is that a more positive approach is a construction of attributes based on an articulation between generic aspirations and disciplinary epistemology. This takes into account the culture of the disciplines and would promote a conversation about attributes that acknowledges the worldview of each field of study.

Disciplinary cultures are a form of social practice with particular forms of knowledge creation, verification and transmission. They are comprised of the methodologies, forms of argument, mechanisms and in many cases languages. Disciplines are integral to the

ways laboratories and clinics are organised and the ways teaching is organised through lectures, tutorials, seminars and practical classes. The disciplinary culture is present in and reproduced by curriculum content and structure, assessment practices, attitudes to teaching, the ways in which research is structured, individual departmental cultures and the professional persona. Importantly the discipline is the main community (alongside the university) within which academics construct their professional identity (Henkel, 2000). The discipline is an ensemble of social practices and symbolic representation. Knowledge, teaching, skills and attributes are intertwined. This investigation into generic skills has focused not on the construction of knowledge but on the assumptions regarding the nature of knowledge and the ways in which this impacts on teaching.

The findings presented here provide new insights into the complexity of generic skills. Through a detailed examination of the relationship between the ways in which academic staff describe the epistemic landscape of their discipline and through an examination of their conceptualisation and teaching of generic skills it has been possible to bring into sharp focus the importance of the disciplinary context of learning. The discipline is the central context within which ideas about teaching are developed. This is not a deterministic approach to understanding the role of disciplines in teaching but one that is situated and contextual.

This is a research-driven examination of the construction of generic skills in five disciplines. It examines the epistemology, structure of the curriculum, ways in which generic skills are taught and assessed and the reasons behind the gap between espoused theory and theory-in-use. In each discipline generic skills have a very particular construction, even though there are some parallels between disciplines. However, when separated from the disciplinary context, much of what is central to the idea of generic skills becomes meaningless. It is the situated nature of their existence that gives them life. Certain elements of generic skills may then be utilised beyond the disciplinary context. For example the ability to construct an argument, examine assumptions, yet even this depends in part on the technical nature of the discipline.

The findings will contribute to a richer understanding of the scholarship of teaching. As Huber and Moreale (2002a) point out, the scholarship of teaching and learning draws strength from being situated within the disciplines. Huber (2002) agues that teaching is not a generic process but one that derives from a deep understanding of one's own field. However, development of teaching and learning should not be confined to the disciplines since growth of knowledge 'comes at the borders of the disciplinary imagination' (Huber & Morreale, 2002b). This investigation has focused on the construction of generic skills within the disciplines but it has also examined these important 'trading zones' or areas in which there is conversation and exchange between disciplines (Gallison, 1997).

Perhaps the most important way in which this research advances understanding of the disciplinary context in shaping pedagogy is through a detailed examination of aspects of the curriculum that were assumed not to be disciplinary, and through the finding that there is much about generic skills that are, in fact, deeply rooted in the epistemic culture of the disciplines.

This points to the importance of the cultural dimension and is particularly salient in a context in which the authority of disciplinary epistemology has been questioned (Gibbons et al., 1994; Scott, 1995). While inter and transdisciplinarity is significant, and it has been argued here that the disciplines which engage in active dialogue with others are strengthened by the contact, the importance of the local and the cultural cannot be underestimated. Even multidisciplinary fields such as education or cultural studies draw on a range of disciplines to shape their worldview and practice, both in research and teaching.

Generic skills or graduate attributes are social and political constructs and as such are recast according to changing priorities. The increased emphasis on generic skills is significant because it is symbolic of the changing relationship between the university and society. The post-industrialist, post-Fordist transformation away from mass production manufacturing to service industries is a fundamental social change that has profound implications for the university (Scott, 1995). Increasingly, universities are required to

justify their existence. The focus has shifted away from pure disciplinary knowledge to adaptable skills, from knowledge for its own sake to vocational learning. As Lyotard (1984:48) suggests, higher education is increasingly expected to supply managerial and technical skills:

> Universities and the institutions of higher learning are called upon to create skills and no longer ideals… The transmission of knowledge is no longer designed to train an elite capable of guiding the nation towards its emancipation, but to supply the system with players capable of acceptably fulfilling their roles in the pragmatic posts required by its institutions.

The decreased government funding to universities, accompanied by increased control and stronger management, the economic imperatives and audit culture have created a climate in which generic skills, for employability and economic growth have become significant. In addition, there is a move away from the authority of the discipline. Further, the current climate means that there is a move to classify and measure. Yet for academic staff the discipline remains central. Generic skills may be so intricate that they resist precise definition and measurement. The question of the relationship between generic skills and disciplinary knowledge is a complex and highly charged one and is central to the scholarship of higher education.

