A Sociology of Informal Learning in/about Design

by

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Declaration

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published and written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or another institute of higher learning, except where due acknowledgement has been made in the text. I acknowledge the editorial assistance and proofreading by Jennifer Gamble, and the software coding, for Design Studio, in Flash® by Alex Lin.

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Ethics Statement

Ethics consent was obtained to all human subjects participating in this study in accordance to guidelines from the Human Research Ethics Committee (HRES) at the University of Sydney (reference number 09-2006/9484 and 10-2005/8572).

Abstract

The field of design covers a range of disciplines from architecture to engineering, from digital media to fashion. Each of these disciplines may include their own specialisations, such as mechanical and civil engineering; planning and urbanism in architecture; or textiles and haute-couture in fashion. Each of these disciplines define 'design' from its own disciplinary perspective. Within the field of design, disagreements exist regarding what knowledge one needs to design and what is the 'right' kind of knowledge. What is valued as meaningful or special within one discipline may be seen as less important for another. Such disagreements affect designers' practices, and the teaching and learning of design, including learning within informal settings such as a museum.

This thesis explores what is considered legitimate knowledge and practices within the field of design, and how these can be brought into a design learning experience within a museum setting. To do this, the thesis first examines the nature of the knowledge valued within the field of design, focusing on four disciplines: engineering, architecture, digital media and fashion. Then, the thesis proposes a way of supporting museum visitors to learn about what is valued within the field, while learners experience the processes of designing an object within a museum setting. The two main issues addressed in the thesis are: the use of computer-mediated learning environments to support informal learning of design within museums; and what is the form of knowledge learners may be accessing as they learn about design.

The research draws on theoretical frameworks from the sociology of education to examine how actors (designers), discourses and practices are specialised within the four design disciplines. The thesis uses evidence from interviews, surveys and research literature to explore the different 'measures of achievement' for what is considered legitimate within four disciplines of design. The thesis illustrates various trajectories for each of the design disciplines, examining the differences in the way each discipline structures their profession as reflecting the nature of the knowledge they value. The thesis argues that speaking of knowledge in design cannot be neutral and asocial as to what counts as knowledge, which in turn have significant implications for design professionals, design education and for the way lay audiences interact with design as a process.

The thesis presents new results from a sociological analysis of the design field, finding that engineering is more likely to be perceived as technical and objective whereas fashion is described as more subjective and reliant on the designers' dispositions. Architecture and digital media are perceived as emphasising both knowledge and knowers structures. Results from the sociological analysis formed the basis for the development of Design Studio, a socio-educational computer-supported learning environment to experience design within a museum. The three main contributions of the thesis include: a sociological analysis of the design field; a Bernsteinian approach to the research process; and, the application of a social realist approach to the development of an e-learning environment to experience design.

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CHAPTER 1 – INTRODUCTION TO THE STUDY

1.1 Introduction

This thesis explores the bases of what is considered legitimate knowledge and practices within the field of design, and how these can be brought into a design learning experience within a museum setting. To do this, the thesis first examines the nature of the knowledge valued within the field of design, focusing on four illustrative disciplines: engineering, architecture, digital media and fashion. Then, the thesis proposes a way of supporting museum visitors to learn about what is valued within the field while experiencing the processes of designing an object within a museum setting. The two main issues addressed in the thesis are: the use of computer-mediated learning environments to support informal learning of design within museums; and what is the form of knowledge learners may be constructing as they learn about design.

'Lifelong learning' is the notion that learning takes place throughout life and in a variety of settings, going beyond people's early years and formal educational contexts (Jarvis, 2006). Current discussions amongst educators, social scientists and policymakers, tend to view the nature of modern industrialised countries as embodying a 'learning society' or what Bernstein (2001) called a 'Totally Pedagogised Society', that is, a society that is constantly demanding new knowledge, due to its continuous and rapid changes. Jarvis (2000) points out that the 'society has become reflexive and the knowledge that people acquire is no longer certain and established forever – its value lies in its enabling them to live in this rapidly changing society' (p. 349). Individuals are, therefore, under an increased pressure to learn new skills and knowledge so that they can keep abreast of the challenges they face. However, in everyday life most of this learning may happen at alternative settings, or may include non-institutionalised learning, which may be incidental, as people adapt their behaviour to the new conditions or to the innovations with which they are faced. Thus, learning is no longer seen as confined to formal educational contexts (e.g. schools or universities), and increased interest is being directed at

understanding learning that happens within a diverse range of contexts such as non–formal (e.g. vocational or community institutions and others) or informal settings (inter–generational learning or learning through mass media and others) (Osborne et al., 2007).

The museum is one such context for learning. Museums are settings in which visitors expand formal activities and engage in informal learning. Learning within a museum context is often described as having an informal or free–choice nature (Falk, 2004; Knutson & Crowley, 2005; Roberts, 1997). Museums of design, such as the Exploratorium in San Francisco and the Powerhouse Museum in Sydney, display design perspectives, knowledge and objects to a wide variety of audiences. Visitors are seen as informal learners using the museums' grounds as a laboratory to explore design artefacts and ideas, learning about design beyond the boundaries of formal classrooms. Recent research related to audience engagement in museums has been exploring a number of issues in connection to visitors' experiences and interactions with exhibits or museum guides. These include, for example, social interactions within these environments (Briseño-Garzón et al., 2007), use of technology (Hall & Bannon, 2005; Knutson & Crowley; 2005; Kortbek & Gronbak, 2008; Mantyjarvi et al., 2006), collaboration (Heath et al., 2005), ways in which to make the museum experience more enjoyable and meaningful for visitors (Allen, 2004), how to do research within museum contexts (Falk, 2004), teaching strategies used within museums, historical parks and cultural institutions (Taylor & Neill, 2008), and museums' educational role as influenced by their own policies and practices as well as the wider political, economic and educational agendas (Grek, 2005; Grek, 2007).

Museum audiences are often familiar with technological devices; museums have been using mobile technology as guides for visitors for many years (Damala & Kockelkorn, 2006; Grinter, et al., 2002; Hsi, 2002; Mantyjarvi, 2006) and visitors have been exposed to computer-based exhibits (Hall & Bannon, 2005; Heath et al., 2005). However, there is little research on the use of computer-supported environments to promote informal learning within museum contexts (Sefton-Green, 2004). Within formal educational contexts, in contrast, there are a few studies examining and evaluating computer-supported environments to guide learners' self-directed inquiry (Jackson et al., 1998; Luckin & du Boulay, 1999; Quintana et al, 2005; White et al., 1999; White et al., 2002). Particularly missing from the literature are studies examining the use

of mobile technology to support inquiry-based learning in informal settings in general, and into museums of design specifically. However, in order to explore the use of mobile technology that enables informal learning of design within a museum context, it is necessary to understand what it is that is being learned, i.e. what 'counts' as knowledge in design.

Design covers a range of disciplines from architecture to engineering, from digital media to fashion. Each of these disciplines may include their own specialisations, such as mechanical, civil, or electrical engineering; heritage conservation, planning or urbanism in architecture; or pattern making, textiles or haute–Couture in fashion. They all practise design in its broadest sense – the intentional production of a material work to satisfy functional needs – but each of these disciplines is likely to reflect different forms of design knowledge. Within the field, debates exist over the content and forms of knowledge required to design and what is considered 'legitimate design'. What is valued as meaningful or legitimate within one discipline (e.g. first-person accounts, empirical evidence) may be viewed as of less significance within another.[1]

Such disagreements can affect designers' practices, the teaching and learning of design, as well as the way lay audiences may relate to the design profession. Design is often considered a 'collaborative' or 'co-operative' venture (Kleinsmann & Valkersburg, 2008; Kvan, 2000). Most designers regard the process of designing as involving members of both their own and other professions and thus an often multi- or inter–disciplinary endeavour (Kvan, 2000). Disagreements on what counts as valuable design knowledge can implicitly come into play in the social context of such design ventures. For example, when design professionals describe their processes to others (with whom they are interacting), they may tacitly assume that these individuals already know (or agree with them) what it is that constitutes a legitimate display of design knowledge. Thus, each member within a design team may assume a common shared implicit language in design, which may not necessarily be shared by all (Kleinsmann & Valkersburg, 2008). In a multi or inter–disciplinary scenario, the communication amongst the

[1] The debates referred to in this thesis are not about discipline-specific knowledge discussions such as preferential differences between modernism and post modernism architectural styles. Nor are they about contesting the diversity of the knowledge needed to design within specific disciplines such as the knowledge needed in architecture and engineering. Rather, the thesis focuses on exploring the *forms* taken by knowledge that is valued, cultivated, and more generally emphasised within a discipline.

various team members may be permeated by underlying differences in what is considered legitimate design knowledge, within each of the different design disciplines that constitute the team. That is, when a design team gets together to discuss the 'design' of a given object, underlying this discussion potentially lies a range of different, and at times competing, views of what 'design' actually is. Every experience of the design team is affected and mediated by relationships between design knowledge and the design social context. Despite recognition that different ways of describing design exist (Dorst & Dijkhuis, 1995, Dorst, 2008a, 2008b), the field still lacks an integrative sociological discussion of how knowledge, discourses and actors (that is, designers) are framed within the field of design.

Issues such as the structuring of knowledge, discourses and actors in educational and intellectual fields are the focus of studies in the sociology of education. According to the sociology of education, relationships exist between knowledge and its social contexts, which influence how the knowledge of a field is produced and transmitted in a learning context (Moore, 2004). Any learning context implicitly reinforces a set of 'codes' or 'rules' which express struggles for power within the field or discipline. These codes could be considered as the often unwritten 'rules of the game' (Bourdieu, 1983) which will need to be followed by anyone wishing to participate in the field or discipline. Thus, a key element for a meaningful or insightful learning experience in design is that learners are able to comprehend and produce design knowledge according to these implicit 'rules' of the design discipline in or about which they are learning. However, in the design educational context, this task may be very complex, because it may be affected by the diverse nature of the range of disciplines in the field.

The educational context also reflects debates existent within the intellectual field. That means within the educational context of a particular design discipline there may also exist a range of definitions for what constitute legitimate design knowledge and practices, and these disagreements will affect and influence how students understand a design discipline. Design learners may struggle to comprehend the values being emphasised within an educational environment that accommodates distinct ways of understanding design. For example, values may shift within a faculty or department of design depending on the disciplinary background of the lecturer in the room, which may mean competing assumptions or expectations from different

lectures. Design learners thus need to be made aware of what is expected from them in the specific learning context in which they see themselves.

Learning within the field of design, as in other fields, involves different dimensions. Educational theorists and psychologists investigate various aspects of learning such as cognitive, emotional and social (Illeris, 2002). Research in design is dedicated to similar topics, that is, design cognition (Cross 2004; Purcell & Gero, 1998), aesthetics and emotions in design (Crilly et al., 2004; Norman, 2002) or collaborative design (Kleinsmann & Valkenburg, 2008; Kvan, 2000). There is a lack of studies focusing on the relationships between design knowledge and its social context – that is, the implications of learning within the field of design (Chapter 2). When considering the social dimension of learning, behavioural aspects tend to be privileged (e.g. how people collaborate in design) over the social aspects in relation to knowledge (e.g. how design pedagogy expresses and reflects struggles for power within the field).

Within a museum's learning context, lay audiences are also affected by the way they interpret and differentiate design knowledge of the various design disciplines. Learners will bring to the museum environment their own ideas about what is considered meaningful and interesting in design, and may at times assume one set of values holds across design disciplines.

Therefore, there are two key issues to be addressed in this research:

(1) What are the bases of legitimate design practices and knowledges?
(2) How can the learning of these be facilitated in an informal learning context?

The thesis presents an investigation of the nature of knowledge within four design disciplines: engineering, architecture, digital media and fashion. The thesis also presents the development and implementation of Design Studio – a computer-mediated learning environment to support museum visitors' investigations of what is considered meaningful within the design field. Design Studio is aimed at situating the learner within the language of the field, while this learner undergoes the inquiry process related to the design of an object, within the museum context. Design Studio was implemented in conjunction with the Powerhouse Museum (Sydney, Australia). The collaboration with the Powerhouse Museum aimed to explore the use of mobile computing systems to enhance the learning experiences in the museum.

1.2 Research Questions

This thesis addresses the two main questions above through three sub-questions:

What are the bases of legitimate design practices and knowledges?

a) *Sub-question 1: How do designers perceive legitimate design knowledge and legitimate designers across the four design disciplines?*

b) *Sub-question 2: What strategies do designers use to recognise and realise legitimate practices of design in the four design disciplines?*

How can the learning of these be facilitated in an informal learning context?

c) *Sub-question 3: How can social realist principles be developed and implemented into the design of an e-learning environment?*

The first sub-question examines the nature of design knowledge through the perceptions of designers within engineering, architecture, digital media and fashion design. The second sub-question examines the nature of the strategies used by designers to recognise and realise legitimate design practices. These two sub-questions investigate what designers consider as legitimate design practices and knowledge. Sub-question 1 places an emphasis on the perceptions of designers about the discipline and other designers in his/her discipline, that is, how they 'see' their discipline and other disciplines. Sub-question 2 places an emphasis on the designer's own practices, that is, how they actually 'do' design.

The third sub-question examines a way to facilitate design learners' inquiry into the language of the design disciplines within a museum setting. The support provided is to be deployed via a technology mediated mobile system.[2]

1.3 Aims and Objectives

The primary aim of this research is to conceptualise what is considered legitimate design practices using engineering, architecture, digital media and fashion design as disciplines to compare differences. These four disciplines represent a range of positions within design. The

[2] In this thesis, the term e-learning environment is used to refer to this technology mediated mobile system.

research develops a way of supporting design learners' inquiry into legitimate design practices through an e-learning environment – grounded in concepts derived from the sociology of education – to experience design within an informal learning setting.

There are eight objectives in this research, which are related to the two research questions. The aims and objectives are:

Aim 1 - Identify designers' perceptions of legitimate design practices and legitimate designers across four disciplines of design: engineering, architecture, digital media and fashion

Objective 1. Identify the underlying principles structuring specialist knowledge within four disciplines of design (engineering, architecture, digital media and fashion).

Objective 2. Identify designers' strategies when inquiring into, and constructing, an image of legitimate design practices.

Objective 3. Propose a model to represent the underlying principles structuring specialist knowledge within the four design disciplines, and strategies used in the inquiry into legitimate practice within these disciplines.

Objective 4. Evaluate and adjust the model to represent the underlying principles structuring specialist knowledge within the four design disciplines, and strategies used in the inquiry into legitimate practice within these disciplines.

Aim 2 - Develop and implement an informal learning experience in design that incorporates legitimate design practices and knowledge

Objective 5. Define ways of supporting a design learning experience mediated by an e-learning environment and the museum setting.

Objective 6. Define requirements for an e-learning informal environment for experiencing design.

Objective 7. Develop and implement an e-learning informal environment for experiencing design.

Objective 8. Evaluate the design learning experience within the museum setting.

Figure 1.1 represents the research questions, aims and objectives of this research. The left side of the figure relates to the question: *What are the bases of legitimate design practices and*

knowledges? The right side of the figure relates to the question: *How can the learning of these be facilitated in an informal learning context?*

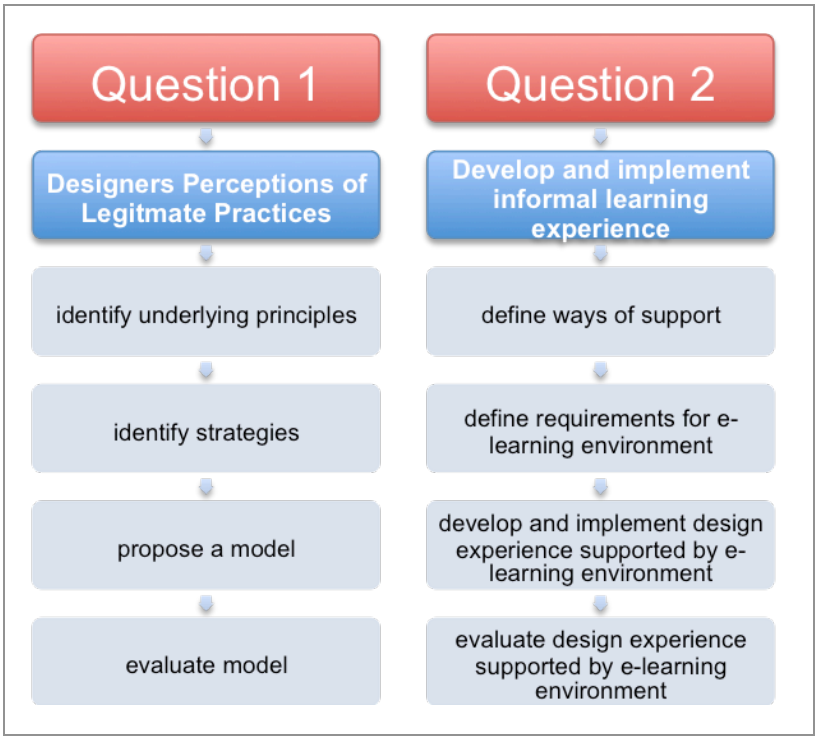

Figure 1.1 Two Research Objectives

1.4 Research Significance and Contributions

1.4.1 Sociological Analysis of the Design Field

Debates within the design field over what counts as design knowledge among its various constituent disciplines are a complex matter because 'design' includes the 'totality of disciplines, phenomena, knowledge, analytical instruments and philosophies that the design of useful objects must take into account' (Vitta, 1989, p. 31). The struggles to agree upon what counts as design knowledge and its cultural identity can therefore be perceived as affecting and being affected by a complex range of factors, including economy, production, social significance, consumption, use of objects, and so on. For designers, the diversity of what may be incorporated into the interpretation of design activities is overwhelming and its complexity may even prevent the realisation of the discussion of what is considered legitimate design knowledge.

In order to objectify these debates, this research contributes a sociological analysis of the underlying basis of achievement and membership within four disciplines of design. The research draws on social realist theoretical frameworks from the sociology of education (Bernstein, 1977; 2000; Maton; 2000; Moore & Maton, 2001) to examine how actors (designers), discourses and practices are specialised within the four design disciplines. Through the identification of the nature of design knowledge valued within engineering, architecture, digital media and fashion, this research shows how a meta-language is used to facilitate the discussion of what counts as knowledge in design, advancing the debate of the differences within and commonalities across the field.

1.4.2 A Bernsteinian Approach to the Research Process

According to Basil Bernstein, it is important to unambiguously acknowledge the relationships between empirical data and theory (Moore, 2004). However, there is a lack of research instruments to uncover the nature of knowledge within disciplinary contexts and tools to support their translation into an informal learning experience. Most studies detailing the process by which such connections are materialised are often carried out within formal educational settings or have curriculum examination as the primary focus of the investigation (Morais & Neves, 2001). Thus, the present research addresses this issue, contributing a detailed description of the development of empirical tools to support a research process directed toward studying informal learning of design.

The approach incorporates both qualitative and quantitative methods to produce and examine tools to be used in two different contexts. The approach discusses methodological implications through the lessons learned during the research, through the mapping of the theory and empirical data and in the development of the research instruments (e.g. the interview questionnaire and the survey protocol). The thesis presents and discusses the use of flash cards to facilitate the definition and discrimination of semantic terms used to characterise the theoretical concepts as they are deployed into the research.

1.4.3 Embedding Social Realist Principles within an E-learning Environment to Experience Design

Museums of design display design knowledge and objects and are sites in which lay audiences engage in informal discoveries in design. While most educational software for inquiry-based learning tend to focus on in-school education, little attention is being paid to how these types of software may support learning within informal settings (Sefton-Green, 2004). Design Studio was designed as a way to address this gap. That is, Design Studio is a technology-mediated informal learning environment facilitating the experience of design within a museum setting. The software is grounded on social realist principles.

Design Studio incorporates in its framework Basil Bernstein's concepts of 'classification' and 'framing' (1977, 2000) and Karl Maton's concepts of 'legitimation codes of specialisation' (Maton; 2000; Moore & Maton, 2001). These sociological concepts, combined with the empirical results of the research, were used to support instructional purposes within Design Studio. Through interaction with Design Studio and the museum surroundings, visitors are exposed to and supported in investigating the relationships between design knowledge and its social context. That is, learners are exposed to different ways of inquiring into design practices – via interactions with the museum collection, with peers or other visitors, with online resources and others – learners consider different aspects of the design of an object of their choice.

Design Studio accommodates different options in the way the design experience may occur, allowing the learners a degree of autonomy. Museum displays are used as resources to mediate the learning experience and museum visitors learn design by designing, by experimenting with design, by exchanging ideas about design, and by experiencing design within an informal learning environment.

1.5 Structure of the Thesis

Chapter 2 develops the thesis argument, focusing on how learning experiences in design need to support learners in the recognition and realisation of the language of the field. The chapter discusses the importance of learners comprehending what the 'rules of the game' are in the given learning context in which they see themselves. Basil Bernstein's theory contextualises the

relationship of knowledge and the social context in which it occurs. Legitimation Code Theory is discussed as a framework for uncovering the underlying principles structuring what are considered legitimate knowledge and knowers within the four design disciplines. In other words, Legitimation Code Theory provides the lens to identify the 'rules of the game' within engineering, architecture, digital media and fashion. Additionally, Chapter 2 discusses learning within the informal learning context of a museum, and the use of computer-supported learning environments to situate learners within a sociological context of a design discipline. Chapter 2 briefly reviews computer-supported learning systems in the literature, which contributed to Design Studio's structure.

Chapter 3 discusses the methodology, design and procedures used in the research process. The chapter presents a Bernsteinian approach to the development of empirical tools to support the practical application of the theoretical concepts.

In order to conceptualise what is considered legitimate design practices, a two part exploratory study was conducted involving interviews and a survey. Chapters 4 and 5 present the results of this exploratory study, which analysed the nature of knowledge within engineering, architecture, digital media and fashion. Chapter 4 discusses results from ten in-depth interviews. These included two designers from each design discipline. The interviews focused on designers' perceptions of the design disciplines, of other designers, and which strategies they use to recognise genuine design. The interviews additionally included two staff members from a museum of design, focusing on learning design within informal settings. Chapter 5 broadens the discussion of the nature of knowledge within the four design disciplines with the results from an online survey with 139 participants. The participants were comprised of design professionals, design tertiary students and design academics. Based on these interviews and surveys, a framework representing the perceptions of the design disciplines, designers and strategies used to identify legitimate design is then proposed.

Chapter 6 details the development of Design Studio, focusing on how theoretical concepts and empirical results were embedded into the structure of the e-learning environment. Chapter 7 discusses a design experience at the Powerhouse Museum, reporting on Year 10 students' experiences at two workshops offered at the Museum. Chapter 7 also analyses students'

perceptions of the four design disciplines in the study, as well as their interaction with Design Studio and the museum surroundings.

Chapter 8 presents an overview of the thesis and discusses the limitations of the research. The chapter reviews the effects of the differing values in the nature of knowledge within design. The chapter suggests implications of this research within design education, for formal and informal learning, and within computer-supported learning environments. The thesis concludes by establishing the future directions of this type of research work.

CHAPTER 2 - LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter reviews current research literature that contributes to the understanding of what are considered legitimate design practices and knowledge, and how the learning of these can be facilitated within a museum setting. The chapter reviews literature from the design field, museum studies and computer-supported learning systems, such as inquiry based e-learning environments. The chapter also discusses theoretical frameworks that contributed to the development of this research's conceptual base, focusing on the sociology of learning within the field of design. Firstly, the chapter commences by showing that, within the design field, competing perspectives exist about what constitutes valuable design activities and the form of knowledge required to undertake them. Secondly, the chapter presents Basil Bernstein's concepts about the social structuring of knowledge within learning contexts in general, and discusses the existence of implicit agreements within different disciplinary contexts. Bernstein's theory is used to explain how the competing perspectives within the field of design can be seen as shaping and reflecting professional and educational aspects within each design discipline, and in consequence, affect learning in/about design. Thirdly, Legitimation Code Theory (LCT) is reviewed as a theoretical framework to analyse the sociology of the four design disciplines investigated in this research. Fourthly, the chapter proceeds by examining implications of learning within a museum context. Fifthly, the chapter discusses the embedding of the sociology of learning in design into computer-supported learning environments, examining environments that contributed to the development of Design Studio. The chapter concludes by summarising the review of the literature and the theoretical frameworks that informed the development of this research.

2.2 What is Legitimate Design?

For the purposes of the current research, design is about transforming knowledge and ideas into a material product. As a field, design encompasses many disciplines (e.g. engineering, architecture, fashion design and others), is constantly evolving and has a range of newly emergent 'multi-disciplinary' areas (e.g. interaction design, experience design, sustainable design and others). Different designers may be seen as employing similar processes when designing and, within the design field, there are forms of knowledge that are considered as being "special to the awareness and ability of a designer, independent of the different professional domains of design practice" (Cross, 2004, p. 54). Design professionals in general are said to "hold a different system of constructs through which they understand and evaluate the environment" (Wilson, 1996, p. 33). Nevertheless, disagreements also exist within the field about the nature of the knowledge needed to design and what the 'right' kind of knowledge is. Designers within different design disciplines do not necessarily possess the same values, and different groups may define what they consider to be legitimate practices in different ways. That is, design disciplines (or groups within a discipline) may possess their own implicit shared understandings about what is considered interesting and/or meaningful within their particular discipline. Disciplines may thus have their own (often unwritten) 'rules of the game', which regulate the basis of membership and achievement within that discipline.