12.2 Implications for theory and practice

The findings of this study have significant implications. While universities may aspire to their students achieving attributes upon graduation such as independent critical thought, or the ability to solve problems and think analytically, these qualities are highly discipline dependant. Further, while employers are pressing for graduates with generic skills, these skills depend at least in part upon the disciplinary background of the graduates they choose to recruit. The implications have been separated into three categories: policy, scholarship and pedagogy although in reality there is, or should be, a close relationship between the three.

12.2.1 Policy

The policy implications are first, that there needs to be a careful examination at the level of government and university level policy and recommendations regarding the prescriptiveness of statements of generic skills and graduate attributes. It has been argued that these skills are powerfully influenced by the disciplinary context and hence differ across disciplines. Further, if generic skills are imposed from the top down, they will only ever be 'bolt on' additions to a subject. An over-emphasis on 'box-ticking' results in the corralling of the imagination and a stifling of creativity. Instead generic skills need to be conceptualised from within the discipline. Secondly, there needs to be more meaningful dialogue with industry regarding the complexity of these skills. While ever the conversation is at a level of generalities and while generic skills remain poorly theorised, there will be gaps in expectations and commensurate levels of disappointment. Without a common language for generic skills or an acknowledgement that they are inherently complex, there can be no way to move forward.

12.2.2 Scholarship

This study argues for rigorous scholarship of teaching through the disciplines since change in the disciplines will only occur if it is embedded in disciplines (Healy, 2000; Healy & Jenkins, 2003). It is clear that an understanding of the disciplinary influences on teaching and learning are central. Without a thorough and detailed understanding of the disciplinary context it is difficult to understand the cultural and epistemological positions out of which teaching and learning occur. This is not to suggest that the disciplinary position should be the only one for the scholarship of teaching and learning since there is much to be gained from interdisciplinarity, from a breadth of perspective and an understanding of commonality. However, this needs to be informed by the 'intellectual substance of the field' (Rice, cited in Healy, 2000).

12.2.3 Pedagogy

The pedagogical implications are that generic skills need to be understood and taught from within the disciplinary context. There is a need for further research regarding the ways in which these skills or attributes are conceptualised from a disciplinary context.

This has been done in some areas, for example the research into problem solving in physics and medicine for example. This can then inform the broader research into generic attributes. Further, there is a need to carefully examine some of the practical impediments to the good teaching of generic skills.

12.3 Limitations of the study and new directions for research

This study has a number of limitations which have implications for the conclusions that are reached. The small-scale nature of the study, in terms of institutions used, disciplines selected and number of participants interviewed means that the findings must be treated with some caution. The choice of two similar universities means that the findings are restricted to the ways in which the chosen disciplines are constructed in these institutions. The study did not consider different departmental or institutional cultures and the impact of these cultures upon the construction of generic skills. So while the study found consistencies within disciplines, there is no attempt made to determine whether these were representative of the particular departmental or disciplinary culture in each institution. Further, the study did not focus upon the culture of the institutions and so revealed little about the articulation of the disciplines within each institution. Because the findings are restricted to accounts of teaching, there are limitations regarding the extent to which this study can comment upon the ways in which generic skills are taught. While this study acknowledges the importance of teaching beliefs (Kane et al., 2002) it also acknowledges that the possible gap between espoused theories and theories in use (Argyris & Schon, 1974) is a highly complex area and that narratives given in interviews about practices are not the same as the practices themselves. A further limitation is that notions of epistemology and knowledge cultures are complex and this study could not cover, in depth, the very sophisticated arguments regarding epistemology and ontology, although they remained in the background throughout.

There remains much need and scope for further research. First, there is a need for a new research agenda regarding generic skills and a further development of the work begun in this study. There is a need for a multilayered examination of the possibilities for each

generic skill/attribute. This requires a detailed consideration of how skills such as critical thinking or problem solving could be defined and how this integrates into the disciplinary culture. It assumes that each skill or attribute is not singular but rather is complex and has multiple dimensions. It would entail an examination of the attributes that are currently valued within the discipline (and/or profession) and the ways they are expressed, an exploration of the ways these attributes can be expanded and extended, and an examination of how these skills are learnt, taught and addressed and how this can be further developed.

Since the present study considered teaching only, an investigation into student perceptions and learning of generic skills would add another vital dimension to the understanding of this very complex area. It would enhance the understanding of the contextual nature of generic skills and would provide very valuable insights into pedagogy. Now that this study has explored the relationship between generic skills and the disciplinary culture in well-established disciplines, it would be valuable to build on this by exploring other multi or interdisciplinary fields. Along similar lines, while this study very deliberately chose two quite similar universities so as to focus on the issue of disciplinary rather than institutional culture, further research in newer and less research centred universities would add another dimension. Research which investigated the relationship between the disciplinary development of generic skills and the employment context would also add a very valuable dimension to an understanding of generic skills. This study was confined to the Australian context and so an exploration of similar issues in other settings would be of interest.