Designers within the disciplines debate about what counts as knowledge (e.g. empirical evidence, first-person accounts) and what displays of knowledge distinguish them. These debates are reflected within the design literature and can be seen in studies examining how designers learn and practice design (Dorst & Dijkhuis, 1995; Dym, 2006; Papanek, 2001; Schön, 1983, 1987, 1988; Sheppard et al., 2006). Such debates reflect and shape the crucial struggles that the design field faces, thus affecting designers, particularly because of the intensifying demands and expectations of multi- and/or inter-disciplinarity, in which collaboration is considered as imperative (Kvan, 2000). To illustrate this point I shall compare studies of two disciplines: engineering and architecture. For example, Sheppard et al. (2006) described engineering practice as involving "complex, thoughtful and intentional integration" (p. 435) of problem solving processes and specialised knowledge. Engineering knowledge is described as

continually evolving and a field where new knowledge is grounded on previous experiences and added to the engineering community's knowledge base. In fact, "knowledge can be thought of as an essential and highly desirable secondary product of work" (p. 433). Dym (2006) reports that most of the content presented in the engineering curriculum continues to place emphasis on mathematics and sciences, with students being encouraged to "apply scientific principles to solve engineering problems, using systematic questioning to analyze constrained situations" (p. 423), with an emphasis on the importance of reaching verifiable solutions. These quotes illustrate engineering design knowledge perceived and described as an object: that is, a 'secondary product of work'. Design learners of engineering are taught in a systematic way, to practically apply scientific knowledge to solve problems.

In contrast, Schön's accounts of architectural design learning places emphasis on developing personal and social dispositions (1983, 1987). By analysing design professionals and others, Schön examined the relationship between practice competence and professional knowledge, and argued for the importance of learning in action and learning by doing. The way one constructs design knowledge is compared to an 'art'. The development of the 'artistry' of professionals, or how such art could be acquired, is considered to be a process similar to studios and conservatories. For Schön, professional artistry depends on the:

> freedom to learn by doing in a setting low in risk, with access to coaches who initiate students into the 'traditions of the calling' and help them, by 'the right kind of telling', to see on their own behalf and in their own way what they need most to see (Schön, 1987, p. 17).

In contrast to engineering design, there is an emphasis here on developing particular dispositions in the learner, orientations towards particular ways of practising design. The learning process includes the guidance of a coach, who is a person prepared to help students by 'the right kind of telling', in which the objective is to develop or to awaken the learners' own sensibility. Schön's accounts draw attention to the idea of coaching, in which the instructor would act as facilitator guiding the learner in constructing their own learning, their own inquiry (1983, 1987). This 'studio' type of instruction is present in most schools of architecture (Goldschmidt, 2003) and requires an 'intuitive behaviour of instructors'. One of the assumptions made in the studio scenario is that students eventually "absorb knowledge as well as attitudes

and values that are transferred through desk crits[3] (and reviews) into their knowledge structures" (Goldschmidt, 2003, p.6).

The many ways of describing design have been discussed by Dorst (Dorst & Dijkhuis, 1995; Dorst, 2008a, 2008b). Dorst compared Simon's rational problem-solving paradigm (Simon, 1995, 1996) with Schön's reflective practice approach (Schön, 1983, 1987). Whilst acknowledging its complexity, Simon described design as "inherently computational – a matter of computing the implications of initial assumptions and combinations about them" (Simon, 1995, p. 247). In contrast, Schön's views place an emphasis on the inherent complexity of design and regard purely rational approaches with their reductionist tendencies and emphasis on quantitative data as unable to cope with the realities of design in practice. For Schön, the 'reflective practitioner' must apply knowledge and experience to each unique circumstance.

Design academics are aware of the existence of differences in the interpretation of design activities and the knowledge required to undertake them. For example, Papanek (2001) differentiates between those designers who aim for a design process that is more methodical, scientific, conventional and computer-compatible or those who follow a process that embraces "feeling, sensation, revelation and intuition" (p. 56). Such differences have been categorised in terms of arts versus sciences, qualitative versus quantitative, and rational versus reflective (Dorst & Dijkhuis, 1995; Dorst, 2008a, 2008b). These differences in the way designers practise design are a reflection of the various values, beliefs and mores held by a design discipline. Strickfaden et al. (2006) described these as part of the 'culture medium', or the seedbed for concept generation and for design. These values and beliefs function as structuring principles of a discipline, generating and organising design practices. They become internalised codes, or part of what in sociology is referred to as the 'habitus' (Bourdieu, 1983) of designers that enable them to successfully operate within the 'rules of the game' of a design discipline. If designers are working to a set of 'rules' that guide their practices, then how knowledge is put to use to practise design within a discipline is premised on what counts as knowledge and what counts as recognisable design practice within the discipline. What designers do to make their activities

[3] The term 'desk crits' or 'desk critiques' is used in architecture education to refer to studio sessions of critique of student's work. 'Desk crits' often involve one-on-one interactions between an instructor and a student.

ontologically described as architectural design or engineering design is to follow the internalised codes, or to perform activities according to the unwritten rules of the discipline. Thus, the ways designers practise design are a reflection of the underlying principles regulating a design discipline. Simultaneously, the ways designers practise design also shape and reinforce these underlying principles regulating a design discipline.

The problem with current research literature analysing the design field is that their focus is often limited to the surface level of design practices. While various researchers may recognise and discuss the existence of differences in the ways of describing and practising design (Dorst & Dijkhuis, 1995; Dorst, 2008a, 2008b; Papanek, 2001), they often offer only limited explanation for these differences in the field, and lack the examination of the various forms of knowledge taken in the field of design, in an objective manner. The field's debate about what characterises legitimate design is manifest through disagreements over what should count as relevant within and amongst the design disciplines and their practitioners. The core of this debate, however, is not located on the surface-level of the specific sets of content knowledge required to design in engineering or architecture. Its essence is deeper, in the 'form' taken by the knowledge that is valued, cultivated and more generally emphasised within a discipline. What form of knowledge is being valued or emphasised is a consequence of implicit social agreements as to what counts as knowledge that leads to organising principles around the formation of design disciplines as practicing versions of design. These practicing versions of design may, in turn, exhibit what is ultimately labelled as scientific or artistic sensibilities. Fundamentally, the debate is not over what the content of design is; rather the debate is over what form of design knowledge is valued.

Designers often will use intellectual resources within the field to engage in these discussions, and the competing definitions of design become both the terrain over which the struggles are fought as well as the resources used in those struggles. Designers tend to interpret the field using, as a reference, how they practise design, looking at the field from where they are positioned within it, using their own situated viewpoint to shape their analysis of the field (Bourdieu, 1983). Thus, the ways in which the debate have been cast are surface features of a more fundamental difference in the underlying structuring principles of the disciplines of design.

Specifically, the differences in the ways of describing design emanate from differences in the underlying bases of knowledge. Consequently, designers struggle to reach a common shared interpretation of what design knowledge is, a struggle that is aggravated by the fact that the field is continuously evolving and expanding into new dimensions, in both practice and understanding (Buchanan, 2001).

To understand what is considered legitimate design, or what design knowledge is, it is necessary to view the field afresh, from a perspective that is not associated with any specific position within the field but rather objectifies the field. This research examines the design field through the lens of social realist approaches from the sociology of education, specifically Basil Bernstein's theory of pedagogic discourse (1977, 2000) and Legitimation Code Theory (Maton, 2000; Moore & Maton, 2001).

The research herein hypothesises that design practitioners and design educators are reproducing and potentially changing knowledge as established by the specific disciplinary group to which they belong. Their practices are considered to reflect and shape how design knowledge is specialised within the various design disciplines. Therefore, the debate about what is design knowledge is not restricted to design professionals' practices; instead, it also resonates and has an impact on the educational arena. How designers perceive knowledge (and determine what type of knowledge is valuable) in their discipline is crucial within design education. In order to become a designer, one needs to learn the 'rules of the game' within the discipline, that is, how to 'recognise' and 'realise' the relevant meanings particular to a design discipline (i.e. what knowledge is valuable within this context). This recognition and realisation is essential, allowing the learner to 'communicate' or practise design according to what is expected in the given context (Bernstein, 2000). The next section describes principles derived from Bernstein's theory, contextualising the theoretical assumptions underpinning this research. The subsequent section discusses the use of Legitimation Code Theory to understand differences within the various disciplines of the field of design.

2.3 The Sociology of Learning in Design

To learn a professional trade, besides learning specific procedures to perform, one has to learn the 'rules', 'processes' and 'language' of the field (Maton, 2009). These implicit processes underlie the professional practice of a discipline, affecting who is viewed as having insight, who is entitled to participate in the profession, whose voice is more legitimate, and so on. The understanding of such principles is essential because it is through these that the professional, as a member of a disciplinary group, will establish a sense of what is a legitimate practice in a given field. Thus, learning in design is permeated by implicit values structuring design knowledge and its social context within the various design disciplines.

In order to be part of a design discipline, the design learner will need to recognise what constitutes a valuable or original design contribution, whether a particular design journal is significant reading, or if a certain design professional is really worthy of attention. The learner is a newcomer entering an established social group, and, to produce design work according to what is expected within that particular group, the learner needs to understand how the current members of a design discipline identify meaningful and/or genuine design, that is, what are the 'rules of the game' within that discipline. Through design education and socialisation into the discipline, the learner is exposed not only to the content of a design curriculum, but fundamentally the learner experiences the structuring of the relationships within the content. Moreover, learners will bring their own ideas and expectations of how the discipline they are entering into operates, which may be more or less accurate, but will nevertheless contribute to the learners' understanding of the discipline.

The research herein examines the relationships between design knowledge and its social context through theoretical concepts derived from Bernstein's theory of pedagogic discourse (1977, 2000) and Maton's Legitimation Code Theory (Maton, 2000; Moore & Maton, 2001). These social realist approaches consider knowledge as social at the same time that they allow for knowledge to be understood as an object (Moore, 2004). These theoretical concepts can be used to examine the different forms that knowledge may take in different disciplines and beyond academia, and to analyse their effects.

Bernstein's theory of pedagogic discourse examines its various practices, focusing on analysing the underlying rules that shape their social construction (Bernstein, 1977). Bernstein's theory considers pedagogic practice in a wide context, which is not limited to the classroom setting of formal educational institutions. It includes relationships present in any social context in which cultural production-reproduction occurs. A pedagogic context is defined as any context in which transmission, acquisition and evaluation of any form of knowledge takes place (e.g. family, school, museum). The components of a pedagogic context include three sets of categories, which are represented by:

(1) actors (e.g. students, teachers, mother, child, friend, designer);

(2) spaces or agencies (e.g. student's space, teacher's space, exhibit's space, or school, family, museum)

(3) discourses (e.g. academic or non-academic, within a discipline, or between disciplines)

In the mid 1960s and 1970s, Bernstein analysed forms of communication within schooling and curricula, theorising that these forms of communication could be considered as instruments that facilitated class reproduction. Bernstein's theory considers that the way knowledge is put together and circulates follows underlying social rules, which reinforce class structures, thereby strengthening the distribution of privilege for the dominating classes. For Bernstein, people's speech comes as a response to strong cultural pressure (1977, 2000).

Within his theory, Bernstein conceptualised how, in order to produce legitimate forms of communication, the learner first needs to identify (or 'recognise') the relevant meanings to the context one is in to produce texts and communicate (or 'realise') according to what is expected within the context. In design education, this means that design learners will first need to identify what are the 'rules of the game' within the disciplinary group they are entering. These rules include what counts as special or interesting, and what these learners should pay attention to in order to be able to communicate according to the expectations of that specific design discipline. Learning in design therefore involves much more than being acquainted with design theories or principles. According to Bernstein, learning in design would consist of more than being proficient in specific procedures, design processes or having skills and knowledge of the technology available to design. Learning in design would involve understanding the implicit

meanings and values of the particular design discipline in which a person is interested. The learner would need to recognise the 'unwritten rules of design' when learning in/about design within a formal educational setting as well as within an informal learning context (such as a museum).

The concepts of 'classification' and 'framing' were developed by Bernstein (1977) as codes to analyse relationships of power and control within a given pedagogic context. Bernstein conceptualised that relationships of power affect symbolic boundaries existent 'between' different categories of actors, discourses and social groups. Thus, for Bernstein, power relations influence the way knowledge is generated, legitimised and reproduced within a pedagogic context. In addition, control relations define the legitimate forms of communication 'within' these categories. These relationships of power and control are expressed through the concepts of classification (C) and framing (F), and their particular strengths.

The strengths of classification relate to the 'permeability' of the symbolic boundaries 'between' the categories or contexts. Thus, classification, relates to how knowledge is organised (e.g. academic subjects in a curriculum), expressing the power of a category in maintaining its knowledge. Stronger and weaker values may be assigned for classification (+C or –C) depending, for instance, on the degree of differentiation of disciplines in a curriculum. A more integrated curriculum would show weaker classification.

The strengths of framing refer to the degree of control 'within' the categories or contexts; it relates to how communication takes place (e.g. between 'teacher-student'). Control over communication can be in relation to the selection of communication, its sequencing, its pacing, the criteria used for evaluation, and the context in which it is taking place (Bernstein, 2000). Stronger and weaker values may be assigned for framing (+F or –F) depending on whether the transmitter or the acquirer of knowledge is in (perceived) control of the communication.

Thus, classification establishes and regulates power relations, while framing regulates the principles of practices, which in turn maintain power relations. However, for Bernstein, a change in the form of control may not necessarily cause a direct change in power relations, and vice versa. This is due to the existence of different principles of control in any given structure of

power relations. Consequently, there are four possible modalities for the 'code', expressing the strengths of both classification and framing, which may vary independently of each other. The relative strengths of classification and framing are represented by '+' if stronger and '-" if weaker. Thus, Bernstein's four modalities of codes are represented as: +C+F; +C–F; –C+F and –C–F.

Bernstein's theoretical principles rigorously underpinned his own research methodology, expressed through the concept of 'languages of description' (2000). 'Languages of description' describes two types of languages in theory and research, and is defined as a "translation device whereby one language is transformed into another" (2000, p. 132). Bernstein makes a distinction between an internal language of description (L1) – or the principles for what counts as significant empirical relation within the study – and an external language of description (L2) – or the principles for how concepts manifest in the study, how concepts relate to the empirical data, or how concepts are operationalised. The importance of laying out these principles, making them explicit, is that it facilitates the research process by allowing the specification of 'what in the world' objectively relates to terms and operations in the theory (Moore, 2004). Within the research context, this means that the researcher will need to develop systematic instruments, which will map the theory to data and vice versa in such a way that the theory 'recognises' its concepts in the world, and the world 'declares' itself to the theory (Moore, 2004).

Bernstein's theory (1977) offers a way to analyse knowledge and education. Bernstein's concepts are yet to be applied within the design field, although they have been explored within several empirical studies in the literature, analysing relationships of power and knowledge within various educational contexts (Botelho & Morais, 2006; Maton, 2009; Morais & Neves, 2001; Rifa & Hernandez, 1997). The application of Bernstein's concepts to analyse the design field may offer insights into why certain design disciplines may appear unappealing or unachievable to some, and why some students may encounter more difficulties than others in understanding the 'unwritten rules' of a design discipline.

Bernstein's theory underpins the theoretical concepts of this research, to investigate how design practitioners and educators are reproducing knowledge as established by the disciplinary group to which they belong. Therefore, the practice of designers and design

educators are seen as reflecting and shaping how design knowledge is specialised in the four design disciplines. From this initial hypothesis, a second assumption is made: by examining designers' discourses about their own practices and the practice of their peers, it is possible to identify what type of knowledge is being valued within a particular design discipline. Bernstein's code theory provides tools to analyse educational practices, enabling knowledge to be seen as an object of study (Maton & Muller, 2007). However, as pointed out by Maton (2009), Bernstein solely focuses on the structuring of knowledge, missing a second dimension also present in any social field of practice: the structuring of knowers. Consequently, although Bernstein's code theory offers useful means to analyse educational fields in which knowledge is explicit, its application becomes less straightforward within fields where knowledge is less explicit. Therefore, Maton proposes that the analysis of knowledge and practice should encompass both dimensions, and the coding of classification and framing should be considered in relation to both knowledge and knower structures. Maton (2009) argues that in a context where knowledge is strongly bounded and controlled, the basis for legitimacy may clearly rely on the possession of knowledge (e.g. emphasis is on 'what' one knows or 'how' one knows), and particular dispositions of actors are less relevant. In this case, knowledge structures would be perceived as +C+F, but knower structures would be –C–F. Conversely, contexts where boundaries are blurry, and with weaker control, legitimacy is more likely to rely on the dispositions of actors (e.g. emphasis is on 'who' knows), placing less importance on 'what' exactly is known. In this case, while knowledge structures may be perceived as –C–F, knower structures would be +C+F. Thus, Maton expanded Bernstein's theory by proposing the Legitimation Code Theory (LCT) as a framework to analyse how 'knowers' are specialised, in addition to how 'knowledge' is specialised within intellectual and educational fields (Maton 2000; Moore & Maton, 2001). For this present study, these two dimensions proposed by Maton were relevant, particularly because the design field incorporates a diverse range of disciplines. This diversity means that in some disciplines knowledge is more explicit than in others.

In order to analyse the structuring of knowledge and practices within the design disciplines, the research herein applies Legitimation Code Theory (Maton, 2000; Moore & Maton, 2001). The next section describes LCT and its application within the design field, particularly to address the

two research questions in this thesis: *What are the bases for legitimate design practices and knowledge?* and *How can the learning of these be facilitated in an informal learning context?*

2.4 Legitimation Code Theory (LCT)

Legitimation Code Theory is a theoretical framework that integrates insights from the approaches of Pierre Bourdieu and Basil Bernstein (Maton, 2000; Moore & Maton, 2001). LCT views educational fields as fields of struggle, in which knowledge and practice embody competing claims for legitimacy, or what the measure of achievement is to be in a given field. For LCT, knowledge and practice are conceived as 'languages of legitimation'. These languages can be analysed through the 'legitimation device', which is comprised of five dimensions: Autonomy, Density, Specialisation, Temporality and Semantics (Maton, 2005, 2009). Each dimension of LCT can be used independently, the choice depending on the object of study and research questions. The research herein draws on one of these dimensions, Specialisation, because the research focus is on the basis of what makes something special of worthy of status within the design field. Such issues are conceptualised through LCT(Specialisation), and this theoretical framework allowed for the analyses of knowledge claims and practices within the field of design.

LCT(Specialisation) is concerned with "what makes actors, discourses and practices special or legitimate" in a given context (Maton, 2007, p. 98). LCT(Specialisation) argues that the basis for legitimacy rests on the 'knowledge' or skills that are valuable to know and on 'who' is an ideal actor, within the given context. In other words, LCT(Specialisation) views every practice or knowledge claim as made by 'someone' (the subject) and being about 'something' (the object). Thus, for LCT(Specialisation), knowledge claims and practices are comprised of two relations: the epistemic relation to the object; and, the social relation to the subject, author or actor. The framework develops four possible codes in which the epistemic and social relation are expressed. Different practices may emphasise these two relations differently, and, as a result, they may be represented as being stronger or weaker along a continuum of strength. Knowledge and practices can be seen as specialised by the epistemic relation, by the social

relation, by both or neither. Their specific structure would vary depending on the field or discipline.

The analysis of the 'languages of legitimation' will identify the 'legitimation codes', that is, the underlying structuring principles of a given field (Maton, 2000). Using the concepts of classification and framing of knowledge, stronger or weaker values may be assigned to the epistemic relation (ER +/–) and for the social relation (SR +/–), with classification and framing of knowers (Maton, 2000; Moore & Maton, 2001). As a result, LCT(Specialisation) proposes four codes: 'knowledge code' (ER+,SR–), 'knower code' (ER–,SR+), 'elite code' (ER+,SR+) and 'relativist code' (ER–,SR–). Figure 2.1 shows a representation of the legitimation codes (Maton, 2007), where the X-axis (abscissa) represents values (+/–) related to the strengths of epistemic relation, and Y-axis (ordinate) represents values (+/–) related to the strengths of social relation. Thus, each quadrant of the model corresponds to a specific LCT code.

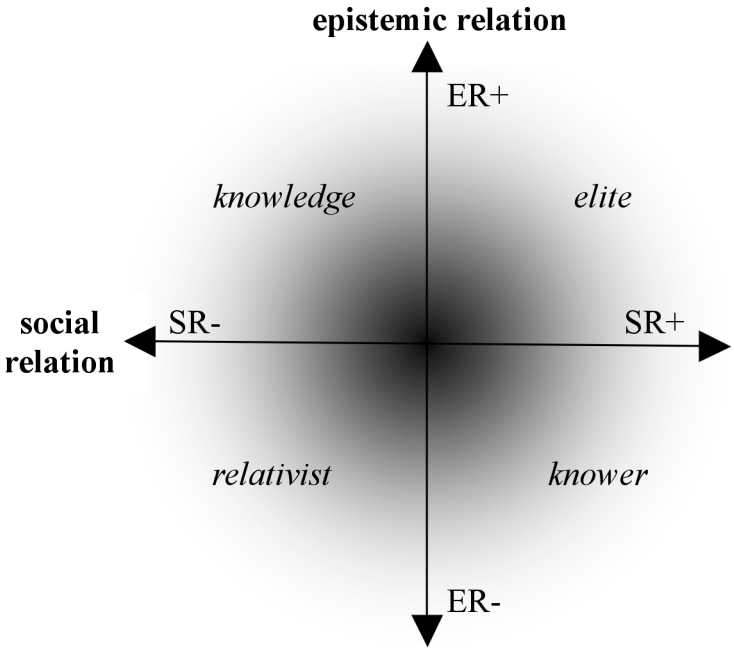

Figure 2.1 Legitimation Codes of Specialisation (Maton, 2007, p. 97)

The knowledge code emphasises procedures appropriate to an object, while the knower code, emphasises personal characteristics or the background of the author. The elite code emphasises both the possession of specialist knowledge in addition to the 'right kinds' of dispositions, whereas in the relativist code neither knowledge nor dispositions are required: 'anything goes' and nothing in particular is perceived as being of fundamental importance in

order to succeed in a given discipline or field. Table 2.1 summarises the codes and their relations to Bernstein's concepts of classification and framing.

Table 2.1 Legitimation Codes & Classification and Framing

LCT code	Emphasis on	Epistemic Relation (ER) (Relations to knowledge)	Social Relation (SR) (Relations to knower)
Knowledge (ER+SR–)	Specialised knowledge, skills or techniques	+C+F	–C–F
Knower (ER–SR+)	Dispositions (natural or cultivated) related to social background	–C–F	+C+F
Elite (ER+SR+)	Specialised knowledge and "right kinds" of dispositions	+C+F	+C+F
Relativist (ER–SR–)	Neither knowledge, nor dispositions (anything goes)	–C–F	–C–F

These legitimation codes conceptualise the 'rules of the game', which are the dominant bases of success in any particular social context. Within any context, a specific code may underpin the unwritten 'rules of the game', but there may be struggles over which code is dominant, resulting in a 'code clash'. It should be emphasised that there is always an epistemic relation to an object and a social relation to a subject; that is, there are always both knowledge and knowers. LCT(Specialisation)'s focus is on which of these is emphasised (knowledge and/or/neither knowers) in practices and knowledge claims. In other words, LCT(Specialisation) explores whether the rules of the game are such that what matters is: one's demonstrated possession of specialist knowledge (knowledge code); one's sensibilities, attributes and dispositions (knower code); both (elite code); or neither (relativist code). This framework has not been applied within the design field, but is currently being used in a range of empirical studies of educational issues (e.g. Doherty, 2008; Lamont & Maton, 2008, 2010; Luckett, 2009; McNamara, 2009; Shay, 2008).

This research applies LCT(Specialisation) to analyse the perceptions of design knowledge and knowers within the four design disciplines being investigated: engineering, architecture, digital media and fashion. The research explored the use of LCT(Specialisation) within different methods (in-depth interviews and survey) and at different stages of the research: in the exploratory investigation of the four design disciplines (Chapter 4 and Chapter 5) and in the

practical implementation of Design Studio (Chapter 6). The research considers e-learning environments as 'pedagogical contexts' (Bernstein, 2000), in which instructional designers and other stakeholders involved in the development of a system would be the 'transmitters', and the learners or users of the system would be the 'acquirers'. Thus, in the practical implementation of Design Studio, Bernstein and LCT(Specialisation) theoretical concepts are used to generate the design of the e-learning environment (Chapter 6).

LCT(Specialisation) has been used primarily within formal educational contexts (for instance, to examine school curricula), but has not yet been applied in connection to informal learning settings or to the development of e-learning environments. The next section discusses learning aspects related to informal learning contexts, specifically museum contexts.

2.5 Learning Design within the Museum Context

Educational theorists define 'learning' in a number of ways. Bandura's social cognitive theory argues that learning is mediated by people's observation, imitation, and modeling of one another (Bandura, 2001). Illeris (2002) considers learning as a process, simultaneously involving a cognitive, an emotional and a social dimension. The cognitive dimension refers to the process of acquisition of content (e.g. a skill or meaning), in this case the term cognitive is used to encompass both knowledge and motor learning. The emotional dimension refers to the psychodynamic process involving feelings, emotions, attitudes and motivations, all of which will be conditions for and influenced by the learning. The social dimension refers to the person's interaction with his/her surroundings, and it also encompasses the learner's dependency on historical and societal conditions. Therefore, the social dimension will also involve the particular disciplinary context in which the learner is situated.

Both Bernstein's theory and LCT offer conceptual tools to objectify the analysis of how the disciplinary context may influence, reflect and shape learners' experiences, pedagogical principles, and professional practices – and its effects on how knowledge is produced and reproduced. These conceptual frameworks are used to understand aspects primarily connected to the social dimension of Illeris' model. However, even if analytically it is sometimes possible to

focus on separate parts of the learning process or on only one of the three different dimensions, it is important to acknowledge that these dimensions are interconnected.

Learning can therefore be understood as combining both direct and indirect social interaction, and also an internal psychological acquisition. In other words, learning involves both individual and social aspects. While in a social level, learners share and interact with others (and the environment) mostly through language (Vygotsky, 1978; Wertsch, 1993), at an individual level, reflection will play a crucial role. It is through reflection that the learner assimilates and processes the learning potential of a given setting, as well as directs her/his actions within the experience (Boud, 1991; Schön, 1983). Even though learners may not be fully aware of the process, learning is more likely to happen when an increased awareness of the learning process is in place. As pointed out by Boud:

> a greater awareness of what is happening in, and a more deliberate interaction with the learning milieu will provide greater opportunities for a more fruitful learning experience (1991, p. 19).

The setting of the learning experience will also affect and influence learners. For example, assumptions and expectations of a student within structured formal educational settings (e.g. schools or universities) may differ from what is expected within non–formal or informal learning contexts (e.g. a museum or zoo). Learners will conceive the learning experience according to their assumptions of what is expected from them within the specific learning context.

Museums are often regarded as settings for informal learning where audiences are offered opportunities to engage in a range of learning experiences as they interact and read about museum objects and exhibitions (Roberts, 1997). Informal learning has a free–choice character with an emphasis on the experience rather than content. Its routes are in experiential learning, which defines learning as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 41). Experiential learning assumes that learning may take place anywhere or at any time, and the environment will only be activated as a learning setting by the learner, his/her interactions, and his/her construction of the experience (Kolb, 1984; Boud, 1991).

In the early 1980s, a trend emerged for exploring the educational possibilities within the museum experience, which affected the process of exhibit making (Roberts, 1997). During this period, exhibit teams started to include educators alongside curators and designers, evidencing the educational character of the museum experience. Nowadays, museum environments are studied as complex and challenging settings, where visitors may potentially experience a mix of educational, social, and leisure time (Allen, 2004, Briseño-Garzón et al. 2007; Cosley et al., 2008; Falk, 2004; Knutson & Crowley, 2005). It is evident that researchers and museum staff need to investigate the nature of the visitors' experience in order to develop meaningful exhibits (Falk & Dierking, 1992; Falk, 1998). In recent years, Grek (2005, 2007) suggested that a new emphasis is being placed in the museum's educational role, and these settings can no longer be seen as providing a-historical or a-political learning experiences. Instead, museum education is seen as being affected by political, economic and educational agendas.

For the present research, exhibitions that may facilitate and support social and collaborative museum experiences are particularly important (Hall & Bannon, 2005; Heath et al., 2005). For example, research developed by Heath et al. (2005) focused on analysing the conduct and interaction of visitors with exhibits as well as around exhibits in various museums and galleries by examining the use of technologies to instigate visitors' engagements. Their findings suggest a number of issues that need to be addressed in such contexts, or when designing for 'interactivity'. Firstly, it is important to recognise the significance of social interaction in people's experiences of exhibits and exhibitions, because visitors usually come to museums and galleries with companions and are often aware of others who happen to be sharing the exhibit space. Secondly, it is important to create spaces for sustained interaction with and around exhibits where participants can shape and re-arrange the experience of others. Finally, an inclusion of spaces for individual and private participation with exhibits in such a way that individual visitors do not miss out on exhibitions designed for groups.

The problem faced by museums is how to create such interactive spaces. Difficulties include not only the design of the technology or interfaces to support social interaction and collaboration, but also the organisation of settings to encourage them (Heath et al., 2005). The result is that most visitors' experiences still follow the model of variances of 'displaying written

information about design', and interactivity is often given by a 'click here and see what happens' rule. Under the Illeris (2002) model, it seems that such museum contexts continue to assume a two-dimensional perspective in which the cognitive and perhaps the emotional dimension prevail, whereas the social dimension is non-existent. Despite museum studies showing how learning and cognitive development are affected by people's engagement in social interaction and discussion, the importance of such socio–cultural theories are often neglected in these environments (Heath et al., 2005). As pointed out by Heath et al. (2005), even though people are rarely alone in a museum or gallery context, the prevalent stereotyped perception is still a romantic one of the lone visitor who wanders through exhibitions and eventually has 'the greatest' insight.

Museums of design need to find ways to support learning experiences that encourage social interactions and that are grounded on the learner's historical and societal conditions. This is a dual challenge because it includes questions of:

(1) how to broaden visitors' experience from merely reading information about design (and/or how people design) to providing an opportunity to experience design, and

(2) how to take a social perspective into this experience

The present study theorises that such challenges could be addressed by a design experience that encompasses active interaction with others, in an environment that promotes or encourages insights into the underlying values structuring design knowledge in our society. The visitor (as a design learner) should be stimulated into their own investigation of what is involved in designing an object, by discussing and considering what needs to be taken into account when designing a product. Furthermore, visitors should be given opportunities to reflect on their own emergent design ideas as well as on how these relate to how design professionals evaluate their ideas, how they incorporate different points of view, how they challenge and question their own design work and those of others. In such an environment a social perspective is incorporated to allow visitors to experience design, rather than to merely read about it. The next question posed is, therefore, what tools can be used to facilitate such a design experience? The next section reviews literature about computer-supported learning environments that influenced the development of Design Studio.

2.6 Using Technology to Mediate a Design Learning Experience

Sefton-Green (2004) conducted a review of informal learning and the use of technology outside schools and identified that little research is being conducted in regard to how Information and Communication Technologies (ICTs) promote informal learning in general. Nevertheless, the use of computers and other technology-supported devices in informal learning is a substantial area for investigation, and the present research addresses this gap, by focusing on computer-supported learning environments (or e-learning environments) that use an inquiry-based framework. The research herein focuses on e-learning environments that facilitate learning design within the informal context of a museum, with an emphasis on investigating:

- how such environments may be used to express the language of a design discipline and,
- how design learners may be offered opportunities to experience the different 'codes' - of the four design disciplines in the study - as they engage in designing.

In the late 1990s and early 2000s, a number of computer-supported learning environments emerged, particularly environments offering support and guidance to learners' own inquiries (Jackson et al., 1998; Luckin & du Boulay, 1999; Quintana et al., 2005; White et al., 1999; White et al., 2002). Of particular significance is SCI-WISE, a system developed by White, Shimoda and Frederiksen (1999) to encourage reflective learning and provide users with opportunities to create and experiment with their own theories of processes needed to support inquiry. The significance of SCI-WISE for this present research is that it suggests ways in which features of an inquiry-based system can be presented to offer learners guidance and opportunities for experimentation with their own ideas. An interesting aspect of SCI-WISE is that guidance was offered by a number of software agents (represented by figures of characters), each providing different strategic advice on collaborative research projects. A second aspect is that students were able to manipulate features of the system to suit their own emerging theories of how to conduct inquiry. A few years later White and team (2002) further developed their ideas through Inquiry Island, with advisors such as the Investigator, the Collaborator or the Reflector, which would suggest goals and strategies to students as they performed tasks within research projects.

The concept behind SCI-WISE and Inquiry Island is that students learn through their interactions with the system, through collaboration with each other, and from the system's content. As students modify and explore features of the system (e.g. testing advice from different software advisors within various tasks) they are able to experiment and test their own theories in a number of activities, which in turn may improve their competency for collaborative inquiry and reflective learning. SCI-WISE and Inquiry Island were used in mainstream schools with junior students (aged 11-14) within a formal educational context in the USA. However, within design education, such systems are rare, particularly those supporting informal inquiry and reflective learning in design.

Computer-supported learning environments often embed in their framework some form of 'knowledge' (e.g. a display of some sort of theoretical content) and a 'context' where interaction is expected to happen between users and the system (e.g., users are invited to form theories about the content by researching information of various advisors and interacting with each other). In addition, in a less visible way, e-learning environments also embed assumptions of the designers and stakeholders who worked in the development of the system. Each environment implicitly carries the 'codes' of these designers, their values about what form of knowledge is relevant, how educational software should look like, features that should be included, its interface, and whether users are supposed to interact with the system in a one-way only manner. In sum, the framework of the system carries the e-learning designers' own beliefs and expectations of genuine and meaningful educational software.

Considering features and functionality of inquiry-based systems through the lens of Bernstein's concepts, it is possible to suggest that the inclusion of features that allow users to experiment with their own theories through their interactions with the system would permit users to have greater control over their learning experience. Users (as learners) may be offered opportunities to choose pacing, sequencing (and so on) of their learning experience.

Under the Illeris model (2002), the system may be designed to encompass learning experiences that relate to different dimensions (cognitive, emotional and social). For example, a learning activity proposed in an e-learning environment may emphasise knowledge content or skills development; others may focus on learners' emotions, feelings and motivations in relation

to a particular task; or they may help to situate the learner into the historical and/or societal conditions of a particular discipline. Each of those would resonate with one of the three dimensions of the Illeris model.

SCI-WISE and Inquiry Island both use pictures of advisors to represent or 'offer' diverse types of guidance. The concept of having advisors to guide reflective learning within e-learning environments may be compared to Schön's (1983, 1987) accounts of a facilitator who is there to support the learners' own discoveries. A similar concept is found in the work of Kim and Baylor (2006) who also used advisors, although here they are animated characters designed to simulate human and peer-like interaction. Kim and Baylor's (2006) research involves the use of Pedagogical Agents as Learning companions (PALs). Such characters are not claimed to be equivalent to human-peer interaction, but are said to contribute to stimulating social interaction and support learners in engaging in various learning activities and tasks. Kim and Baylor (2006) frame the instructional potential of such agents on specific concepts derived from social–cognitive theories, such as distributed cognition, social interaction as well as Bandura's theory (Bandura, 2001). The authors propose seven constituents related to instructional PALs, which could be manipulated to activate or control variables within the learning environment. These constituents are summarised in Table 2.2. Most of the constituents described in Kim and Baylor's (2006) research were adapted and incorporated into the framework of Design Studio. Table 2.2 also summarises how the present research uses these constituents (see also Chapter 6). A fundamental difference however, is that Design Studio uses 'real life' actors to perform the advisors' role, each of them representing different ways a designer may operate within a design discipline, through adapting the concepts derived from LCT(Specialisation).

Table 2.2 Constituents for Agents

Constituent	PALs Summary	Design Studio Summary
Competency	PALs level of competency. A PAL might be designed to be high or low–Competent.	Different advisors emphasise different design practices.
Interaction	Control and content of the interaction between the PAL and learner. A PAL might be designed to be proactive or responsive. In the content of the interaction the design of a PAL may include the use of different discourse functions e.g. suggestion, argument, confirmation, questioning etc.	Each advisor offers 2 types of guidance.
Gender	Male PAL (which has been linked to greater positive perceptions and enhanced recall) over Female PAL.	User can choose between male and female advisors
Affect	Works on relation between affect and cognition. By manipulating a PAL to express positive emotions about a task, learners positive affect may be stimulated.	In introduction Advisors present their likes and dislikes in addition to their ways of viewing and practising design.
Ethnicity	Authors refer to lack on research evidence with regards to computer-based environments. Nevertheless may be potentially manipulated to study levels of credibility and engagement.	Actors performing the role of advisors come from different ethnic background
Multiplicity	Multiple social models may enrich the learning experience. The environment may include multiple PALs, each one having a different perspective or specific skills.	The design activity may be performed under a diverse type of advice (e.g. more objective or subjective)
Feedback	Still needs to be investigated. Nevertheless, there is potential to consider types of feedback provided (such as informative vs motivational), learners' characteristics (such as metacognitive skills, learning styles) and others.	Design Studio offers users the opportunity to access further explanation: 1) about a particular task, 2) how to perform a task with examples, 3) why people perform a task, and 4) suggesting points to reflect once a task is completed.

2.7 Summary of Chapter

This chapter reviewed literature and discussed theoretical frameworks that underpin the conceptual base of this research. The chapter reviews studies that analyse design as a field, examining how design practices reflect the differing nature of knowledge within the various design disciplines. The chapter discusses that design practices are grounded on socially agreed criteria as to what type of knowledge constitutes the realisation of legitimate design knowledge in a given discipline. Basil Bernstein's theory is described to contextualise the set of assumptions of this research, in particular how design professionals and educators are reproducing in their practices the values as they are established within a specific disciplinary group. The chapter explores the use of one of the Legitimation Code Theory dimensions -

Specialisation - as a framework to examine perceptions of knowledge and knowers within the four design disciplines in this study. The discussion considers that, every design discipline possesses its own underlying implicit agreements, regulating achievement and membership to a particular discipline, and, conversely, learners come to a learning experience with their own beliefs about how a design discipline operates or places values, which may be more or less accurate. Nevertheless, it is crucial that design learners effectively recognise the implicit meanings of the discipline in which they are interested, so that they may practise design according to what is expected within the disciplinary group into which they are entering or in which they are interested.

Implications related to learning within the informal learning context of a museum are then examined. In particular, the dual challenge faced by museums in providing an engaging learning experience in addition to situating the learner in the sociology of a design discipline. The chapter theorises that in order to 'learn design by experiencing design' within a museum, learners would benefit from being supported in developing strategies to identify the sociological environment of the design discipline in which they are interested. The chapter argues that such support may be deployed via a computer-supported learning environment with the application and embedding of Bernstein and LCT(Specialisation) concepts to generate e-learning environments. Such e-learning environment would assist in situating the learner in the sociological context of a design discipline to which a chosen design object belongs. The chapter concludes by reviewing computer-supported learning environments in the literature and identifying relevant features (e.g. use of advisors, opportunities to reflect about the learning experience, different framing of the experience), which were incorporated in Design Studio and are discussed in detail in Chapter 6. This chapter raises two new questions:

- *How can Bernstein's and LCT(Specialisation)'s concepts be operationalised for the investigation of the design field? and*
- *How can Bernstein's and LCT(Specialisation)'s concepts be adapted and incorporated into the framework of an e-learning environment to experience the language of design?*

The next chapter discusses the research design, methods, and the development of instruments to operationalise the theoretical concepts of this research. Chapter 4 and Chapter 5 discuss the

results of the investigation of the four design disciplines and Chapter 6 presents the development of Design Studio.

CHAPTER 3 – APPROACH AND METHODS

3.1 Introduction

This chapter is about the operationalisation of Bernstein and LCT(Specialisation)'s concepts into empirical tools to support this study's research process. This chapter discusses the development of instruments used to support the investigation of the nature of knowledge within disciplinary contexts as well as the development of research tools that facilitated the translation of the empirical results into an informal learning experience. The operationalisation of the theoretical concepts is examined within the exploratory phase of this research (interviews and online survey) using both qualitative and quantitative methods. The chapter also discusses the methods for the field study, which relates to the implementation and evaluation of the design experience supported by Design Studio.[4]

As discussed in Chapter 2, this research considers that the practice of designers and design educators reflect and shape how design knowledge is specialised in the four design disciplines in this study. Thus, the research assumes that by examining designers' discourses about their own practices and the practice of their peers, it is possible to identify what type of knowledge is being valued within a particular design discipline. In order to examine the two research questions – *What are the basis for legitimate design practices and knowledge?* and *How can the learning of these be facilitated in an informal learning context?* – the research instruments developed in this study focus on ways of investigating designers' use of language, that is, how designers in the field *express* their views of the field.

Essentially, the function of the research instruments was to identify and conceptualise what language designers use to describe design objects, disciplines, designers and design practices

[4] The operationalisation of the theoretical concepts into the framework of Design Studio, the e-learning environment to facilitate the experience of the language of design, is discussed in Chapter 6.

in engineering, architecture, digital media and fashion. Thus, one of the challenges of this research was to develop an instrument to identify:

- what terminology is used by designers to describe their beliefs and values within design, and its related semantics; and
- how this terminology can be conceptualised in LCT terms.

'Terminology used by designers' refers to specific terms or words designers use to describe design related matters. It is also important to understand designers' perceptions of these terms, that is, the semantics, or what are the *meanings* attributed to the words they use. Terminology *and* semantics are both relevant because designers from different disciplines may, at times, use a specific word with different implicit meanings. This issue may be illustrated through examining a fictional statement, such as 'design calls for creativity'. One way of considering 'creativity' may implicitly contain the notion that competent creative designers draw on their 'knowledge and skills' to identify the best potential solution, amongst multiple possibilities, to solve a particular design problem. This version of 'design calls for creativity', would express a slightly more objective emphasis because it is implicitly stressing the importance of designers' technical skills and knowledge to design. The same expression may, however, be applied with slightly greater emphasis on the subject. In this second version, the term 'creativity' may be associated with the talent, intuition and imagination of 'the designer'. Here, there is an underlying assumption that competent creative designers possess special inherent dispositions, such as talent, intuition and imagination, and these dispositions are instrumental attributes to design.

Understanding designers' values through the ways they express their views of disciplines was fundamental to the realisation of objectives related to the second research question. The language (through terminology and its semantics) used across the various design disciplines was an integral part of the development of Design Studio, ultimately allowing for the development of an informal learning experience in design that used the 'language' of the design field. The aim of Design Studio is to support learners in recognising the language of the field, offering an environment to experience design that is grounded on the structuring of knowledge and knowers within the various disciplines.

The gap in understanding that this chapter addresses relates to the lack of research instruments to uncover the nature of knowledge within disciplinary contexts and tools to support its translation into an informal learning experience. Thus, this chapter describes a Bernsteinian approach to guide and support the research process. This approach is based on the concept of 'languages of description' defined by Bernstein as a "translation device whereby one language is transformed into another" (2000, p. 132). Bernstein differentiates between an internal language of description (L1) – or the principles for what counts as significant empirical relation within the study – and an external language of description (L2) – or the principles for how concepts are manifested in the study, how concepts relate to the empirical data or how concepts are operationalised. The approach is grounded on a methodological question: How can one develop instruments to identify, investigate or measure the theoretical concepts in this research's framework?

The use of this approach resulted in the development of various instruments to guide the research process. The research's languages of description are represented in matrices, used to map the theoretical concepts to the empirical data in Phase 1, 2 and 3. These matrices are discussed in Sections 3.3 and 3.4 of this chapter. In Phase 3 of this research, theoretical concepts and results from Phase 1 and 2 were embedded into the framework of Design Studio, and these will be further discussed in Chapter 6. The research also developed the Controlled Vocabulary List (Section 3.4), based on the use of flash cards, to assist in identifying people's perceptions of words and their associated meanings, in relation to LCT concepts (epistemic or social relation).

This chapter firstly describes the overall research design. Secondly, the research methods are discussed through the research process and lessons learned in the exploratory phase of this research (interviews and online survey). The chapter discusses methodological implications of the development of the empirical tools and instruments (e.g. the interview protocol, survey protocol) and its effects on the theoretical understanding of Bernstein and LCT(Specialisation)'s concepts. Fourthly, the chapter introduces the Controlled Vocabulary List as an instrument to facilitate the discrimination of semantic terms used to investigate the theoretical concepts as they are deployed into the research. Fifthly, the chapter discusses the field study in which the

practical application of this research is conducted. Lastly, the chapter summarises the overall approach and methods of this research.

3.2 Research Design

The research design follows a mixed methods approach with a sequential exploratory strategy (Creswell, 2003). Mixed methods approaches usually employ the practices of both qualitative and quantitative research in a single study. Some researchers consider that the advantage of combining methods is that it allows for simultaneously integrating the strengths of each method, as well as minimising or neutralising the weaknesses of each (Groat and Wang, 2002). The sequential exploratory strategy is usually conducted in two phases: an initial phase of qualitative data collection and analysis followed by a quantitative phase, with priority given to the qualitative aspect of the study. This type of approach and strategy are thought to be very laborious, requiring considerable time, extensive data collection and analysis, and the researcher's familiarity with both methods (Creswell, 2003). Nevertheless, a mixed methods approach with a sequential exploratory strategy is considered particularly relevant when a researcher is interested in exploring complex phenomenon such as social and cultural issues and when the researcher is building a new instrument.

This research employs a mixed methods approach, using in-depth interviews (qualitative) and an online survey (quantitative) to explore the underlying principles structuring design knowledge and knowers within engineering, architecture, digital media and fashion. The research design also includes a practical application of theoretical concepts and the empirical results within Design Studio, an e-learning environment to support an experience in and about design within a museum context. A field study of a design experience supported by Design Studio was conducted at the Powerhouse Museum.

This mixed methods approach allowed the convergence and triangulation of findings from different sources of evidence (e.g. design professionals, design academics, tertiary students of design, museum staff and high school students), and the use of diverse methods (individual and group interviews, paper based and online survey, observations). The sequential exploratory

strategy meant that findings from previous phases would inform subsequent phases (Figure 3.1).

Figure 3.1 Research Design

The research design was therefore divided into three main phases (see Table 3.1). The Exploratory Stage was comprised of a qualitative study conducted via in-depth interviews in Phase 1, and a quantitative study performed via an online survey in Phase 2. The Practical Application was realised during Phase 3 and consisted of the development and implementation of Design Studio and an evaluation of a design experience within the Powerhouse Museum. Each of these phases will be discussed in detail, later in this chapter.

Table 3.1 Phases of Research Design

Exploratory Stage		**Practical Application**
Phase 1	Phase 2	Phase 3
In-depth interviews (N=10) 2 engineers 2 architects 2 digital media 2 fashion designers 2 museum of design staff	Online survey (N=139) Designers, academic staff and tertiary students of: Engineering Architecture Digital Media Fashion Design	Development, implementation of Design Studio and an evaluation of a design experience mediated by an e-learning environment, at the PHM. Survey (N=13) Year 10 Students

Various strategies aimed to strengthen the accuracy of findings. For example, in order to clarify the bias of instruments, the interview questionnaire and survey protocol were piloted so that bias could be identified and avoided. Multiple triangulations were used to verify convergence of findings:

a) In-depth interviews with design professionals

b) In-depth interviews with design educators (from informal educational institution)

c) Online survey with design professionals, design academics and tertiary students

d) Online data collection involved 25 design institutions (e.g. tertiary institutions, design practices and others

e) Online survey with design learners from high school

f) Group interview with design learners from high school

Figure 3.2 details the links between the three phases of the research. The diagram provides an overview of the research process, representing the outputs of one phase that were used as input in subsequent phases. Each of these connections will be explained in detail in subsequent sections of this chapter.