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Appendix 1

Interview Protocol

Brief outline of project. Check that participants have plain language statement.
Double check regarding audio-recording.
Consent forms.

What drew you to this discipline in the first instance?

What is interesting about it as a researcher in this field?

What is particular or identifiable about your discipline?

- Is it the subject matter, particular techniques or methodology, a particular worldview, training for a profession?
- What features do you see as central to this discipline?
- Why are they important?

How do you see knowledge as organised in your discipline?

Which disciplines are most closely related to yours?

- What determines the boundaries between these disciplines?

How important are specialised techniques?

- What are they?
- How much of your time with students is spent teaching these techniques/principles?

If you were asked for the 'one thing' that you wanted your students to gain from studying in your discipline, what would it be?

- Why is it important?
- How do students best learn this?
- How do you set about teaching this?
- Precisely what is it about this type of knowledge that means you teach in this way?
- How do you assess it?

Could you identify perhaps two other outcomes that you would like your students to achieve on graduation.

- Why is this important?
- How do students best learn this?
- How do you set about teaching this?
- Precisely what is it about this type of knowledge that means you teach it in this way?

- How do you assess it?

Are these skills taught from first year or are they only taught (for example) to honours students/postgraduates?

- Why is this?

The research into generic skills has identified the following as important generic skills (show outline)

- Critical thinking
- Analysis
- Problem solving
- Synthesis
- Evaluation
- Communication

You have already mentioned …. Are any of the others relevant in your discipline?

- Why?
- What do you understand these terms to mean? How do you define them?

How do students best learn (critical thinking etc)?

- How do you teach it?
- What sorts of activities promote (critical thinking etc)? Why?
- Why do you teach it in this way?
- What might students in beginning, mid and graduating level of the course be able to do? (re critical thinking/analysis/problem solving)
- Can you give me an example of a piece of work that uses these skills that I can take away with me?
- How do you assess it?
- Why do you assess it in this way?

Is there anything that you wish to add?

Thank you very much for your time…

Check to see if participant requires transcript.
Reminder that I will send out chapter and any material that is published from this data.

Plain Language Statement

Anna Jones,
Teaching and Learning Unit,
Faculty of Economics and Commerce,
University of Melbourne,

Dear _____

My name is Anna Jones and I am the Learning Skills and ESL specialist in the Faculty of Economics and Commerce at the University of Melbourne. As part of my PhD in the Centre for the Study of Higher Education at the University of Melbourne I am investigating the relationship between the higher order generic skills and the disciplinary context in higher education. The principal researchers in this project are Associate Professor Richard James and Professor Craig McInnis.

As part of the study I would like to investigate the ways in which academic staff conceptualise the higher order generic skills in the context of their disciplines. Higher order generic skills are understood as being analysis, synthesis, problem solving and critical thinking. Four contrasting disciplines have been selected in order to enable an investigation of the ways in which the knowledge structures of the disciplines affect the ways in which the generic skills are understood, taught and assessed.

The first stage of the project will involve semi-structured interviews with academic staff. It is anticipated that these interviews will be 1 to 1 ½ hours duration and will be audio recorded and the recordings transcribed verbatim. The second stage of the project will involve examination of teaching and assessment materials in order to gain an understanding of the ways in which the higher order generic skills are taught and assessed in the context of a subject in your discipline. The final phase of data collection will involve the observation of one of your classes, in order to get a first hand understanding of the teaching and learning of the generic skills in the context of a particular subject.

Involvement in the project is voluntary and participants are free to withdraw consent at any time and to withdraw any unprocessed data previously supplied.

Your identity and the identity of your institution will remain confidential subject to legal limitations. Pseudonyms will be used in any analysis of the data and further dissemination of the findings. However, the sample size is small, which may have some implications for your anonymity. All data will be kept in secure locations and will be destroyed after five years. This project has received approval from the University of Melbourne Human Research Ethics Committee. If participants have any concerns about the conduct of this research project, they can contact the Executive Officer, Human Research Ethics, The University of Melbourne, ph: 8344 7507; fax 9347 6739.

I would very much appreciate your involvement in this project. If you have any concerns, please contact me either by ringing 9344 9700 or by emailing me at annalj@unimelb.edu.au.

Thank you for your involvement

Yours sincerely,

Anna Jones

Author/s:
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