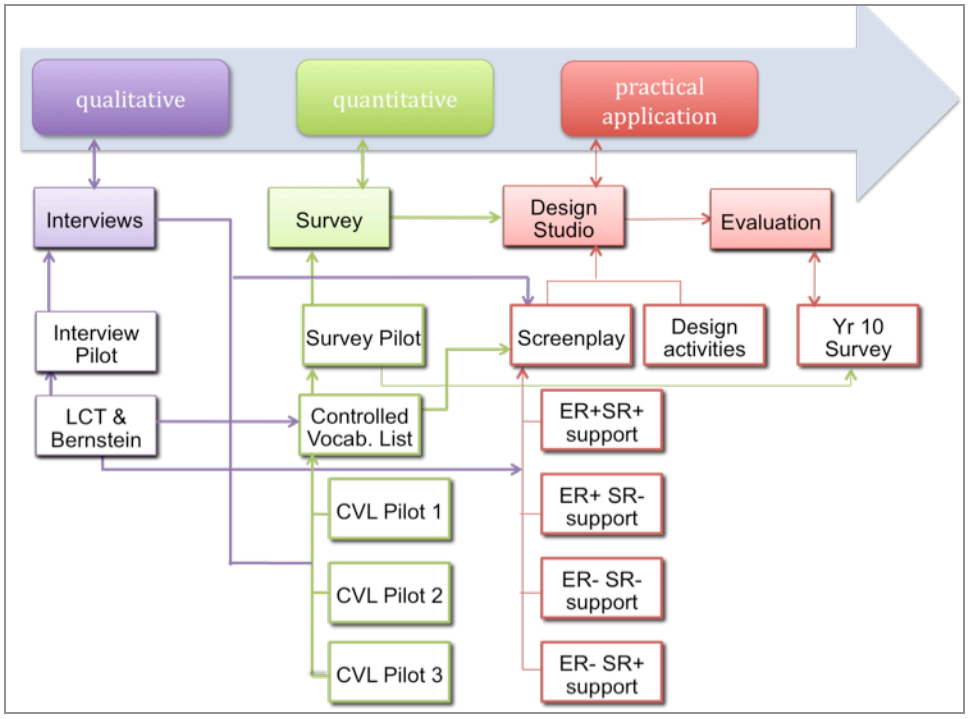

Figure 3.2 Links Between Research Phases

A purposive sampling in combination with a snowball strategy was used for the recruitment of interview and survey participants. A purposive sampling strategy requires the researcher to specify predefined groups of interest for the research (Denzin and Lincoln, 1998; Miles and Huberman, 1994). In the present research, these groups of interest were defined as designers in engineering, architecture, digital media and fashion design. The snowball strategy requires the researcher to identify “cases of interest from people who know people who know what

cases are information-rich" (Miles and Huberman, 1994, p.28). In the sampling of the pilot interviews a non-participant engineering designer suggested the participation of two pilot participants. In the sampling of the interview participants, for example, a non-participant digital media designer suggested the participation of Fashion Designer 1, a non-participant architect suggested the participation of Architecture Designer 2, interviewed Architecture Designer 1 suggested the participation of Engineering Designer 1 and Museum Designer 1 suggested the participation of Digital Media Designer 2. All interviews conducted in Phase 1 had the same interviewer, Lucila Carvalho, using a semi-structured questionnaire (Appendix 1).

In Phase 2, the snowballing strategy was also used. The researcher first identified a set of initial contacts, and asked these key informants whether they knew other designers in the design disciplines of the study who would be willing to participate in the online survey. The researcher then followed up on these contacts. The initial contacts comprised of independent professional bodies (e.g. Engineers Australia), design centres and studios. In addition, the researcher compiled a list of universities and tertiary institutions that teach courses in at least one of the disciplines in the study (e.g. University of New South Wales, Central Saint Martins College of Arts and Design; TAFE). Email addresses of designers, academic designers and tertiary students of design were collected through the websites of these professional bodies, institutions and studios. An email invitation was sent. Once a participant had showed interest by replying to the initial contact, the link for the online survey was sent along with information about the project and a request for suggestions of other potential participants (see 3.4).

Participants in Phase 3 were selected based on their school's proximity to the research setting, the Powerhouse Museum. The researcher first contacted the principal of a private school in the vicinity of the museum and a short explanation about the project was provided with an invitation for fifteen Year 10 students to participate in a design learning experience within the museum setting. After agreement from the school's principal about students' participation, the researcher visited the school's Head of Design and Technology to explain details of the project. The school's Head of Design and Technology selected a sample of fifteen students to participate in the workshops at the Powerhouse museum. The criteria for inclusion in the study included students interested in design, availability for attending two workshops at the museum and

parental consent to participate in the study. These students completed an online survey at the museum, after attending each workshop. A group interview was also conducted by Lucila Carvalho.

3.3 Methods for the Exploratory Study – Phase 1: Interviews

Phase 1 identifies the underlying principles structuring specialist knowledge within four design disciplines (Objective 1), as well as designers' strategies used to define legitimate design practices and works of design (Objective 2). As a result of this phase, a model representing these findings was proposed (Objective 3). Phase 1 realises Objectives 1, 2 and 3 of this research, as described in Chapter 1. Figure 3.3 displays the three objectives of Phase 1 (green) in the context of the overall research process. The left side of the diagram corresponds to the Exploratory Study, which investigates the first research question in the study: *What are the bases of legitimate design practices and knowledges?* The right side of the diagram relates to the Practical Application and the research question: *How can the learning of these be facilitated in an informal learning context?* The diagram illustrates the aims (dark blue) and objectives (grey and green) of this research.

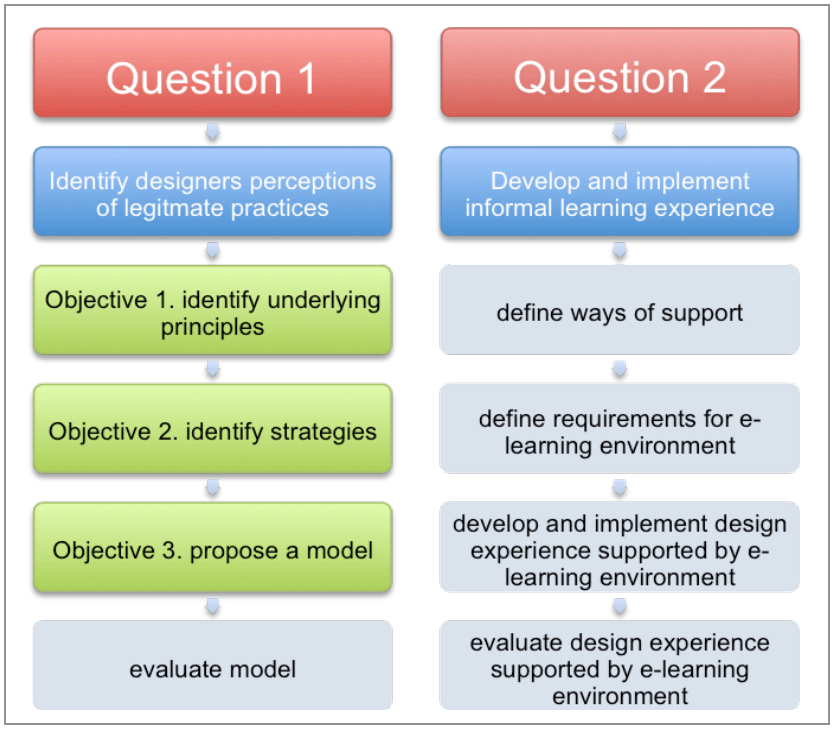

Figure 3.3 Phase 1: Research Objectives

Engineering, fashion, architecture and digital media were selected as objects of study in the present research because of their diversity of trajectories, appeal, characteristics, as well as their familiarity to lay audiences. For example, engineering and architecture are often seen as 'traditional' disciplines within the design field. Their 'status' as academic disciplines is considered to date from hundreds of years ago, and both disciplines are perceived as contributing to important advancements in knowledge related to the emergence of cities and urban growth (Kirby et al., 1990). In contrast, despite the fact that fashion has also been around for a long time, according to Taylor (2002), it was only in the past 15 years that this discipline has received increased attention as an area of academic study. In comparison to these three, digital media is a newly emergent discipline in the field, being associated with recent developments from the end of the twentieth century. Nevertheless, these four disciplines are reasonably well known to lay audiences. This familiarity to lay audiences was particularly important at the last phase of this research, where the design experience was conducted within a museum context. Design disciplines such as experience design or sustainable design might also be characterised as 'emergent disciplines', but they may be more obscure to lay people in general, and young audiences (such as the Year 10 students participating in the study) in particular.

Moreover, the four disciplines seem to cater for or appeal to different audiences. For instance, while engineering is dominated by male designers (Robinson & McIlwee, 1991) a majority of female designers are found in fashion (Bruce & Lewis, 1990). In addition, it was important to take into account the differences in design practices identified by Dorst (Dorst & Dijkhuis, 1995; Dorst, 2008a, 2008b). Both scenarios needed to be included: one in which there is an emphasis on a methodical and scientific design process, as well as one that sees design as connected to feelings and intuition (Papanek, 2001). The examination of design literature suggests that engineering is more likely to be associated with the former (Dym, 2006; Sheppard et al., 2006) whereas architecture would correspond to the latter (Schön, 1983, 1987, 1988; Goldschmidt, 2003). Thus, engineering, architecture, digital media and fashion were included as objects of study in the present research because these disciplines were seen as covering different historical trajectories, appeal, characteristics and yet displayed a degree of familiarity to

laypeople. The diversity expressed through these disciplines, in turn, was hypothesised as a potential reflection of a variety of underlying structuring principles.

In order to identify the underlying structuring principles in engineering, architecture, digital media and fashion, Phase 1 of this research examines how designers see design practice within their own discipline, as well as their views of other designers. Phase 1 was realised through in-depth interviews with two designers from each of the four design disciplines, in addition to two staff members of a museum of design (a curator and a museum educator). Designers' interviews explored themes related to designers' perceptions of the design disciplines, perceptions of designers and strategies used to identify legitimate design practices. Interviews with museum staff explored their perceptions of the design disciplines, perceptions of designers, and strategies used by museums' educators to facilitate design learners inquiry into design within the informal learning setting of a museum. Interviews with museum staff aimed at examining whether (and how) values within the disciplines would be carried through an informal learning context.

3.3.1 Interview Pilot

The interview protocol was piloted with two design academics – an architect and an engineer – and one high school teacher of design (Carvalho & Dong, 2007). The pilot interviewees were contacted and invited to participate in the study via email. The basis for recruitment required that each pilot participant identified him/herself as members of one of the design disciplines in the study or as a high school teacher of design, and were currently working. The interview protocol comprised of open-ended questions exploring perceptions of design, perceptions of designers and strategies used within design practices. Pilot study interviews lasted between one and a half and two hours and were audio recorded for transcription and analysis.

3.3.2 Development of Instruments

Methodological implications from the interview pilot involved modifying and adjusting questions in the interview protocol and in the recruitment of the participants for the interviews in the main study. Data from this pilot study suggested a strong research agenda in academia, which was referred to by pilot interviewees as requiring intensive inter–disciplinary collaboration. These

intensive demands for collaboration and exchange with other disciplines implied that designers may perceive the discipline as expressing weaker classification (–C). However, it was unclear whether the pressure for collaboration was from the academic research environment in general or from a design discipline in particular. It was thus decided to focus the initial investigation on how designers in the professional domain perceive their discipline, and as a result, participants in the qualitative study, who initially were expected to include design academics, were altered to be design professionals who were not primarily involved in academia. The academic participants were, nonetheless, included in Phase 2 in the quantitative study through the online survey.

The final interview protocol (Appendix 1) was comprised of three parts, investigating: (1) perceptions of design disciplines; (2) perceptions of designers; and, (3) strategies used to identify genuine design practices and works of design. The protocol used a majority of open-ended questions to investigate each thematic area. According to LCT's theoretical framework, social fields of practice involve both knowledge and knower structures (Maton, 2000; Moore & Maton, 2001). Thus, the themes in the interview protocol also explore both structures: knowledge structures (through investigation of perceptions of disciplines and practices) as well as knower structures (through investigation of perceptions of designers). Table 3.2 summarises each category investigated in this research, the type of task used, and sample questions extracted from the interview protocol.

Table 3.2 Interview Protocol: Summary of Open-ended Questions

Category	Type of task	Sample Questions
Perceptions of the Design Field	Open-ended questions	How would you describe your design discipline to someone that is new to the field? How does your discipline determine what great design is?
Perceptions of a Designer	Open-ended questions	What are the essential characteristics that a designer must have? What qualities do you look for on a prospective employee/partner?
Strategies	Open-ended questions	How do you evaluate your own work? The practice of other designers? How do you keep up to date with what is going on your field?

At the end of the protocol, interviewees were asked to complete two tasks using Likert Scales (frequency and importance) to categorise their perceptions of the design field and strategies used in their practices. The task related to designers' perceptions of the design field requests that participants consider the importance (not at all, not very, quite or very) of skills, taste and talent for being competent at each design discipline. This part of the interview protocol replicates an instrument developed and used by Maton in previous studies (Lamont & Maton, 2008, 2010). The question states: " In your opinion how important are the following for being good at: (Please place a tick on the appropriate box)" Participants responded to the question for each discipline. The task related to strategies displays a series of statements and asks designers to consider how often designers in their discipline would perform the activities in the statements. These two tasks are further discussed in Phase 2 (See Section 3.4.2). Table 3.3 summarises the two categories investigated, the type of task used, and sample statements extracted from the interview protocol (Appendix 1).

Table 3.3 Interview Protocol: Summary of Likert Scales

Category	Type of Task	Sample Statement
Perceptions of the Design Field	Use four point Likert Scale to rate the importance of statements.	How important are the following: - Skills, techniques and specialist knowledge - Natural-born talent - Taste, judgment or a developed "feel" for it
Strategies	Use five point Likert Scale to rate the frequency of statements	How often designers in my discipline: - Consult scientific journals - Participate in conferences

3.3.3 Interviews' Coding Scheme

A theory driven 'coding scheme' was created and used to support the comparison and analysis of data at each phase of this research. In Phase 1, the interviews' coding scheme uses LCT theoretical concepts (strengths of the epistemic and social relation) in the framing of the thematic topics in the interview protocol (perceptions of disciplines, designers and strategies used to identify genuine practices). The interviews' coding scheme was therefore used to organise the results, supporting the analysis and the combination of text data under categories. The analysis searched for the way participants understand their disciplines, that is, what were

the norms, values, and rules guiding their descriptions of design objects, designers, disciplines and design practices.

The interviews' coding scheme was represented in a matrix, which displays the external language of description (Bernstein, 2000) of this research. The matrix consists of a table mapping the theory to data, thus facilitating the visualisation of the relations between the theoretical concepts and the empirical data. The matrix became an instrument to translate how the phenomenon studied manifests in the particular data set being analysed. The matrix consists of four headings and their descriptions: (1) concepts; (2) description of the concept; (3) description of how the concept manifests in the study; and, (4) an example extracted from data. Table 3.4 illustrates the matrix in relation to the interview data:

Table 3.4 External Language of Description: LCT Concepts & Interview Data

Concept	ER+	ER–	SR+	SR–
Description of Concept	Knowledge, skills, procedures or techniques are strongly bounded and controlled (+C, +F of ER).	Knowledge, skills, procedures or techniques are weakly bounded and controlled (–C, –F of ER)	Emphasis on the subject as the author (+C,+F of SR)	The subject as author is downplayed (–C, –F of SR)
How concept manifests in current study	Emphasis is placed on knowledge within own discipline. Designers refer to the application of design knowledge. Designers focus on how a solution meets a proposed problem and how the technical challenges are overcome so that the designed product could be generated.	Emphasis is placed on exchanging ideas with other design disciplines, and/or learning from other unrelated disciplines. Experiences from outside own discipline are valued, and designers use of multiple channels to acquire knowledge.	Designers' characteristics or background are emphasised. Real-life experiences and/or feelings are emphasised.	There is less emphasis on persons' characteristics or on designer as an author. The designer may be seen as an object (as a "resource") rather than a person.
Example	"Where the real originality in that project is, is not necessarily the bridge itself, it's just the application. It is taking that type of bridge and putting it where it is to solve a problem which was about rocks falling off the face of the cliff. Again it is about the solution to what was probably a geotechnical issue which was slope stability was down by a bridge." (engineering designer 1)	"I find ideas… is from everywhere, you know, Alfred Hitchcock once said ideas come from everywhere and I think that's really true and when I'm sort of stuck on an idea I'll get up from the office and I'll go for a walk or I'll take myself out and do something else like I'll go and see a film" (digital media designer 1)	"There's something inside of you that says you can't live without this thing, if you can't, if somebody took that away from you you'd be as good as nothing, that you'd be as good as dead probably." (fashion designer 1)	"If you're being employed and for me here I'm seen as a resource, so I come into projects, give my consultation or do my work on it and then leave again." (digital media designer 2)

3.3.4 Data Analysis and Model 1

Interviews were audio taped and transcribed for analysis. Each individual interview lasted between twenty minutes and one hour, with a total of 7 hours and 30 minutes recorded interview data. Content analysis of interview transcripts was performed using NVivo software. The analysis focused on applying LCT(Specialisation) concepts (the strengths of epistemic and social relation) to identify patterns for the nature of the knowledge valued within interviewee's discourses. The analysis first categorised passages from each interviewee's discourse into three sets: passages that interviewees talk about knowledge or practices in the discipline, passages about authors (designers), and passages about other matters. Each passage from the two first categories are then searched again, with a focus on the weights of the epistemic and social relation. Data is then searched a third time for trends or patterns into stronger or weaker epistemic and social relation. The matrix (Table 3.4) assisted the process by providing guidance in the mapping of the theoretical concepts to the data. The external language of description of this study, displayed in the matrix supports the researcher in maintaining a focus for the analysis, as a reminder of how to examine the data through the lens of the theoretical concepts (e.g. ' what is this passage about?', 'Is this passage about knowledge or knowers?' or 'Is this passage emphasising or downplaying knowledge?'). In addition, the matrix also helps the researcher's analysis by establishing visual connections between the theoretical concepts and the ways these concepts may manifest or be observed in the study.

As a result of Phase 1, a model was proposed to graphically represent participants' perceptions of the nature of knowledge valued within the four design disciplines in the study: engineering, architecture, digital media and fashion (Chapter 4). This model is re-evaluated in Phase 2 of the research (Chapter 5).

3.4 Methods for Exploratory Study – Phase 2: Online Survey

Following Phase 1, a quantitative study was performed through an online survey in order to explore the usefulness of and expand the model developed out of the qualitative study. The analysis of the online survey resulted in a final refined model of designers' perceptions of

knowledge and knowers within the four design disciplines. The final model also represents strategies used by designers to define legitimate design practices and works of design.

Phase 2 realises Objective 4 of this research (highlighted in green in Figure 3.4). The diagram displays the objective of Phase 2 in the context of the overall research process. The left side of the diagram corresponds to the Exploratory Study, which investigates the first research question in the study: *What are the bases of legitimate design practices and knowledges?* The right side of the diagram relates to the Practical Application, and the second research question in the study: *How can the learning of these be facilitated in an informal learning context?* The diagram also represents the aims (dark blue) and objectives (grey and green) of this research.

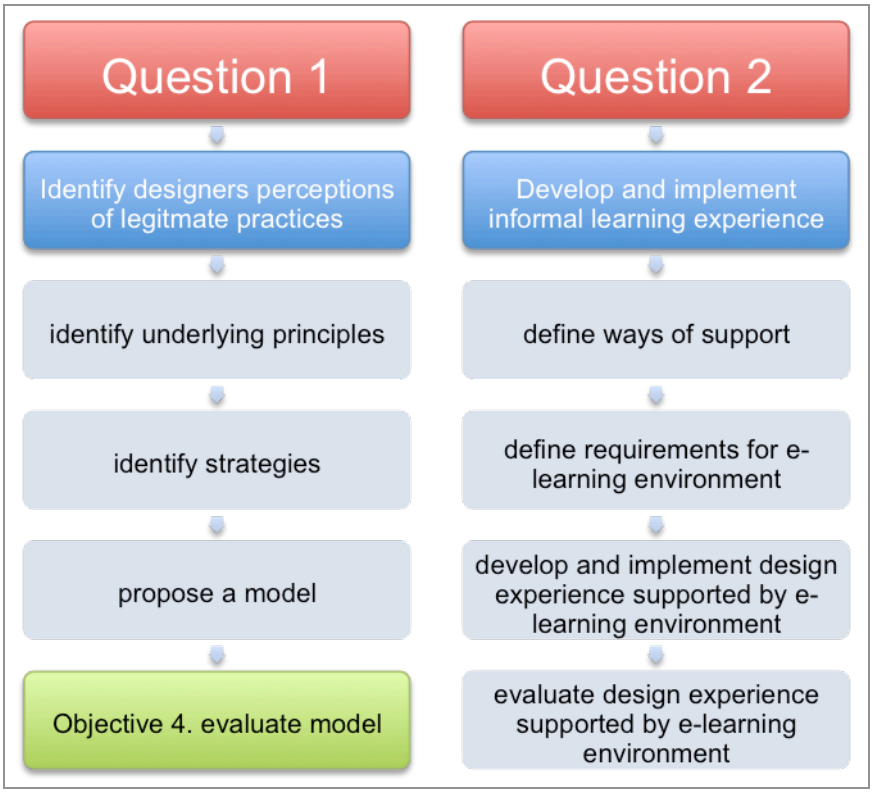

Figure 3.4 Phase 2: Research Objectives

Participants in Phase 2 included design professionals, academic staff and tertiary students from the four design disciplines: engineering, architecture, digital media and fashion. Design professionals, academics and tertiary students of design represented the research population in this study because individuals within these three groups are part of the design field, being involved in the production or reproduction of knowledge within the disciplines. The recruitment of participants started with a search for email addresses of design companies, tertiary teaching

institutions, as well as professional bodies (e.g. Engineers Australia). A total of 145 emails were individually sent to design professionals, academics and tertiary students of design, inviting the addressee to participate in the study. A snowball technique was used, asking the contacted person to re-distribute the email amongst his/her peers. The study collected a total of 139 responses from 25 universities, tertiary institutions and design organisations, both in Australia and overseas. The online survey explored the same three main themes from the interviews: perceptions of the design disciplines, perceptions of designers and strategies used by designers. In order to reduce bias in the instrument, the survey protocol was piloted several times.

3.4.1 Online Survey Pilot

A total of four pilot studies were conducted prior to producing the final survey protocol (Appendix 2). These pilot studies aimed at devising tools to investigate the research topics within the survey and at revising questions within the protocol itself. A second matrix, containing the external language of description of this research, was developed to map the survey questions to the thematic categories in the study (e.g. questions related to perceptions of design disciplines or perceptions of designers), and also to map potential answers to the theoretical concepts investigated (epistemic or social relation oriented). The development of this matrix will be detailed and explained in the subsequent sections.

3.4.1.1 Controlled Vocabulary List: Assigning LCT codes to a list of words

One of the challenges in this research was to identify semantic terms that could be used by participants to describe what is valued (knowledge and/or knowers) within the design disciplines and to determine the associated meanings of these terms. In the organisational behaviour research field, a similar problem has been addressed via DICTION, a software package designed to support content analysis in strategic management research (Short & Palmer, 2008). One of the interesting features of DICTION is that it contains 31 predefined dictionaries, which were developed based on different businesses' text narratives (e.g. annual reports or CEO speeches) as well as concepts from linguistic theory. Each of these dictionaries contains thousands of search words that can potentially be used to analyse a particular text. Thus,

DICTION searches for 'language' that fits into predetermined characteristics in its 31 dictionaries (e.g. words related to 'tenacity', 'ambivalence', or 'cognitive terms') and can be manipulated to identify frequently encountered words in textual data.

As there is not a similar instrument in the design literature, a 'Controlled Vocabulary List' was developed for the purposes of this research. This Controlled Vocabulary List incorporates LCT(Specialisation) concepts (epistemic and social relation) into a list of words to describe the design disciplines. That means, the research established, for each term in this list, what was its associated meaning in relation to the theoretical framework, whether the use of a specific word in the list would be more likely to be linked to the description of a discipline that emphasises knowledge and/or knowers.

Three pilot studies were conducted to produce the Controlled Vocabulary List (discussed below). Overall, these pilots contributed to a series of adjustments that were undertaken in the design of the survey protocol and the development of the matrix to guide the survey process. The final survey protocol can be seen on Appendix 2, and examples of the matrix appear in Table 3.8, Table 3.9 and Table 3.10.

3.4.1.2 Controlled Vocabulary List - Pilot 1

In tasks 1 and 3 of the online survey, participants were presented with lists of words that they could use to describe a design discipline and designers (Refer to Table 3.6 for words that were used in the survey). In order to produce this list of words, three pilot studies were conducted. The first list was produced through brainstorming: the researcher thought of as many words as possible to describe a profession or job.

A list of 50 words (Appendix 3) was then piloted with high school students. The list presented the words in alphabetical order. Words in the list were categorised as associated with:

(1) knowledge code, for example 'procedural', 'technical' and 'driven by knowledge'
(2) knower code, for example, 'social', 'subjective' and 'driven by taste'
(3) elite code, for example 'glamorous', 'outstanding' and 'elite'

(4) relativist code, which included adjectives with generic connotation in terms of coding orientation but denoting a positive, negative or neutral emphasis, for example ‘modern’, ‘boring’ and ‘curious’

This list of words used in this pilot study comprised of a paper survey with thirteen Year 10 students from a high school in the inner west of Sydney who were attending a workshop at the Powerhouse Museum. The pilot survey explored students’ perceptions of engineering, architecture, digital media and fashion design, and their perceptions of designers working on these disciplines.

One of the lessons learned was that the words categorised as expressing an elite code (e.g. ‘outstanding’ or ‘elite’) were actually words connected to the semantic meaning of the word ‘elite’ rather than the LCT(Specialisation) driven meaning. Within the context of this research, the use of these terms associated with the elite code was inaccurate because, as explained in Chapter 2, the elite code is intended to express a relatively strong epistemic relation and a relatively strong social relation, but does not necessarily imply a social superiority as defined by ‘elite’ or ‘outstanding’.

Through this pilot, it was also learned that attempts to identify the LCT codes of specialisation directly (knowledge, knower, elite or relativist) were inadequate. The problem with this approach is that it misses the fact that each code is composed of two distinct values, that is each LCT code of specialisation is a combination of the strengths of two relations (epistemic and social relation). The code can only be identified through the examination of the strengths of each relation separately. Thus, the next question posed was: how to investigate whether a person is emphasising the epistemic and/or social relation as s/he describes a discipline? To answer this question, this research identified a need to explore the semantic meanings of words used to describe a discipline, that is, what meaning is being assigned when a person uses a specific word to describe a discipline. For example, if someone says engineering is ‘innovative’ and ‘clever’ or ‘creative’, how could the researcher definitely say they were talking about a relatively strong epistemic relation, social relation or both? How could the researcher verify the meanings being assigned to words according to the theoretical concepts in this study? As a result, a second pilot study was performed.

3.4.1.3 Controlled Vocabulary List - Pilot 2

The second pilot study shifted the approach to identifying the values at the level of the relations instead. By looking at each relation separately, or isolating each of them prior to assigning the code, it was possible to focus the analysis, which ultimately facilitates the process of identifying the code itself. It became, therefore, a three-step process:

(1) Examine and identify strengths of the epistemic relation (ER+ or ER–)

(2) Examine and identify strengths of the social relation (SR+ or SR-)

(3) Combine the relations to identify the LCT code (ER+SR– = knowledge; ER–SR+ = knower; ER+SR+ = elite; ER–SR– = relativist)

The first step aims at examining the strengths of the epistemic relation. In order to examine whether a survey participant perceives a particular discipline as emphasising the epistemic or social relation, the researcher analyses the participant's choice of terms. Similar issues required a similar approach in the second step, in terms of the social relation. Thus, the aim of this second pilot study was to identify whether specific words or terms were perceived as associated with the epistemic relation, the social relation or both.

Pilot 2 implemented this approach through a new list of words, which comprised of 55 adjectives or expressions (Appendix 4) and incorporates new words used by participants in Pilot 1. In this second pilot, participants were given instructions and a sheet of paper containing a list of words and a table. Participants were asked to read the list of words presented to them, and to categorise these words by assigning them under different headings in a table:

(1) Words that could be used to describe a discipline that emphasises technical content, skills, and/or techniques

(2) Words that could be used to describe a discipline that emphasises personal or social dispositions, aptitudes and attitudes

(3) Words that were not connected to the two above, but could express a positive, negative or neutral connotation

Participants were also asked to provide their own words if they wished. There were only two participants in this second pilot, and both complained that instructions were too complex and the task of writing 55 words on paper was too laborious. Pilot 1 and 2 were instrumental in the research process because they raised questions related to the operationalisation of the

theoretical concepts of this research. The pilots pointed out the need for identifying what meanings participants attributed to specific words. They contributed to the development of the Controlled Vocabulary List, which ultimately laid the foundations for the external language of description in relation to the survey. The Controlled Vocabulary List was presented in the third pilot study.

3.4.1.4 Controlled Vocabulary List - Pilot 3: A Method to Assign LCT Concepts to a List of Words

The third pilot involved presenting participants with two sets of 30 flash cards. The first set of flash cards had words that could be used to describe a job or a discipline. The second set contained words to describe a professional. Words presented in these two sets of cards (Appendix 5) were based on the lists used in the previous pilot studies.

The third pilot had nine participants, and was comprised of people with and without a design background (e.g. 3 design students, 2 primary school teachers, 1 speech pathologist, 1 medical researcher, 1 administrative officer and 1 marketing manager). Participants were approached individually by the researcher and invited to participate in the pilot. Each individual pilot session lasted between 10 to 15 minutes. Participants were read an introduction to the pilot (Appendix 6), which explained that some jobs privileged skills, techniques and specialist knowledge (stronger epistemic relation), and in other jobs personality or personal background (stronger social relation) were more important in order to be successful. Participants were then asked for examples of jobs in each category. Their examples are listed in Table 3.5:

Table 3.5 Examples of Jobs

Skills, Techniques & Specialist Knowledge	Personality &/or Personal Background
Medicine	Journalism
Engineering	Arts
Mechanic	Marketing
IT	Entertainment Industry
Research and others	Sales
	Welfare Work and others

Participants were then asked to assign each flash card under 4 categories (Figure 3.5):

(1) Skills, techniques and specialist knowledge – This category represented terms that would be used to describe jobs in which skills, techniques and specialist knowledge were considered fundamental in order to be successful (ER+ terms).

(2) Personality, personal background – This category represented terms that would be used to describe jobs in which personality and personal backgrounds were considered fundamental in order to be successful (SR+ terms).

(3) Both – This category represented terms that could express both categories above.

(4) Neither – This category represented terms that the participants would not use to describe a job.

Terms that were considered by the majority of participants (at least five out of the nine pilot participants) as ER+ terms and SR+ terms[5] were included in the Controlled Vocabulary List, that is terms in categories (1) or (2) above. Terms that were perceived as indiscriminately expressing both categories at once, that is, words in (3) (e.g. innovative, clever, or creative) as well as words in (4) were not included in the Controlled Vocabulary List.

Figure 3.5 Flash Cards: List of Words

[5] In this thesis, 'ER' refers to epistemic relation and 'SR' to social relation. Thus, 'ER terms' or 'ER words' refer to epistemic relation oriented terms, that is, terms that are associated with an emphasis on skills, procedures, techniques or specialist knowledge. 'SR terms' or 'SR words' refer to social relation oriented terms or terms associated with an emphasis on personal dispositions or background of the author.

Table 3.6 summarises the results from this pilot study. The table shows ER+ and SR+ terms used to describe a job or profession, and ER+ and SR+ terms used to describe a worker or a professional. In each bracket is the number of answers for each word, out of a total of nine participants in the pilot. Words in the Controlled Vocabulary List were used in various questions of the survey protocol (e.g. presented in a list form for Task 1 and 3, or as part of a phrase in Task 4. For examples, refer to Table 3.8, Table 3.9 and Table 3.10.

Table 3.6 Pilot Study 3: Controlled Vocabulary List

Describe a job or profession		Describe a worker or professional	
ER+	**SR+**	**ER+**	**SR+**
Scientific (9)	Social (8)	A scientific person (8)	A social person (7)
Technical (9)	Empathic (7)	A technical person (7)	A tasteful person (5)
Methodical (7)	Driven by taste (6)	A procedural person (6)	An empathic person (5)
Systematic (7)	Fancy (6)	A methodical person (5)	A glamorous person (4)
Objective (6)	Glamorous (6)	An objective person (5)	A sensitive person (4)
Procedural (5)	Individual (6)	A problem solver (5)	An individualist person (4)
Skilful (5)	Influential (5)	A systematic person (5)	An artist (4)
Driven by knowledge (5)	Elegant (5)		

The Controlled Vocabulary List was created to support the content analysis in this study. This list was of particular assistance during the analysis of survey data because, unlike in the interviews, it was not possible to clarify the meaning that a participant is attributing to a particular word within the online survey setting. In order to examine the survey participants' perceptions of legitimate design it was necessary to create an instrument that would act as a translator device, that is an external language of description. The Controlled Vocabulary List provided semantic terms (and their associated ER or SR meanings) used in questions within the online survey, the matrix to guide the survey analysis, and in the development of the e-learning environment, particularly into the screenplay of the various fictitious designers in Design Studio (Chapter 6). In addition, the Controlled Vocabulary list provided terms used in the survey with high school students (Phase 3 of this research).

3.4.2 Development of Instruments

This section discusses how the Controlled Vocabulary List, described above, was incorporated within the survey protocol (Appendix 2) and into the matrix used to guide the research process. The survey protocol comprised four parts: Part 1 with questions related to personal background, Part 2 with questions about disciplines, Part 3 with questions about designers, and part 4 with questions about design practices. Thus, the three parts of the survey followed the same three thematic categories from the interviews: perceptions of design disciplines, perceptions of designers and strategies used to identify genuine design. In order to investigate each thematic category, two types of tasks were proposed (Table 3.7). However, different from the interviews, the survey protocol used a majority of questions with multiple–choices that aimed at exploring participants' perceptions in a more directed manner.

Table 3.7 Online Survey: Categories and Tasks

Category	Number of Tasks
Personal background information	n/a
Perceptions of design disciplines	Task 1 and Task 2
Perceptions of designers	Task 3 and Task 4
Strategies used	Task 5 and Task 6

(A) Online Survey - Perceptions of the design field

Perceptions of the design disciplines were explored through Task 1 and 2 in the online survey. Task 1 asked the participants to choose three words that could be used to describe each design discipline. The list of words presented to participants was generated through the series of pilot studies discussed in Section 3.4.2. Participants had to complete a sentence about each discipline (e.g. "Engineering design is…") using their own words or by picking a word out of a list of sixteen words in a drop down menu. From the sixteen words presented to participants, eight were considered to be associated with a relatively strong epistemic relation, and eight words were associated with a relatively strong social relation. The question stated:

> Consider what you know about engineering, architecture, digital media and fashion design, either from your work, study, family, friends or the media. Then please

choose three words that you could use to describe these design disciplines. You can write your own words or pick from the list through the drop down menu.

Participants responded to the question for each discipline (see Figure 3.6):

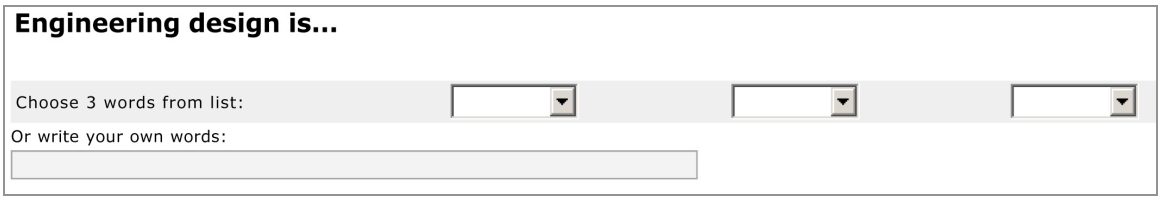

Figure 3.6 Task 1 of Survey

Task 2 explored perceptions of the design disciplines using a Likert Scale. This question examined whether knowledge within a particular discipline was perceived as emphasising the epistemic or the social relation. The task requests that participants consider the importance (not at all, not very, quite or very) of skills, taste and talent for being competent at each design discipline. This part of the survey protocol replicates the instrument developed and used by Maton in previous studies (Lamont & Maton, 2008; Maton, 2007) and used in Phase 1 as part of the interviews. The question states: “In your opinion how important are the following for being good at: (Please place a tick on the appropriate box)” Participants responded to the question for each discipline (see Figure 3.7):

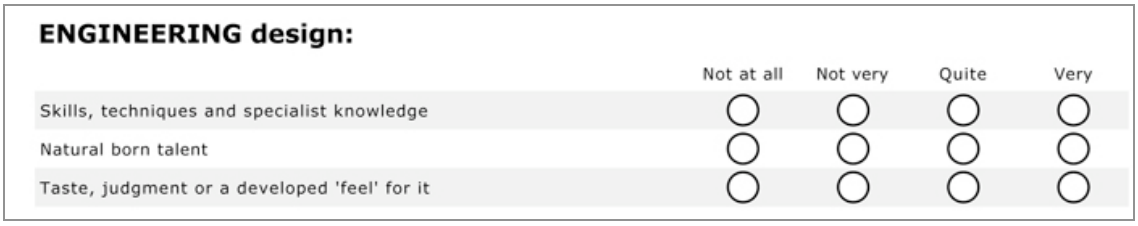

Figure 3.7 Task 2 of Survey

A full version of the survey can be seen in Appendix 2. Table 3.8 summarises the survey format, illustrating the type of tasks, sample questions and LCT(Specialisation) concepts within the category ‘perceptions of the design field’:

Table 3.8 Survey: Perceptions of the Design Field

Category	Type of task	Sample Questions	ER/ SR
Perceptions of the Design Field	Choose 3 words from a list of 16/ pick own to complete a sentence	Engineering design is…	8 ER+ words – e.g. Scientific, Technical, Objective 8 SR+ words - e.g. Social, Empathic, Driven by taste
	Knowledge (object x subject) Likert Scale (Maton)	Skills, techniques and specialist knowledge	ER
		Natural-born talent, and Taste, judgment or a developed 'feel' for it	SR

(B) Online Survey - Perceptions of designers

Similar to the perceptions of design disciplines, Task 3 asked the participants to choose three words that could be used to describe designers in each design discipline. The list of words presented to participants was generated through the pilot studies discussed in Section 3.4.2 of this chapter. Participants had to complete a sentence about designers, (e.g. "An engineering designer is…") using their own words or by picking one out of a list 14 words in a drop down menu. From the 14 words presented to participants, 7 were considered to be associated with stronger epistemic relation, and 7 words were associated with stronger social relation. The question stated:

> Consider the designers you have met either from your work, study, family, friends or the media. Then please choose three words that you could use to characterise engineers, architects, digital media designers and fashion designers. You can choose your own words or pick from the list through the drop down menu.

Participants responded to the question for each discipline (see Figure 3.8):

Figure 3.8 Task 3 of Survey

Task 4 explored the perceptions of designers, presenting the participants with a series of statements about a fictitious designer. Some of these statements were based on passages of the interviews in Phase 1. The statements also incorporated words from the Controlled Vocabulary List, this time presented to participants within the context of a sentence (e.g. X. is a very methodical person. That is why s/he chose this sort of work). There were 7 profiles associated with an ER emphasis and 7 profiles associated with a SR emphasis. Statements associated with an ER emphasis relate to the designers' skills or to specialist knowledge:

> *X. is a very technical and methodical person. That is why s/he chose this sort of work.*
>
> *X. is a highly skilled person who has developed skills by studying and working really hard.*

Statements associated with an SR emphasis relate to personal dispositions, or the background of the designer, examples include:

> *X. has travelled a lot and this travelling experience has helped her/him a lot in her/his work.*
>
> *X. recognises the value of beauty. In her/his profession one certainly needs a great sense of taste.*

The order of statements was randomly arranged in each survey. Participants were asked to choose which design profession the person might work in, and they could associate a statement with as many design disciplines to which they thought the statement would apply, if any. The question stated:

> The statements below relate to fictitious people. Please tick the box that you think corresponds to the design profession the person might work in (you can tick as many boxes as you wish).

The participants responded by placing ticks in the boxes (see Figure 3.9):

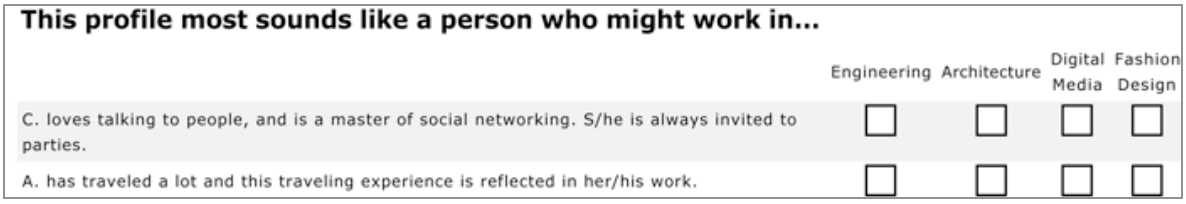

Figure 3.9 Task 4 of Survey

Table 3.9 summarises this part of the survey, showing the type of task performed, sample questions and how the LCT concepts were employed with each task.

Table 3.9 Survey: Perceptions of Designers

Category	Type of Task	Sample Question	ER/SR
Perceptions of Designers	Choose 3 words from a list of 15/ pick own to complete a sentence	An engineering designer is...	7 ER+ words - e.g. a scientific person, a technical person 7 SR+ words - e.g. a social person, a tasteful person
	Choose which discipline the statement of fictitious designer could be in (multiple disciplines or none may be assigned)	X. is a very methodical person. That is why s/he chose this sort of work.	ER Statement
		X. recognises the value of beauty. In her/his profession one certainly needs a great sense of taste.	SR Statement

(C) Online Survey – Strategies related to design practices and work

Task 5 and 6 of the survey examined strategies related to design practices and work. These questions aimed at exploring how designers probe or examine the structuring of knowledge in design. Task 5 presented a list of statements (randomly arranged for each survey participant) about activities designers might get involved with in their work. Participants were asked to use a Likert Scale (frequency) to describe how the statements applied to their design discipline. The elaboration of these statements is based on words from the Controlled Vocabulary List as well as passages of interviews with designers in Phase 1. A total of 26 statements were shown (e.g. Designers in my discipline participate in conferences to listen to new ideas in the field) and participants chose the frequency (always, frequently, not sure, rarely or never) of the strategies for identifying knowledge in their design discipline. Statements of activities oriented to skills, techniques, specialist knowledge were considered as ER statements, for example:

> *Designers in my discipline participate in conferences to listen to new ideas in the field.*
>
> *Designers in my discipline develop skills by reading about cutting edge work developed in the field, and/or participating in training courses and workshops.*
>
> *Designers in my discipline follow methodical procedures in their design practices.*

Statements of activities oriented to personal background or dispositions were considered as SR statements, for example:

> *Designers in my discipline develop an 'eye' for the job, through work experience.*
>
> *Designers in my discipline express their feelings through their design work.*

Designers in my discipline draw on personal experiences (e.g. watching a film, talking to friends) to get inspiration for their design work.

The question stated: “Read the statements below and then please place a tick on the box that better describes how these statements apply to designers in YOUR design discipline.” Participants responded by placing a tick on their chosen answer (see Figure 3.10):

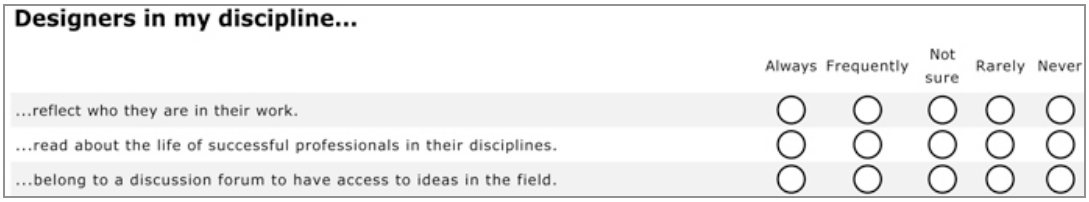

Figure 3.10 Task 5 of Survey

Task 6 was an open-ended question in which participants were invited to write about strategies they would like to comment on, or any other comment they would like to add. Table 3.10 illustrates the type of tasks within this theme, sample questions and their association with LCT concepts. The question stated: “Are there any strategies or comments you would like to add?” Participants responded by typing their comments.

Table 3.10 Survey: Strategies

Category	Type of Task	Sample Question	ER/SR
Strategies	Open ended question	Are there any strategies or comments you would like to add?	n/a
	Statements using a Likert scale (frequency)	Designers in my discipline participate in conferences to listen to new ideas in the field	ER+
		Designers in my discipline express their feelings through their design work	SR+

3.4.3 Online Survey Coding Scheme

The survey also used a theory-driven ‘coding scheme’ to support the analysis of data. In Phase 2, the survey’s coding scheme applied LCT(Specialisation) theoretical concepts (strengths of the epistemic and social relation) in the framing of the answers available to participants. The survey’s coding scheme was therefore used to organise the results, supporting the analysis and the combination of survey data. The survey’s coding scheme was generated through the pilot studies, and used the Controlled Vocabulary List to map the responses available in the survey and the theoretical concepts of this research. Thus, the instrument was used as the external language of description in the survey phase.

Table 3.11 summarises the resulting coding scheme after the various pilot studies within Phase 2:

Table 3.11 Survey: Coding Scheme

Category	LCT	Examples
Words to describe a professional	ER	a scientific person, a technical person, a procedural person, a methodical person, an objective person, a problem solver
	SR	a social person, a tasteful person, an empathic person, a glamorous person, a sensitive person, an artist
Words to describe discipline	ER	scientific, technical, methodical, systematic, objective, procedural, skilful, driven by knowledge
	SR	social, empathic, driven by taste, fancy, glamorous, individual, influential, elegant
Profile of a fictitious designer	SR	X. has travelled a lot and this travelling experience has helped her/him a lot in her/his work. X. really understands other people's feelings. S/he can easily put her/himself in other people's shoes. X. recognises the value of beauty. In her/his profession one certainly needs a great sense of taste.
	ER	X. is a very technical and methodical person. That is why s/he chose this sort of work. X. is a highly skilled person who has developed skills by studying and working really hard. X. is a very practical down to earth sort of person, which is always reflected in her/his working practice.
Strategies	SR	…use their personal experiences as inspiration for their design work …participate in conferences for social networking …develop an 'eye' for the job through their design practice
	ER	…consult scientific journals …participate in conferences to listen to ideas …read technical books on the subject

3.4.4 Data Analysis and Model 2

The online survey generated 139 valid responses. In order to be included in the analysis, at least one section of the protocol (besides the background section) needed to be completed. The analysis of the online survey used the coding scheme described in Section 3.4.3 to categorise responses as realising an emphasis on the epistemic relation and/or an emphasis on the social relation. These responses were then used to characterise each discipline in terms of LCT codes of specialisation.

The analysis of Task 2 of the online survey applies a rule for distinguishing between ER and SR on an interval-based scale previously developed by Maton (Lammont & Maton, 2008). Values

(minimum of 1 and maximum of 4) are assigned to respondents' answers about skills (ER) and to the combined questions related to taste and talent (SR). A mean is then calculated in relation to all responses. The analysis of responses in Task 2 of the online survey follows the rule:

> It is knowledge code if ER results are above the mean and SR results are below the mean.
>
> It is knower code if ER results are below the mean and SR results are above the mean.
>
> It is elite code if ER results and SR results are above the mean.
>
> It is relativist code if ER results and SR results are below the mean.

Unfortunately, at present, the theoretical model LCT(Specialisation) does not prescribe a parametric model; thus, in the absence of reference studies and data, it becomes largely up to the researcher to prescribe appropriate thresholds to identify a population as emphasising a social or epistemic relation. One of the methodological challenges in this research was how to quantitatively measure the LCT(Specialisation) codes, in particular, a more complex code such as the elite code. Theoretically, the elite code would be indentified when an emphasis on both the epistemic and the social relation are present. However, the theoretical model does not clearly establish how much is 'enough' to qualify as a 'comparable emphasis'. Thus, for the purposes of this research, a threshold was established and another set of rules was created and applied to the analysis of Task 1, 3 and 4. Only a qualitative analysis was performed for Task 5 and 6, because these questions maintained a focus on the participants' perceptions of strategies used in their own discipline. That is, Tasks 5 and 6, differently from Task 1, 2, 3 and 4, did not explore participants' perceptions of strategies within the four disciplines in the study, just their own discipline.

The analysis of Task 1, 3 and 4 of the survey presents percentage results according to ER associated terms or statements or SR associated terms or statements. In Task 1 respondents described a design discipline using three words from a set list of sixteen terms (see 3.4.2). Taking into account the probability of a respondent randomly selecting a word out of the possibilities offered, only results (that is, a histogram of the total responses to a given word) above 18.7% are considered to be significant. In Task 3 respondents describe designers using three words from a set list of fourteen (see 3.4.2), and only results above 21% are considered to be significant. Based on these percentages, a slightly higher threshold of 30% was chosen

as being significant, meaning that the respondents displayed an emphasis towards a specific relation. For the analysis of Tasks 1, 3 and 4 of the survey the following rules are used:

> It is knowledge code if ER results are above 70% and SR results are below 30%.
>
> It is knower code if ER results are below 30% and SR results are above 70%.
>
> It is elite code if percentage for ER results and SR results vary and both values are consistently above 30%.
>
> It is relativist code if ER results and SR results vary and both values are not consistently above 30%.

Tasks 1, 3, and 4 used the Controlled Vocabulary List (see Section 3.4.1.4), that is, these tasks employed words which were previously associated with an emphasis on the epistemic or social relation. However, non-use of words proposed in Tasks 1 and 3, or non-association of a statement with a discipline in Task 4, do not necessarily correspond to perceptions of downplay of the epistemic or social relation in a particular discipline, that is, a relativist code. For example, the preference for other terms not in the survey could imply a need for self-expression. Thus, the rule above is used to guide the analysis of responses related to each individual task, but the analysis is not completed until results in all tasks are considered. Thus, tables presented in Chapter 5 are provisory till the combination of results in Table 5.11 and Table 5.12. This is due to the fact that the identification of the LCT code of specialisation for each discipline takes into account overall results in all tasks in the survey. Thus, in order to differentiate between an elite code and a relativist code is necessary to consider overall results related to a discipline. If the majority of tasks' results show variance of use of epistemic and social oriented terms and statements to describe a discipline *and* both ER and SR terms and statements are above the 30% threshold, then an elite code identified. In contrast, if the majority of tasks show variance of use of the epistemic and social oriented terms and statements to describe a discipline *but* both ER and SR terms and statements are *not* above the 30% threshold, then a relativist code is identified.

Phase 2 reviews and builds on Model 1 that was proposed in Phase 1 of the study. As a result, Phase 2 proposes an elaborated, expanded model to represent designers' perceptions of the design disciplines, perceptions of designers and strategies used to identify genuine practices. Chapter 5 discusses the online survey results and Model 2.

3.5 Field Study: Design Experience at the Powerhouse Museum

In the third phase of the study - the development and implementation of Design Studio and the evaluation of a design experience - themes generated in the exploratory phase of the research were adapted (Objective 5) and incorporated into an e-learning environment designed to support design learners' inquiry in an informal setting (Objective 6 and 7). Results from Phase 1 and Phase 2 formed the basis of the informal learning experience in design. This informal learning experience in design involved learners going through the enquiry process connected to the design of an object, using the museum surroundings as the setting of the experience, and having the support of an e-learning learning environment, Design Studio. The design experience aimed at supporting learners in their own investigation of the language of the four design disciplines in the study. Year 10 students' experiences with the e-learning environment were evaluated in a field study at the Powerhouse Museum. The field study qualitatively examined students' perceptions of design as a field, and their perceptions of the design experience (Objective 8). Phase 3 of this research, realised Objectives 5, 6, 7 and 8 as described in Chapter 1 and summarised in Figure 3.11. The diagram displays the four objectives of Phase 3 (green) in the context of the overall research process. The left side of the diagram corresponds to the Exploratory Study, which investigates the first research question in the study: *What are the bases of legitimate design practices and knowledges?* The right side of the diagram relates to the Practical Application and the research question: *How can the learning of these be facilitated in an informal learning context?* The diagram illustrates the aims (dark blue) and objectives (grey and green) of this research.

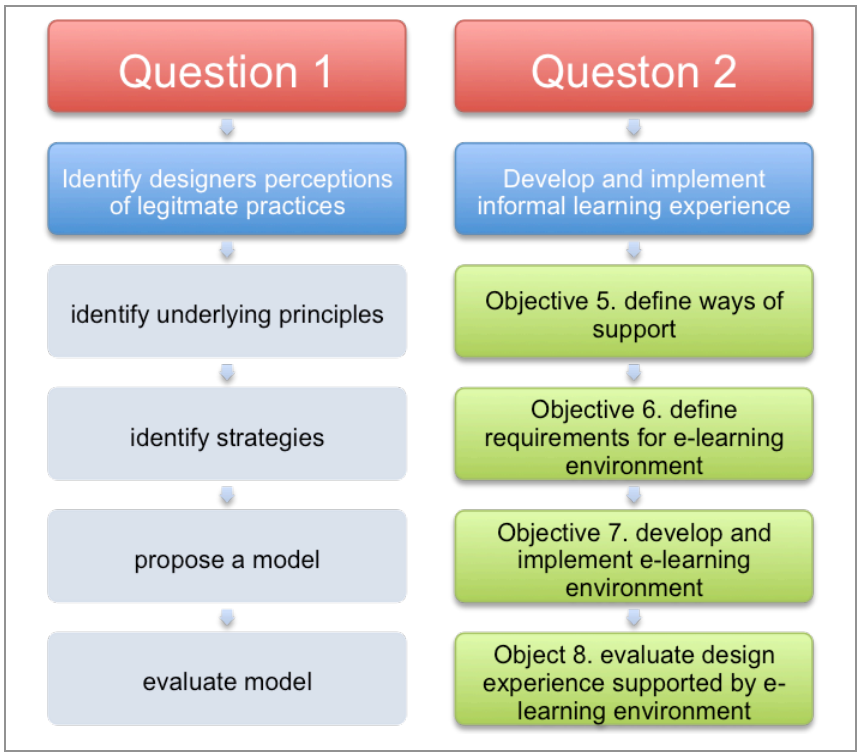

Figure 3.11 Phase 3: Research Objectives

3.5.1 Defining the Type of Support and Defining Requirements

The e-learning environment was designed to support learners in their inquiry by offering them opportunities to experience the different 'codes' of the four design disciplines as learners engaged in the design of a chosen object. The support provided is discussed in detail in Chapter 6.

Requirements, that is, the identified needs of what the e-learning environment should be or perform, took into account the model of the structuring of knowledge in design from Phase 1 and Phase 2. In addition, requirements included ideas generated from the research literature about e-learning environments designed to support inquiry and reflective learning (e.g. Luckin & du Boulay,1999; Quintana, et al., 2005; White et al., 1999). The requirements of the e-learning environment involved the location where it was to be implemented (the Powerhouse Museum), and the specification of users (Year 10 students attending one of the visitor packages offered by VectorLab). Year 10 students were chosen as the target population, and are seen as representatives of the 'design learners' in this research. As this age group has not yet started their senior high school years, they are still to decide on their Higher School Certificate subjects, and consequently on their future career preferences. An exposure to design may

therefore be of benefit for this age group, and provide a rich and potentially life changing experience.

General requirements of the e-learning environment included:

(1) The computational formalism to be followed should be a rule-based approach.

(2) The e-learning environment should be installed in laptop computers (e.g. MacBook).

(3) The e-learning environment should be comprised of an opportunity to experience design. Within the museum environment, users would not only read information related to design practices and/or see examples of design work, they would also be going through an inquiry process connected to the design of an object. Users will learn in/about design by experiencing design.

(4) The design experience should integrate the 3D Workshop offered at VectorLab, in which students learn how to use Cinema 4D software.

(5) The design experience should integrate the museum environment (e.g. current exhibitions and museum collection).

Based on these preliminary requirements, an e-learning environment for informal learning in/about design was developed using Flash®. Usability testing cycles were performed and the e-learning environment was refined before implementation. The structure of the e-learning environment is discussed in Chapter 6.

3.5.2 Evaluation

The analysis of the design experience at the Powerhouse Museum involved 13 Year 10 students, who participated in two workshops at the VectorLab. These participants were recruited from a private Sydney school. Pre- and post-qualitative evaluations were conducted, using a survey protocol (Appendix 4) based on the protocol developed for Phase 2.

In the pre-qualitative evaluation, participants were requested to perform a design task (1). Subsequently, they were invited to complete an individual survey about their design experience. Observational data was also collected. In the post-evaluation, participants completed a design task (2) using the e-learning environment. At the end of their design experience, they again completed an individual survey, and participated in a group discussion about their design experience. The pre- and post-qualitative evaluation allowed the comparison of perceptions of the design disciplines and the design experiences offered at each 3D Workshop. The evaluation study is discussed in Chapter 7. Table 3.12 summarises the evaluation design:

Table 3.12 Design Experience: Evaluation

Design Task 1 (N=13)	Design Task 2 + e-learning environment (N=13)
Evaluation Method Survey & Observations	Evaluation Method Survey, Group Interview & Observations

3.6 Validity and Limitations

Design, as discussed, involves many different sub-disciplines. The use of purposive sampling of participants from engineering, architecture, digital media and fashion, necessarily meant that other sub-disciplines of design were left out. Thus, one of the limitations resulting from the use of purposive sampling is that it decreases the generalisability of the results. Other sub-disciplines of design might present distinct ways of valorising design knowledge and practices.

Moreover, within a particular discipline each designer has some level of individual agency in the adoption or not of values or beliefs that are dominant within a disciplinary group. The sample size in Phase 1 being small (N=10) meant that findings in Phase 1 were not necessarily representative of the disciplines, that is, a different sample of interviewees might produce different results.

In Phase 1, audio recording was used to collect data from designers' interviews. These interviews were transcribed into text, and the text data was then analysed. However, a number of limitations and possible biases are often associated with the use of interview methods in qualitative research (Denzin and Lincoln, 1998; Miles and Huberman, 1994). As noted by Miles and Huberman (1994) within an interview, interviewee and interviewer are often co-producing a "story", the interviewee developing a sense for what the interview is about and deciding on what will be said, how the story is to be told. Throughout the interview people "read" signs and get clues through interpretation of phrases, pauses or insistence on pursuing a specific line of questioning. Miles and Huberman argue that the more unstructured the interview the less comparable the data. Another possible bias commonly associated with this method relates to the transcription of the interview data. Once data is collected it has to be transformed into text

data, a process that implies a transformation, where a conversational mode is transformed into a narrative discourse. Miles and Huberman (1994) point out that transcriptions are inescapably selective and within this process data may be subject to superficial coding and a decontextualization of what was said. Moreover the use of interview methods may also be affected by the researcher's bias, since the researcher is the one deciding on what part of data will be reported and how it will be reported.

The biases associated with interview methods exist due to the fact that "the spoken or written word has always a residue of ambiguity, no matter how carefully we word the questions and report or code the answer" (Denzin and Lincoln, 1998, p.47). In order to minimize these biases in Phase 1, a semi-structured interview protocol was used (Appendix 1). That is, the interviewer asked questions based on a pre-defined set of questions. The semi-structured protocol used open-ended questions that allowed exploring themes and topics relevant to participants' perceptions of design and designers (see section 3.3 for details on the development of the interview protocol). Interview data was fully transcribed by an independent transcriber but the interviewer was also the data analyst. The use of a semi-structured interview protocol and having the same interviewer to conduct all the interviews meant that there was less variation in the way data was collected. Nevertheless, researcher's bias may still be present, particularly since data was collected and analysed by the researcher conducting the study. Thus, there were limitations in drawing generalisations from results obtained in Phase 1. Being aware of these potential biases and limitations of Phase 1 led the researcher into adopting the mixed methods approach with a sequential exploratory strategy (discussed in 3.2. Research Design). The use of this approach aimed at strengthening the accuracy of the results by validating data obtained in Phase 1 with data from Phase 2. Moreover, other strategies were adopted to strengthen validity, such as multiple triangulations (see section 3.2).

In Phase 2, data was gathered through an online survey (Appendix 2). A purposive sampling with a snowballing strategy was used. This method allowed for collecting data from a larger number of designers but there were also limitations. For example, potential participants were identified by searches on the web. These potential participants were then approached via email and invited to participate in the project. Using this method meant that only design institutions

with an online presence on the web were contacted. Moreover, only websites in English were researched. Thus, the generalisation of findings in Phase 2 is limited to designers who are English speakers and who work or study within design institutions that are contactable via a website.

The survey protocol (Appendix 2) underwent several pilot studies to validate the words incorporated in various questions within the protocol (see 3.4). As a result the instrument uses mostly closed responses. Nevertheless, the ambiguity of written text may still represent a bias (Denzin and Lincoln, 1998). For example, the online survey provides only verbal descriptions (based on the Controlled Vocabulary List) for the respondents' expression of how they perceive design and designers. However, these words may not always be an accurate description of how the respondents may actually perceive design. Biases associated with this method relate to validity and reliability of responses. Surveys rely on self-reported data and the accuracy of data may suffer from participants' poor memory, misunderstanding of a question or intentional deception (Leedy and Ormond, 2005). In order to minimise biases associated with this type of method, the survey protocol incorporates two questions to explore each thematic category. That is, the protocol contains two types of questions that aim at investigating participants' perceptions of design, two types of questions that investigate perceptions of designers and two types of questions that investigate types of strategies used by participants to identify legitimate practices of design (discussed in section 3.4).

Limitations from Phase 3 of this research relate to the small sample size and the evaluation of the design experience. Due to the small sample size (N=13), findings in Phase 3 are not necessarily representative of how the general population may perceive the design disciplines or may interact with Design Studio; that is, a different sample of participants might produce different results. Moreover, the evaluation of Phase 3 was restricted to an evaluation of participants' experience. The character of the learning experience as an informal learning one brought challenges to the measurement of potential learning outcomes derived from interactions with Design Studio. For example, it was not possible to accurately measure whether a participant learned something solely as a result of the experience. In fact, participants were likely to bring to this experience their previous views and beliefs about design

learned from interactions in other settings, such as school, the media, friends or others. That is, participants' learning as a result of their participation in the design experience cannot be isolated and measured as a sole result from their design experience at the Powerhouse museum (see Chapter 6 for further discussion). The evaluation study focused on examining participants' perceptions of the design disciplines and of their interactions with Design Studio.

3.7 Summary of Chapter

This chapter presented the research approach and methods, laying out the research design. The chapter discussed the use of the theoretical concepts within different methods: interviews (qualitative) and online surveys (quantitative). The chapter also explained how a Bernsteinian approach influenced the development of the research's languages of description. The chapter discusses how Bernstein's concepts of classification and framing and Maton's concepts of Legitimation Code Theory (Specialisation) were employed in the research process. In addition, the chapter presents how these theoretical concepts were used to map the theory to the instruments used for data collection and the empirical data. The chapter considers the lessons learned through the examination of pilot studies, its effects on the theoretical understanding, and the approach used to overcome the problems encountered during the research process.

The next question in this research is about the usefulness of the instruments presented in this chapter. This question is addressed in Phases 1, 2 and 3 of this research. The next chapter presents and discusses the results of Phase 1 of the Exploratory Phase (interviews) and Chapter 5 discusses the online survey results. Chapter 6 explains the enactment of the theoretical concepts, discussing the development and implementation of Design Studio, an e-learning environment to support a design experience within the Powerhouse Museum. Chapter 7 discusses the use of the environment at the Powerhouse Museum.

CHAPTER 4 – EXPLORATORY STAGE – PHASE 1: INTERVIEWS

4.1 Introduction

The aim of the Exploratory Stage (Phase 1 and 2) was to examine and conceptualise what designers consider to be legitimate design practices, within engineering, architecture, digital media and fashion design. Thus, the Exploratory Stage (Phase 1 and 2) addressed the first research question of this study: *What are legitimate design practices and knowledges?* As set out in Chapter 1, it approaches this question by addressing two sub-questions:

(1) *How do designers perceive legitimate design knowledge and legitimate designers across the four disciplines?*

(2) *What strategies do designers use to recognise and realise legitimate practices of design in the four disciplines?*

This chapter discusses the application of Legitimation Code Theory (LCT) as a framework to investigate the nature of knowledge valued within design. The chapter focuses on Phase 1 of the Exploratory Stage of this research. The chapter discusses the analysis of interview data using LCT(Specialisation) concepts to uncover the underlying principles structuring legitimate knowledge and knowers within design.

Phase 1 of the Exploratory Stage comprised eight in-depth interviews with designers from engineering, architecture, digital media and fashion. The interviews explored designers' perceptions of their own disciplines, their perceptions of designers and the strategies they use to identify genuine design practices. In addition, interviews with two museum staff (a museum educator and a curator) were conducted. Museum staff was also included in the interviews because, museum professionals such as curators and educators, shape the ways design is presented within the informal learning context of museums.

The chapter first discusses the results from interviews with the eight participant designers. Then, aspects from interviews with two staff members from a museum of design are discussed.

As a result, Model 1 is proposed. The aim of the model is to represent interview findings in relation to LCT(Specialisation) concepts.

4.2 Results of interviews

4.2.1 Engineering Designers

The ways the interviewed engineering designers described their discipline can be conceptualised as grounded on the epistemic relation of knowledge to its object. When describing what constitutes originality, both participants focused on the application of engineering knowledge, rather than features of the designed object itself or how that object is experienced. A key focus was how a solution addresses a problem and how technical challenges are overcome so that the designed product could be generated. Engineering Designer 1 exemplifies original work by explaining how knowledge is used to develop a solution to a problem:

> the Seacliff Bridge down the South Coast is an example. What it is, is fantastic application. There is nothing particularly, in a purely engineering sense, there is nothing new about that bridge. (...) Where the real originality in that project is, is not necessarily the bridge itself, it's just the application. It is taking that type of bridge and putting it where it is to solve a problem which was about rocks falling off the face of the cliff. Again, it is about the solution to what was probably a geotechnical issue which was slope stability was down by a bridge. (Engineering Designer 1 – excerpt 1)

Similarly, Engineering Designer 2 exemplified value in engineering design in terms of the use of scientific research and mathematical knowledge in 'The Water Cube', the National Aquatics Centre for the Beijing Olympic swimming pool:

> Interesting, original. Probably the most obvious one to explain is The Water Cube. (...) that was the idea of the building needed to be square, so how can we make a building square and still make it interesting (…) they sort of look at how soap bubbles form and then did research on the mathematics behind and (how could) you automate that (...) That geometry you see there is the creation of if you've got a soap film and blew it up and that's how it was created. (Engineering Designer 2 – excerpt 2)

While emphasising the ways in which specialised engineering knowledge is applied to design situations (the epistemic relation of knowledge to the object), the engineering designers downplayed the social relation of knowledge to the subject. Even when discussing the interests of engineering designers, the participants emphasised mathematical and physical concepts required by the discipline and downplayed subjective aspects, emphasising they should possess a 'liking' rather than a 'passion' for technical issues. For example:

> They should have a technical, not a passion, but a liking for technical sort of problems and the like. So that's why a lot of engineers are just good at maths and science because it leads you that way and every day there's physics concepts and mathematical concepts that are just sort of part of my every day life. (Engineering Designer 2 – excerpt 3)

Again, the characteristics perceived as being fundamental for a designer, were being methodical or thorough, being objective and having developed technical skills. In this scenario, 'creativity' was seen as necessary, but used in a practical way – to find different possible solutions to a problem:

> From an engineering point of view, a good designer will be thorough and if they've got a problem to solve, they won't solve half the problem then be satisfied that they've done enough. They will see it all the way through and make sure it's covered. (…) So you do have to be thorough, but also you've got to have a creative flair not a flair per se, flair is more a bit too sort of flamboyant, but a creative aspect. When you get a problem, problem-solving - if you only try and solve a problem the way you know it, then you'll always hit a dead end at the point of the limit of your knowledge; whereas if you think about solving it another way, then you'll come up with a new approach to solve the problem. (Engineering Designer 2 – excerpt 4)

The downplaying of the social relation is noted when personal dispositions are perceived as unimportant, or devalued by the discipline. When referring to characteristics of engineers as subjects, the interviewed engineering designers downplayed the social relation. For example, Engineering Designer 1 considers that when working on a project it is important that engineers do not impose their "particular discipline on top of anybody else". Instead, this designer considers that engineers need to "really believe (they) are the least important person" otherwise they "will never start listening to anybody else". Engineering Designer 1 adds: 'It's not just about you."

Both interviewed engineers described how their design discipline is perceived as being an "anonymous profession". When comparing their own discipline to architecture, the engineers considered that 'renowned' architects may be easily identified by a lay person, whereas famous engineers are more likely to be unknown by actors from beyond the field. For example:

> if you went around the world now and said, "Who are the great architects?" and people would name sort of five of them and they are sort of recognised in their field as being the top architects, if not the biggest architects and that, you can say, Renzo Piano and Richard Rogers and Norman Foster and who's the Spanish guy Santiago Calatrava is he Spanish I think so. I think the architectural profession sort of recognises them. In engineering, if you went around and said, "Who are the world's top engineers?" they get more identified by companies than individuals. (Engineering Designer 2 – excerpt 5)

The analysis of the interview with Engineering Designer 1 showed that this designer has similar views to Engineering Designer 2. Engineering Designer 1 also illustrated his perceptions of engineers through a comparison between engineering and architecture designers. The designer considered that individual engineers are not usually identified as the author of a particular design project. Engineering Designer 1 pondered that in architecture, however, designers were more likely to be individually indentified as the authors of projects. For example:

> There is a big difference between engineering and architecture and possibly other disciplines is they will look at the Opera House and a lot of them will also know that the architect was Utzon. They will look at the Harbour Bridge and they will have no idea who the designer was and engineering is an anonymous design thing. I'm not even sure…there probably isn't a single person behind the Harbour Bridge or say the Seacliff Bridge down near Stanmore Park (…) you will never hear the individual who designed it. I don't know if it necessarily is an individual. It might have been. (Engineering Designer 1 – excerpt 6)

However, as pointed out by Engineering Designer 2, the 'anonymity' currently seen in the discipline is a recent development in the history of the profession. Engineering designers in the industrial revolution were much more likely to be recognised as authors. For example:

> if you were to name the top engineers of the twentieth century, you could go back historically and say, "What were the top engineers of the eighteenth century and the nineteenth century?" and people will say Telford and Brunel and all the guys in the

> industrial revolution who created the bridges and the steam trains and the railways. In the twentieth century, it's not as obvious. (Engineering Designer 2 – excerpt 7)

Similarly, both interviewees differentiated between the focus of engineering on meeting technical requirements and the focus of architecture on more subjective issues, such as beauty. For example, Engineering Designer 1 considers that a definition of engineering design would be that "things stay up because we (engineers) design them to stay up and architects design them to fit into the environment and look beautiful and work well".

In short, the participating engineering designers emphasised specialised knowledge, skills and procedures as the basis of insight and quality (stronger epistemic relation or ER+) and downplayed the significance of the dispositions, attributes and aptitudes of subjects (weaker social relation or SR–): a *knowledge code* (ER+,SR–).

These results from the interviews with engineering designers resonate with academic literature in the field. Indeed, the emphasis and value placed on technical knowledge is a long-standing tradition in engineering design. For example, a longitudinal review of engineering design practice in Germany stated:

> The essential thinking and procedural obstacles, as well as errors in thought and action were recognised. They originate mainly in disorderly or, respectively, non-systematic procedures where individual strategies do not revolve sufficiently around specific problems. Very good results are often missed due to a lacking analysis of target and demand, too narrow and insufficiently abstract observation of the solution field, as well as insufficient analysis of the solution. (Pahl et al., 1999, pp. 493-494)

This quote suggests that the form of knowledge valued within engineering design is systematic thinking and orderly processes and procedures. Furthermore, other researchers have shown that issues that were conceptualised in this thesis in terms of the social relation are looked upon with caution in engineering design. For example, in their study of engineering designers at Rolls-Royce, Baird and colleagues found that the way knowledge is gathered is at least as important as who possesses and transmits the knowledge, if not more so (2000). Engineers are said to routinely report their contributions, and are always requested to describe the process by which evidenced is gathered. Engineers are asked to complete their accounts if they provide a 'verdict without evidence' or if they forward 'evidence without a verdict" (Baird et al., 2000, p.

345). They described the valuation of engineering knowledge at Rolls-Royce as part of the company's provenance system. The value of knowledge is embodied in the practical evidence provided; the engineer who is valued is the one who followed processes grounded in systematic and scientific approaches. A "commitment to the ideas behind their designs" as "one of the things that architects value most highly" (Lawson, 1994, p. 134) is not as highly valued in engineering design.

4.2.2 Fashion Designers

In contrast to engineers, the interviewed fashion designers emphasised the kinds of dispositions, attributes and attitudes required to be a successful designer. For example, Fashion Designer 1 described that the decision to become a designer is based on the need of 'listening' to an inherent 'calling' to this profession:

> probably the most important thing is have, have, I don't know like have that sensation that something inside of you is pushing you to do this and you don't quite know why. (…) There's something inside of you that says you can't live without this thing, if you can't, if somebody took that away from you you'd be as good as nothing, that you'd be as good as dead probably. (Fashion Designer 1 – excerpt 8)

Rather than a 'liking ... for technical problems' (see Engineering Designers' Interviews, for example, excerpts 3 and 4), a fashion designer needed an 'inner calling', and to have 'a lot of passion' or 'a strong interest' (Fashion Designer 2). However, Maton (2007) emphasises that there is always an epistemic relation and a social relation (or, there is always knowledge *and* knowers). Accordingly, the fashion designers did not suggest that technical skills were not required at all, but rather that they were secondary to personal attributes. The interviewees emphasised that one needed to have motivation, passion and artistic attributes *before* embarking on the technical aspects of the discipline. Indeed, some skills were viewed as part of one's personal characteristics, such as having a 'natural' sense of proportion or of colour:

> I don't think there are any prerequisites to be honest. I don't think you have to be an amazing illustrator (…) I think there are natural things that you know, a sense of colour and a sense of just a natural sense of proportion and um somebody can try and teach you all that but I think if you haven't got it naturally well then you know, everything's a lot slower, the whole process is probably a lot slower I guess. (Fashion Designer 1 – excerpt 9)

For one interviewee, fashion design is akin more to art than to anything resembling a technical science, using a self-description as “a practising contemporary textile artist who predominantly weaves” (Fashion Designer 2).

This emphasis on the social relation (SR+) and downplaying of the epistemic relation (ER–), a *knower code* (ER–, SR+), was also reflected in the ways the participants described originality in fashion design. Rather than emphasising utility and function in relation to a defined problem (as the engineers did), the fashion designers described original design in more ‘subjective’ terms, such as the experiences it evokes in an audience (e.g. “containing a real simplicity”, Fashion Designer 2), its use of old ideas in new ways that might surprise the audience, or its cultural or political message, (e.g. ‘the hand craft as a cultural or a political practice and message’ Fashion Designer 2).

4.2.3 Architecture Designers

While the engineering designers highlighted systems and procedures and fashion designers used more subjective terms, the interviewed architecture designers described their discipline as *combining* creativity *with* scientific knowledge - *a balance* between ‘arts’ and ‘science’. For them, architecture is “a discipline that crosses a number of fields in terms of balance, creative and philosophical endeavours with quite scientific engineering bases.” (Architecture Designer 1). Similarly, the kinds of attributes they suggested that are required by a successful designer also combine artistic and scientific characteristics. Architecture Designer 2, for example, argued:

> it is a combination of passion and creativity and tenacity but then you also do need the rigors of discipline and structure and order, organisation as well. I think a lot of people maybe don’t have that balance, it’s the old thing about you know, art and science to me that covers that, it is that balance of art and science; creativity and pragmatism. (Architecture Designer 2 – excerpt 10)

Though there are always epistemic and social relations, and therefore one expects participants to discuss both skills or procedures and subjective characteristics (unless operating with a relativist code, where both are unimportant), architecture designers not only discussed both (as

did other designers) but also emphasised both equally - an *elite code* (ER+, SR+). Originality in design is, participants suggested, a matter of 'juggling' two measures:

> I always tell people it's like juggling and always trying to make things practical but you also have an agenda that's a social agenda or a creative idea or an artistic idea and they don't always meet. And when they do meet well, that's when good products come out. (Architecture Designer 1 – excerpt 11)

Like the engineering designers (see Section 4.2.1), the interviewed architecture designers emphasised the need to provide solutions to specific problems, but they also emphasised the artistic and creative dimension that architecture brings to the solution of such problems. The specific contributions that the individual architect brings to design were emphasised. This difference between engineering and architecture designers was highlighted by the interview participants from both engineering and architecture. For example, Architecture Designer 2 considered that "what the architect or designer can do is bring imagination to that process because anybody can pour concrete or you know, build buildings in commodity". This designer considered that the contributions of architects are grounded on "a particular need either by, a society need or a community need or a business need" and the architecture designer is the one that "can imagine how that might manifest itself in a built form." (Architecture Designer 2)

An emphasis on the designer as an author is also pointed out by Architecture Designer 1, who argued that, although technical processes and abstract knowledge are important, "the kind of thing that drives your ideas is much more intrinsic to you and your way of thinking." Similarly, the architects measured the success of solutions to design problems not only in terms of functionality or the nature of the object itself but also one's experience of the designed object. They discussed, for example, of "buildings that have genuinely moved me", the "connection to a number of selves, which is always personal" that great design achieves, the 'self referential' and 'subjective' nature of design (Architecture Designer 1) and the need to 'appreciate the space' (Architecture Designer 2). Thus, legitimacy for these designers was based not only on particular dispositions of the author or solely on the relation of specialist knowledge to its object, but on both being viewed as evident. This mutual emphasis on the epistemic and social relations are seen across the interviews of both architecture designers, which are highlighted by their views about the importance of the individual at the same time as referring to an emphasis on

knowledge as an object. Both designers do not seem to privilege one over the other, leading the analysis to weigh that on balance, both codes are equally emphasised.

4.2.4 Digital Media Designers

Where interview responses from designers in the other three design disciplines tended to share similar specialisation codes (though often expressed in different ways), the two digital media designers interviewed were strongly divergent. Digital Media Designer 1 emphasised the personal attributes of designers as crucial for achievement, for example, by considering the importance of knowing "how to speak to people" or having a "worldly experience" to be successful in design. However, this designer considers that these characteristics are not innate, for example:

> You're not born a graphic designer or born a designer, you can, I think you can actually develop those skills but you have to have a good idea about them and you know, you can develop them. (Digital Media Designer 1 – excerpt 12)

For this designer, the kind of design knowledge one may 'pick up' through personal experience is more significant than that acquired by formal study, and being 'worldly' is more relevant than a 'beautiful portfolio'. Legitimacy here comes from attributes of the designer (a stronger social relation), such as interpersonal skills (e.g. "I've had this weird background so I think all that creates an originality"), while the significance of specialist techniques related to a well-defined object is downplayed (a weaker epistemic relation): a *knower code* (ER–, SR+). For example, ideas may come from everywhere (ER–) and are selected, recontextualised and legitimated on the basis of the personality of the designer (SR+):

> I've had so many different jobs, in hospitals and I've worked in prisons as well in the area of information collection so I've had this weird background so I think all of that creates an originality that if I was a graphic designer from when I was eighteen to now, I probably wouldn't have that, because I can draw upon that wealth of information inside that makes it different, but I don't know what makes it. It's such a personal thing, what makes something interesting. What do they say, one man's meat is another man's poison. It's kind of like, it's so subjective, isn't it. (Digital Media Designer 1 – excerpt 13)

In contrast, the second interviewee focused on technical content and the ways one might use this knowledge to present information or communicate ideas. Rather than viewing design as 'subjective' and 'a personal thing', Digital Media Designer 2 emphasised the importance of designers emotionally distancing themselves from their designs (SR–) and instead focusing upon providing design solutions to problems (ER+): a *knowledge code*. For example:

> Critical thinking and analysis and also to really separate yourself from your designs emotionally and always remain focused on providing a solution and there's more than one solution to a problem. So you can't really afford to become tied to a solution. (Digital Media Designer 2 – excerpt 14)

For Digital Media Designer 2, it is the design problem that provides the basis for selecting, recontextualising and legitimating knowledge and ideas, rather than the personality or subjective dispositions of the designer. Similarly, originality in design is, for this designer, based on how it has addressed particular issues. Indeed, the designed object is judged in terms of the application of technical knowledge to provide solutions to a series of tightly-defined problems:

> you can say in this (web)site this worked really well here, which might be a tiny bit of it and I just actually can't think of anything. I know there are things that I've seen and gone, 'Oh that works really well here' or something, but when I'm scouting around, I never really look at a site as a whole anymore. I look for individual pieces now, because the work that I'm doing is so detailed. (Digital Media Designer 2 – excerpt 15)

For this participant, the designer is also an object - a consulting resource for the employing organisation: "If you're being employed and for me here I'm seen as a resource, so I come into projects, give my consultation or do my work on it and then leave again." Thus, the social relation to the designer as subject is downplayed (SR–) in favour of the epistemic relation to the design object (ER+).

4.3 What is Legitimate Design in These Disciplines?

The architects' emphasis on the social relation is a characteristic that is strongly noted by Lawson (1994) in his study of key architects. Lawson considers that "each of the designers discussed here have strong programmes of their own which they explore and develop through their design work." (p. 144). In addition, he states that architects "explore and develop their own

intellectual programme" (Lawson, 1994, p. 138) by working on various projects. Lawson's conclusion further affirms the architects' personal relation to design knowledge, which would be cultivated through their practice and shape their values. In contrast to this description of architects emphasising the role of the social relation in generating knowledge, Baird characterises valuable knowledge becoming archived at Rolls-Royce, as being recorded/stored through following particular procedures:

> Such knowledge is captured by experts over successive fleets of engine history and is recorded in data, diagrams, written reports. This data is gathered by specialist engineers who have particular interests in engine components histories and is moderated by their experienced judgement. (Baird et al., 2000, p. 346)

The interviews reflected similar perceptions from those described in the design literature. For example, architecture designers interviewed emphasised social relations (in addition to epistemic relation) and engineering designers' interviews indicated an emphasis on epistemic relation.

The interviewees from across the range of design disciplines also emphasised the difference between designers and the lay audience. Architecture Designer 2, for example, stated that:

> what makes it a great piece of work is because it is complex, you know it's not easy to achieve so you've got to be prepared again to have this vision, have this idea um and I think that's what makes it interesting because the average lay person will go in and they won't appreciate any of the complexities, they will just appreciate the space as a good, simple inspiring space. (Architecture Designer 2 – excerpt 16)

Similarly, though Fashion Designer 2 focused on good design "containing a real simplicity", this feature of quality was something that many people would not see.

Although the participant designers point to differences in how 'laypeople' and 'design professionals' understand a 'design object', the basis of this 'expert vision' (of design professionals) is different amongst the various disciplines. The way participants described the basis of legitimacy in their own discipline can be understood as representing a knowledge code for engineering, a knower code for fashion, an elite code for architecture, and either a knowledge code or a knower code for digital media. The results from the analysis of interviews are represented in Model 1 (Figure 4.1).

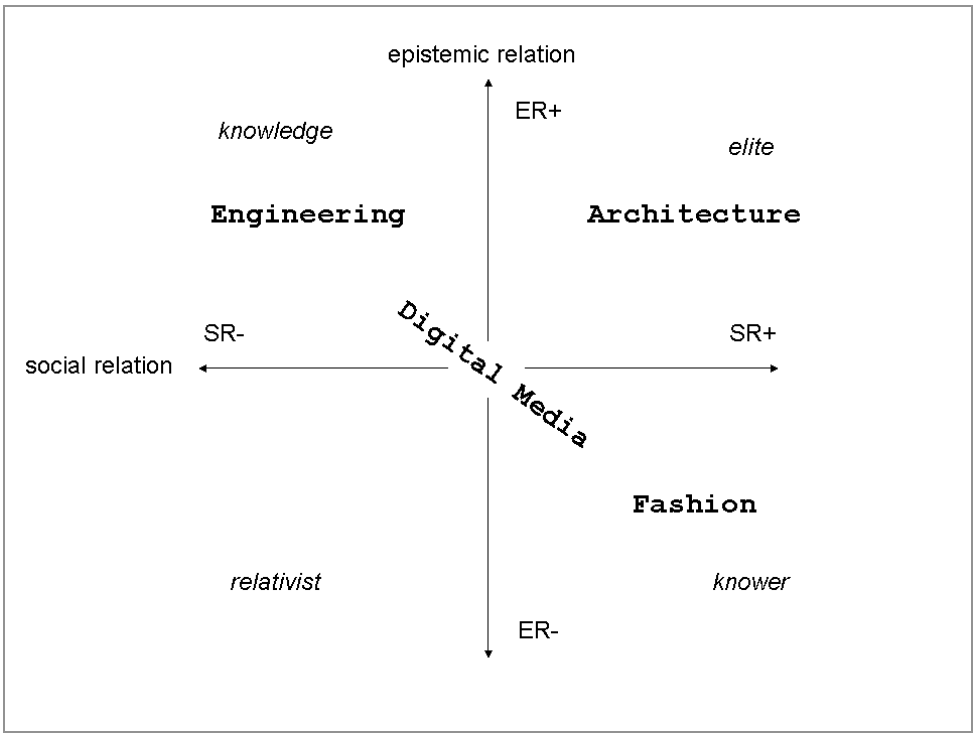

Figure 4.1 Model 1: LCT(Specialisation) and the design disciplines

The two different codes underlying responses from the two digital media designers might reflect their different working environments: a knower code underlies the responses of a designer working in a small private company; a knowledge code was voiced by a designer working for a large corporation, a potentially more anonymous and less intimate environment. Also, digital media is a comparatively younger field than architecture, engineering or fashion; and claims to the legitimacy of knowledge in this discipline may not yet be resolved.

4.4 General Trends in Design Practices

Across disciplines, an understanding that design practices are rapidly changing and the need to collaborate with others is strong (Kvan, 2000). In terms of Bernstein's approach, this might suggest that the 'symbolic boundaries' of the knowledge structure of design disciplines may not be as strong as they would have been in the past. For example, architecture designers commented on how the discipline seems to be moving towards interaction with other related disciplines:

> At the moment there is a big push for a cross discipline approach, architecture is learning from animation, from areas like the car manufacturing industry, there's a lot of push to extend beyond the traditional master architect role and collaborate and use new technologies. (Architecture Designer 1 – excerpt 17)

Architecture Designer 1 suggested a change in the way architecture designers are currently perceived from the way these designers used to be perceived in the past; for example:

> Historically the architect is seen as the generator, the master, architect means master builder and, but there's a growing trend to become more diverse and work in a more open fashion. (Architecture Designer 1 – excerpt 18)

This designer's description of how architecture is now working in a 'more open fashion' (see above) may be seen as an expression of more permeable 'symbolic boundaries'. Architecture designers may establish partnerships with others fields or disciplines, for example:

> So you might have a philosopher on your team, there's a famous project in Paris where the architect worked with a French philosopher. There's an American architect who is working closely with the car manufacturing industries to develop new technologies in both directions, he's learning from them, they're learning from him. And so it is a new field this kind of becoming more open to seeing what other people are doing and how they operate. I mean there's been a long tradition associated with the arts but I think it's becoming far more diverse. (Architecture Designer 1 – excerpt 19)

Similarly, Architecture Designer 2 commented on how this trend manifests in the form of collaboration 'with anybody and everybody':

> it's not just about the architect delivering a product via their own imagination, it's collaboration with anybody and everybody. It could be economists, it could be you know, research people looking at particular types of materials, it could be other architects um you know, all sorts of different people. (Architecture Designer 2 – excerpt 20)

In engineering design, these demands are equally perceived and valued. In particular, when referring to large structural projects, engineering designers described the need for the involvement of different people at various capacities. These exchanges with other disciplines or fields are perceived as positive developments in the design field. Architecture Designer 1, above, considered that collaborations with other disciplines or fields may result in richer experiences (e.g. he's learning from them, they're learning from him). Engineering Designer 1 has similar views:

> The infrastructure projects now are becoming bigger and bigger. They involve more and more people and I think the more we work on them and get an appreciation of

> what other disciplines can offer and integrate all those things, there is new design in that. Electrical engineers solving civil problems. (Engineering Designer 1 – excerpt 21)

Designers perceive that knowledge within their disciplines is different nowadays than what used to be, which in turn affects the way they practise design. For example, Engineering Designer 1 considered that "there is no pure civil engineering product" anymore and this would affect the old role of engineers. These designers are now seen as having to contribute to projects by supporting "other disciplines whether it is a power project or something like that", Engineers "are constantly integrating other people's ideas" (Engineering Designer 1). The analysis of fashion designers interviews also identified these designers' perceptions of blurry boundaries within the field, for example:

> I think a conscientious designer is aware of what's going on around them and what the other designers in other fields are doing and um has a keen interest in, you know, for me I have a very keen interest in architecture. (Fashion Designer 2 – excerpt 22)

4.5 Design Education within Informal Learning Settings

Interviews conducted with two museum staff (educator and curator) illustrate the ways design is presented within the informal learning context of museums. For Museum Designer 1, all forms of design needed to be 'techno–creative' – a designer would need to be at the same time a 'geek' (epistemic relation) and 'creative' (social relation), that is someone characterised by an elite code. A great designer is perceived as someone who "understands the technology as well as the creativity" (Museum Designer 1). A position that is perceived as current within the field, for example:

> I don't think any area of design can afford to function in a bubble anymore. To say I am going to be a graphic designer, who works in 2D print graphics, is an incredibly limiting thing...I would say all forms of design are techno–creative; which means you cannot be functionally creative without an understanding of the technology and the underlying technical things that are going on. You can't be a creator without being a geek. Vice versa. All geek and no creativity is dull too...But you can't be one or the other…You are never going to be able to articulate your vision, unless you actually understand the technology. (Museum Designer 1 – excerpt 23)

Similarly, Museum Designer 2 also emphasised an elite code, in which being knowledgeable and technical, is as important as being creative and possessing an ability to add enjoyment for an audience; for example:

> I guess whether they're contributing in terms of innovation whether that be in some formal design innovation or technological innovation. How much that design adds to what's already out there (...) you know whether it adds a significant level to our understanding and enjoyment whether it uses a new technology in a very kind of new and innovative way. (...) So I mean it's a very subjective thing, one person's good design is another person's, can be another person's abhorrent design. (Museum Designer 2 – excerpt 24)

Although, an elite code seems to prevail in the museum educators' descriptions of design as a field, this is not a strong and definite picture for these participants. The role of technology was discussed by the museum educator in its effects on opening up the symbolic boundaries of disciplines (weaker classification). This interviewee identified technology as mediating the way design is practised, influencing its new directions. Technical skills related to how to use technology underpin all areas of design. However, this interviewee also found it important that these skills were coupled with creativity. For example, Museum Designer 1 referred to how technology is affecting the differentiation of design disciplines, as most of the disciplines may use similar tools to perform design. Similar to Architecture Designer 1 (e.g. excerpts 17 and 18) or Engineering Designer 1 (e.g. excerpt 21), this participant acknowledges a historical shift in design from a collection of isolated disciplines to a unifying field. In the past, different disciplines may have been attached to specific tools, but with computing technology these boundaries are now less strict. This museum designer considered:

> I find it very difficult to see any form of design on its own anymore. Like I guess that's… I imagine that is quite particular to me and not necessarily something, a thought that is widespread, but I find it very hard to see the differences between architecture and gaming design. (Museum Designer 1 – excerpt 25)

The interviews with the museum educator and curator suggest that informal learning settings, such as a museum of design, are also subject to the codes of a design discipline. For example, Museum Designer 2 ponders the need to consider their partnerships to renowned professional

bodies or organisations that support events in the museum, alongside being innovative and open minded.

> part of our brief is to be as open minded to new ideas as we possibly can be and to new technologies and utilising new technologies in a way we interpret and display design. So whether we're influenced by design fields, I mean we have areas where we have stakeholders and affiliated societies and special interest groups so you know we have partnerships. So the Sydney Design Festival for example is (inaudible) AAA, Australian Architecture Association, the DIA, Design Institute of Australia and the graphic design. So we're sort of constantly liaising with those people too… (Museum Designer 2 – excerpt 26)

In fact, museums are now conscious of their changing educational role, and strategies derived from settings from formal education (e.g. lectures and workshops) are being aggregated into the museum context. Another aspect is that their brief includes addressing two different audiences, one that is perceived as being more 'specialised' and another formed by the 'layperson'.

> our educational role is to expand appreciation and understanding of that area. So we would want to try to attract an audience beyond that immediate kind of professional audience. (Museum Designer 2 – excerpt 27)

Overall, some aspects of the designers' interviews seem to resonate into museum educators' perceptions of the field, specifically their perceptions of what is viewed as legitimate knowledge and knowers within design. In particular, museum educators acknowledged the influence of the language of the discipline into the way design exhibitions are planned, therefore affecting how informal learning tasks or activities may be realised within museums.

4.6 Summary of Chapter

This chapter examined interviews with two engineers, two fashion designers, two architects and two digital media designers. Using theoretical concepts derived from LCT(Specialisation), the chapter discussed the bases for what is considered legitimate knowledge and knowers within engineering, fashion, architecture and digital media.

The interviews suggest that different disciplines in the field of design practice design differently not just because of the variety of knowledge content that is required to perform the associated

tasks but also because of the way that knowledge is valued in the respective discipline. Engineering is characterised as a knowledge code (ER+,SR-), fashion as a knower code (ER-, SR+) and architecture as an elite code (ER+,SR+). The two designers from digital media perceived their discipline as under different legitimation codes of specialisation (knowledge and knower). The disciplines reflect different 'rules of the game', measures of achievement or 'legitimation codes'. The results also point to cross-disciplinary perceptions of increased demands for collaboration and exchange with other disciplines, which are likely to be affected by the differences in values across the disciplines. Similarly, these 'rules of the game' are also likely to be reflected within formal and informal learning settings for design education. Interviews with two museum educators described that museums are not neutral learning environments and are also influenced by the knowledge valued within the field. It is important to consider, however, that within a discipline, each designer has some level of individual agency to adopt a different code to that which dominates the disciplines. Thus, a different sample of interviewees may result in slightly different results.

The new question arising from this chapter relates to the usefulness of the model developed out of the qualitative study. This question is addressed in the next chapter (Chapter 5) which discusses Phase 2 of this research exploring the validity of the qualitative findings across a broader population. Chapter 5 presents the results of an online survey with 139 designers in engineering, architecture, digital media and fashion and reviews Model 1, incorporating results from the online survey.

CHAPTER 5 – EXPLORATORY STAGE: PHASE 2: ONLINE SURVEY

5.1 Introduction

The purpose of Phase 2 was to explore the validity of the qualitative findings of Phase 1 across a wider population. In this phase, the relative strengths of the epistemic and social relation for each of the four design disciplines (e.g. engineering, architecture, digital media and fashion) were examined through an online survey (Appendix 2). Concepts derived from LCT(Specialisation) were developed and applied to produce analytical tools and the survey protocol (discussed in Chapter 3). The survey examined the same three main themes from Phase 1: (1) perceptions of design disciplines; (2) perceptions of designers; and, (3) strategies used to recognise genuine design practices. Survey participants contributed with perceptions about their own discipline (e.g. how engineers perceived engineering) as well as perceptions about the other disciplines in the study (e.g. how engineers perceived architecture, digital media and fashion).

Both Phase 1 and Phase 2 examined the first research question of this study: *What are legitimate design practices and knowledges?* As set out in Chapter 1, Phase 2 approaches this question by addressing two sub-questions:

(1) How do designers perceive legitimate design knowledge and legitimate designers across the four disciplines?

(2) What strategies do designers use to recognise and realise legitimate practices of design in the four disciplines?

Phase 2 explored the validity of the model proposed in Phase 1, and as a result generated a final model, Model 2 to represent designers perceptions of legitimate practices and knowledges within the four disciplines.

This chapter presents the results from the online survey. Firstly, an overview of the results from all participants in the survey is presented. Secondly, results related to each design discipline

are examined, in particular the designers' views of their own discipline and their peers, as well as the types of strategies most often undertaken in engineering, fashion, architecture and digital media. Each discipline is examined separately in order to identify which LCT(Specialisation) code best characterises the discipline. This section will first lay out the survey results and then present a summary and discussion of the findings for each discipline. Thirdly, the chapter discusses the implication of these results by reviewing Model 1 proposed in Phase 1. Lastly, the survey results are then incorporated into Model 2. This revised model was used as the basis for Design Studio, the e-learning environment presented in Chapter 6.

5.2 Survey Results

5.2.1 Four Disciplines of Design

As the number of responses varied across disciplines, each discipline's results reported in this thesis – regarding designers' perceptions of design disciplines, designers and strategies used – have been normalised to allow comparison. That is, percentages for the results of disciplines are calculated according to total responses collected from each individual discipline.

5.2.1.1 All participants – Background

A total of 139 responses were collected from professional designers and/or tertiary students of design. Table 5.1 show the number of responses obtained from each of the disciplines. The higher number of architecture participants may be due to the fact that this research study was conducted within a Faculty of Architecture, Design and Planning, thus being more appealing for those who identify with this discipline.

Table 5.1 Survey Participants

Discipline	Number of Participants
Engineering	28
Architecture	65
Digital Media	30
Fashion	16
All	139

Demographic details were collected to ensure that data was from a balanced population in terms of age, gender, place of origin, professional status and years in the field. Participants' age ranged from 18 to 69 years old (*M*=28.1, *SD*=10.6), being 77 male and 61 female participants. Sixty-eight designers were born in Australia and 69 were born in other countries. Fifty were undergraduate students, 53 postgraduate students and 44 a staff member of a design company and/or tertiary institution. Seventy-four participants have been working and/or studying in design for less than 5 years, 29 have been in the field between 6 and 10 years, and 36 participants have been in the field for more than 11 years.

5.2.1.2 All participants – Perceptions of design disciplines

The survey protocol (Appendix 2) comprised of four parts: Part 1 with questions related to personal background, Part 2 with questions about disciplines, Part 3 with questions about designers, and Part 4 with questions about design practices. Part 2, 3 and 4 of the survey focused on design and followed the same three thematic categories from the interviews: perceptions of design disciplines, perceptions of designers and strategies used to identify genuine design. Each thematic category was investigated through two types of proposed tasks. The survey protocol used a majority of questions with multiple–choice.

Task 1 asked the participants to choose three words to describe each design discipline (Section 3.4.2. of Chapter 3). Each participant described their own design discipline as well as the other disciplines in the study, using their own words or selecting words from a set containing 16 options based on the Controlled Vocabulary List (Section 3.4.1. of Chapter 3). Eight words were associated with an ER emphasis (e.g. driven by knowledge, methodical, objective) and 8 with an SR emphasis (e.g. driven by taste, elegant, empathic). Only words that had been considered to be associated with an emphasis on ER or SR by *at least* 5 pilot participants (out of a total of 9) are displayed in Task 1 (16 words in total).

Mean values were calculated for all participants' use of ER and SR words to describe each discipline. Mean values closer to 3 or 0 show, as is the case for descriptions of engineering and fashion, a higher level of agreement between respondents. Mean values closer to 3 show that respondents tend to emphasise one of the LCT relations (ER or SR). Mean values closer to 0

show that one of the LCT relations (ER or SR) is downplayed. Mean values closer to 1.5 show that both types of words were used in the description of the discipline; thus, there is higher variance in responses. Mean values closer to 1.5 were seen in the descriptions of architecture and digital media.

Figure 5.1 shows that participants were more likely to associate engineering with ER words (94%) (*M*=2.78, *SD*=0.47) rather than SR words (5.2%) (*M*=0.15, *SD*=0.40). In the descriptions of fashion, SR words (87.8%) (*M*=2.56, *SD*=0.71) were more commonly used than ER words (12.1%) (*M*=0.35, *SD*=0.58). In the descriptions of architecture, participants used 55% SR words (*M*=1.58, *SD*=0.86) and 44.9% ER words (*M*=1.29, *SD*=0.85). In the descriptions of digital media, participants were also used 55.8% SR words (*M*=1.64, *SD*=0.87) and 44.1% ER words (*M*=1.28, *SD*=0.85).

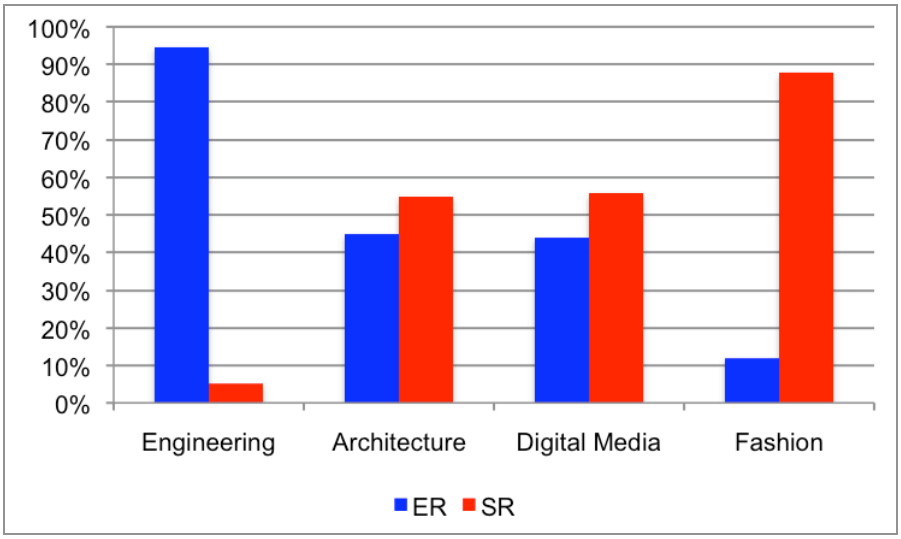

Figure 5.1 Perceptions of Design Disciplines (All)

Words used by the designers to describe the design disciplines in the study are shown in Figure 5.2. The left side of the graph contains words that were associated with an emphasis on the epistemic relation (e.g. driven by knowledge, methodical, objective), and the right side of the graph contains words that were associated with a stronger social relation (e.g. driven by taste, elegant, empathic). Figure 5.2 shows that engineering (red) is mostly present on the left side of the graph (epistemic relation) whereas fashion (green) is predominantly on the right side of the graph (social relation). Both architecture (yellow) and digital media (blue) descriptions appear in both sides of the graph. Taking into account the probability of a respondent randomly selecting

a word out of the possibilities offered, only results above 18.7% (black horizontal line) are considered to be significant (not likely to be random).

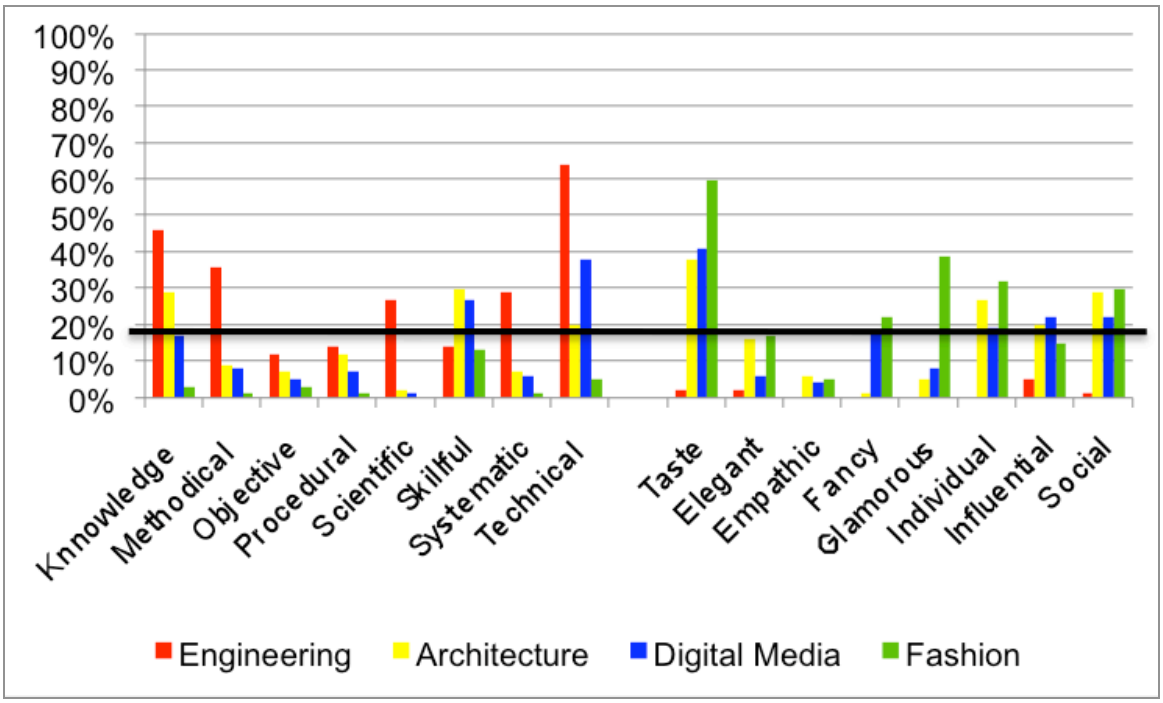

Figure 5.2 Engineering, Architecture, Digital Media, Fashion Design is… (All)

In Task 2 of the survey (Section 3.4.2 of chapter 3), participants were asked to consider the importance (not at all, not very, quite or very) of skills, taste and talent for being competent at each design discipline. This part of the survey (Appendix 2) used an instrument developed and used by Maton in previous studies (Lamont & Maton; 2010). Values (minimum of 1 and maximum of 4) are assigned to respondents' answers about skills (which would be related to the epistemic relation), and to the combined results for the questions referring to taste and talent (which would be related to the social relation). The mean is calculated in relation to all the design disciplines, and anything above the mean is considered stronger (ER or SR) and anything below the mean is considered weaker (ER or SR). Thus for the results for Task 2 related to all disciplines the mean value is 3.44 for 'skills' and 3.06 for 'taste and talent'. Table 5.2 shows the values for skills and combined values for taste and talent, for each design discipline as seen by all participants in the survey. The table also shows the corresponding values for ER and SR and the LCT(Specialisation) code according to the ER/SR values.

Table 5.2 Skills & Taste + Talent: All Disciplines

Discipline	Skills	Taste + Talent	ER	SR	LCT Code
Engineering	3.81	2.56	ER+	SR–	Knowledge
Architecture	3.54	3.26	ER+	SR+	Elite
Digital media	3.38	2.99	ER–	SR–	Relativist
Fashion	3.02	3.44	ER–	SR+	Knower
Mean for all	3.44	3.06			

5.2.1.3 All participants – Perceptions of designers

In Task 3 of the survey (Section 3.4.2. of Chapter 3), participants were asked to use three words to describe designers in each of the disciplines in the study. Participants could use their own words or select words from a set containing 14 options from the Controlled Vocabulary List. Seven words were associated with an ER emphasis (e.g. a methodical person, a problem solver, a procedural person) and seven words with an SR emphasis (e.g. a glamorous person, a sensitive person, a social person) (see Chapter 3 for a description of pilot study). Only words that had been considered to be associated with an emphasis on ER or SR by *at least* 5 pilot participants (out of a total of 9) are displayed in Task 3 (14 words in total).

Mean values were calculated for participants' use of ER and SR words to describe designers. Mean values closer to 3 or 0 show a higher level of agreement between respondents. A mean closer to 3 shows an emphasis on the LCT relation (ER or SR) and a mean closer to 0 shows that the LCT relation (ER or SR) is downplayed (e.g. descriptions of engineering and fashion designers). Mean values closer to 1.5 show that participants use both types of words (e.g. descriptions of digital media and architecture designers).

Similar to results in Section 5.2.1.2, Figure 5.3 shows that participants were more likely to use ER words (96.6%) (*M*=2.87, *SD*=0.44) rather than SR words (3.3%) (*M*=0.06, *SD*=0.28) in their descriptions of engineering designers. On the other hand, SR words (89.9%) (*M*=2.63, *SD*=0.70) were more commonly used to describe fashion designers than ER words (10%) (*M*=0.29, *SD*=0.55). The participants' descriptions of architecture designers show 56.8% SR words (*M*=1.69, *SD*=0.82) and 43.1 % ER words. (*M*=1.27, *SD*=0.79). The descriptions of digital

media designers also show 56.9% SR words (*M*=1.67, *SD*=1.01) and 43% ER words (*M*=1.22, *SD*=0.95).

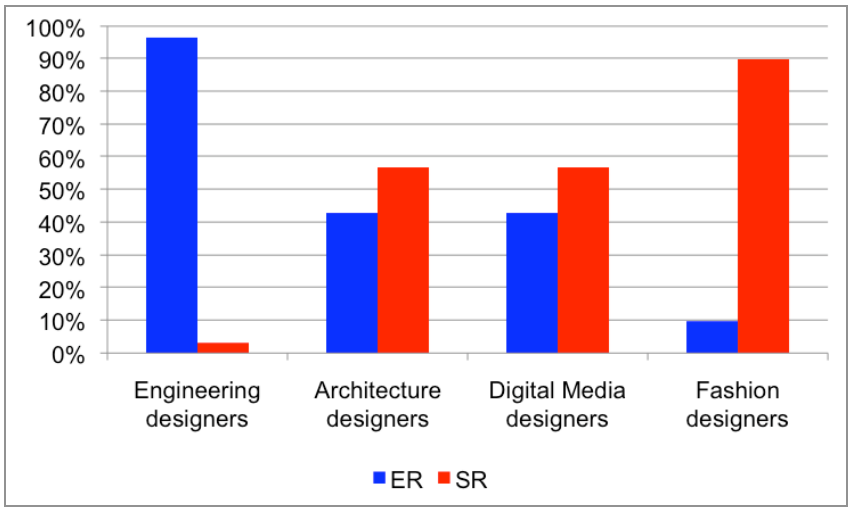

Figure 5.3 Description of Designers (All)

Words used by the participants to describe designers from the four design disciplines in the study are shown in Figure 5.4. Taking into account the probability of a respondent randomly selecting a word out of the possibilities offered, only results above 21% (black horizontal line) are considered to be significant. The left side of the graph contains words from the Controlled Vocabulary List, which were seen as associated with an emphasis on an epistemic relation (e.g. a methodical person, an objective person), and the right side of the graph contains words that were associated with a stronger social relation (e.g. a sensitive person, an artist). Figure 5.4 shows that words used to describe engineering designers (red) are solely present on the left side of the graph (epistemic relation) whereas descriptions of fashion designers (green) are predominantly on the right side of the graph (social relation). Descriptions for both architecture (yellow) and digital media designers (blue) appear in both sides of the graph.

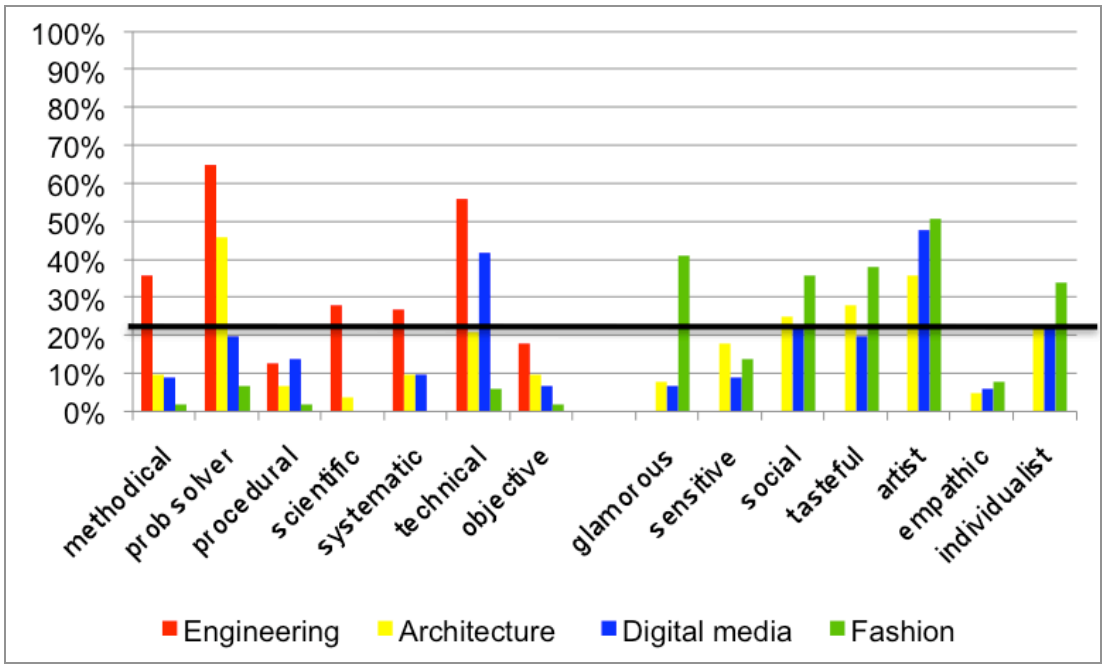

Figure 5.4 An Engineering, Architecture, Digital Media, Fashion Designer is... (All)

In Task 4 of the survey (Section 3.4.2. of Chapter 3), participants read profiles of fictitious designers (e.g. X. is a very technical and methodical person. That is why s/he chose this sort of work) and were asked to select in which design profession(s) the fictitious designer is most likely to work, if any. There were seven profiles associated with an ER emphasis and seven profiles associated with a SR emphasis (see Chapter 3). Responses show that engineering designers were more likely to be associated with ER profiles (72.8%) rather than SR profiles (27.1%). Conversely, fashion designers were more likely to be associated with SR profiles (83.9%) rather than ER profiles (16%). Architecture designers were associated with 60.8% SR profiles (60.8%) and 39.1% ER profiles. Similar results are seen for digital media designers with 54.2% SR profiles (54.2%) and 45.7% ER profiles (Figure 5.5).

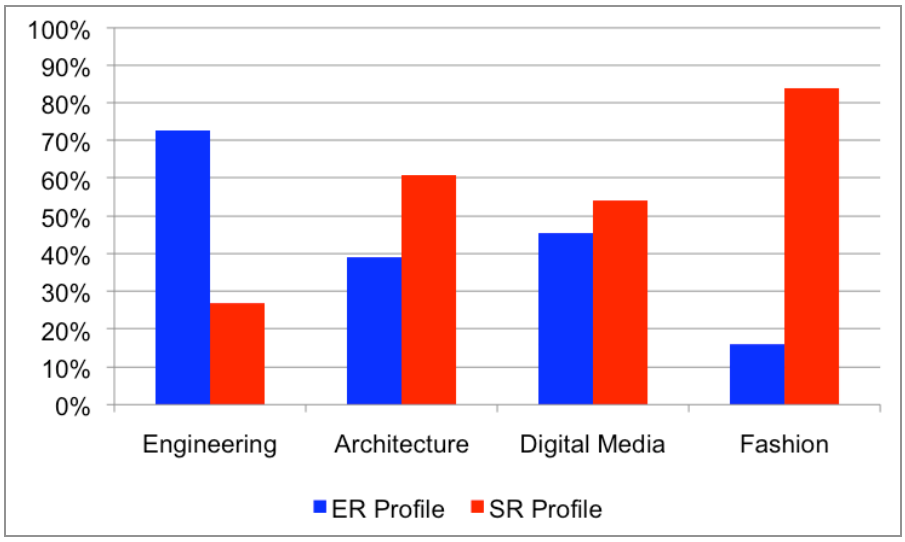

Figure 5.5 Profiles of Fictitious Designers (All)

5.2.1.4 All participants – Strategies

In Task 5, participants read 26 statements (e.g. Designers in my discipline participate in conferences to listen to new ideas in the field) and chose the frequency (always, frequently, not sure, rarely or never) of the strategies for identifying knowledge in their design discipline. Overall, a slightly greater emphasis on ER strategies over SR strategies was found in the combined results of all participants in the survey (Figure 5.6). ER strategies were always (25.2%) and frequently (43.4%) used. SR related strategies were always (22.1%) and frequently (43.9%) used.

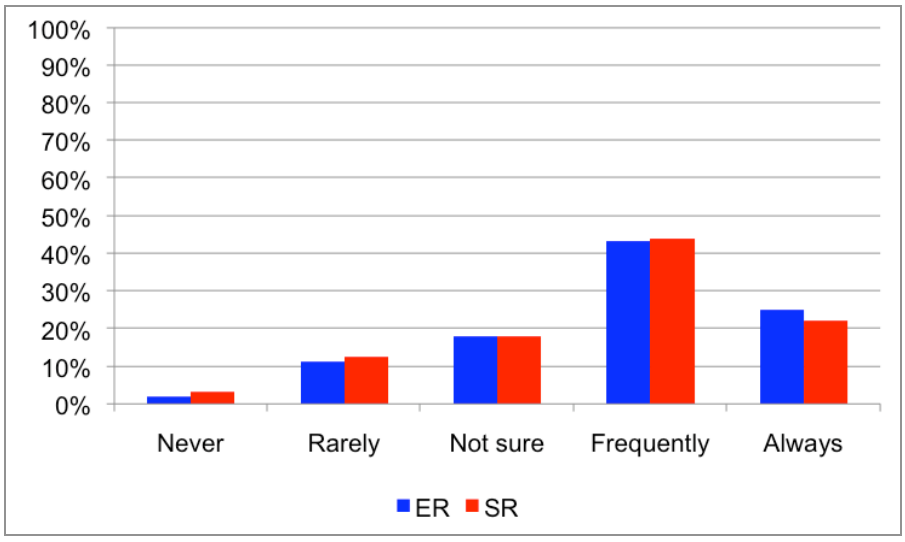

Figure 5.6 ER and SR Strategies (All)

In Task 6 participants were invited to contribute with their own strategies, but only few comments were added. Two of these comments reported their views of this research (e.g. “this questionnaire really won’t review a lot about the type of people you are trying to identify through your study”). The remaining comments were largely about their views of the design field in general (e.g. “Design is a multi-discipline and somehow congenital capability”) or some disciplines in particular (e.g. “There are many different kinds of ‘engineering’”).

The next sections examine the results according to disciplines, that is, the participants’ perceptions of their own discipline and their peers, as well as the types of strategies undertaken in engineering, fashion, architecture and digital media. Each section also shows how participants perceive the other disciplines in the study. The discussion of responses for each separate discipline first shows the results for individual tasks. Then, at the end of each section a summary of the results for that discipline is presented. The analysis of responses related to each individual task and their corresponding tables are provisory until the combination of overall results in Table 5.11 and Table 5.12. The identification of the LCT code of specialisation for each discipline takes into account results in all tasks in the survey.

The analysis follows the principles described in Section 3.4.4. For Task 2 of the online survey the following principles are used:

> It is knowledge code if ER results are above the mean and SR results are below the mean.
>
> It is knower code if ER results are below the mean and SR results are above the mean.
>
> It is elite code if ER results and SR results are above the mean.
>
> It is relativist code if ER results and SR results are below the mean.

For Tasks 1, 3 and 4 the following principles are used:

> It is knowledge code if ER results are above 70% and SR results are below 30%.
>
> It is knower code if ER results are below 30% and SR results are above 70%.
>
> It is elite code if percentage for ER results and SR results vary and both values are consistently above 30%.
>
> It is relativist code if ER results and SR results vary and both values are not consistently above 30%.

5.2.2 Engineering

5.2.2.1 Engineering designers - Perceptions of design disciplines

In Task 1 of the survey, the engineering design participants chose three words to describe each design discipline. Figure 5.7 presents the results of this task. Considering the probability of a respondent randomly selecting a word out of the possibilities offered, only results above 18.7% (black horizontal line) are considered to be significant. This shows that engineering designers used predominantly ER words such as 'technical' or 'driven by knowledge' (blue) to describe their own design discipline rather than SR words (red) or their own words (green).

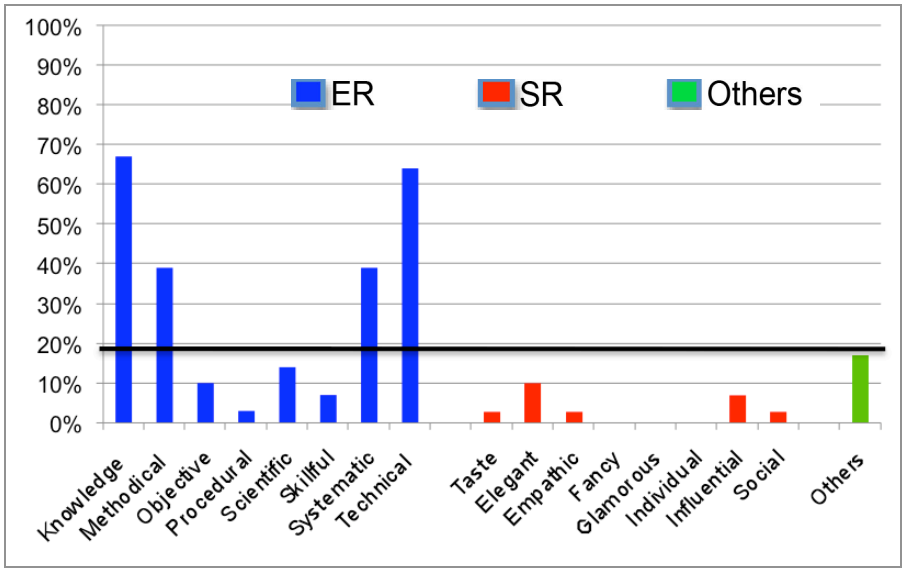

Figure 5.7 Engineering by Engineering Designers

Each participant was also invited to contribute his/her views regarding the other disciplines in the study. This data was used to explore the convergence of results, that is, whether designers from other disciplines would have similar or diverse views of designers in the discipline of origin. For example, perceptions of fashion designers about fashion design could be compared with results of how engineers, architects and digital media designers view fashion design.

Figure 5.8 shows engineering participants' use of ER or SR words to describe the four disciplines in the study. The results show that engineers were more likely to use ER words (89.6%) to describe their own discipline. They were also more likely to use SR words (97.3%) to describe fashion than any other discipline. A greater emphasis on SR was also identified in the way engineers described both digital media (62.6%) and architecture (63%); however, the

emphasis on SR rather than ER was not as strong as for their description of fashion. Engineering designers also used 36.9% ER words to describe architecture and 37.3% to describe digital media. ER and SR results for both architecture and digital media were above the threshold mark of 30%.

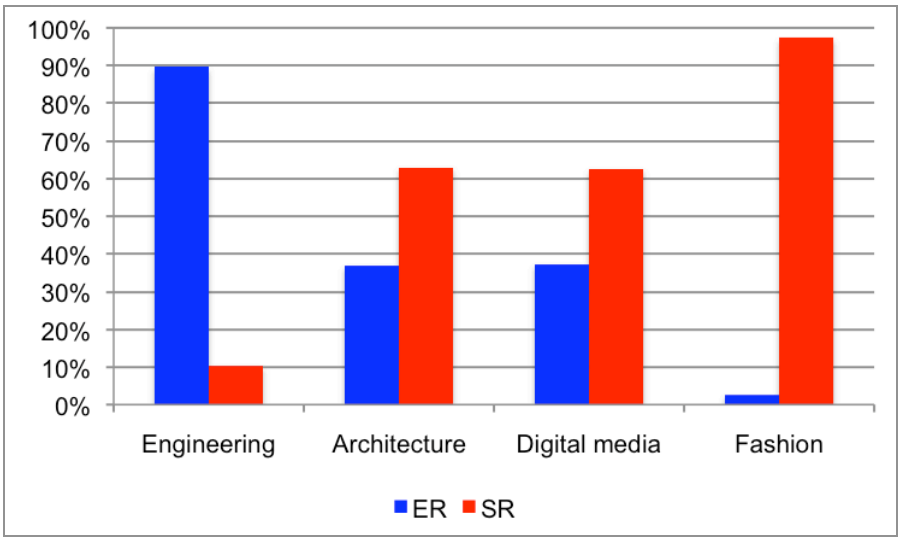

Figure 5.8 Engineering: Perceptions of Disciplines

In Task 2, the engineering design participants considered the importance (not at all, not very, quite or very) of skills, taste and talent for being competent at each design discipline. Table 5.3 shows all the design disciplines in relation to LCT concepts, as perceived by engineering designers. The engineering mean value is 3.33 for 'skills' and 3.22 for 'taste and talent'. Engineering was perceived as emphasising ER and downplaying SR, which would mean a knowledge code. Architecture was seen as emphasising both ER and SR, that is, an elite code. Digital media was seen as emphasising neither ER nor SR, which would translate into a relativist code. Fashion was seen as downplaying ER and emphasising SR, i.e. a knower code.

Table 5.3 Engineering: Skills & Taste + Talent

Discipline	Skills	Taste + Talent	ER	SR	LCT Code
Engineering	***3.89***	***2.69***	***ER+***	***SR–***	***Knowledge***
Architecture	3.42	3.48	ER+	SR+	Elite
Digital media	3.17	3.08	ER–	SR–	Relativist
Fashion	2.82	3.62	ER–	SR+	Knower
Engineering mean for all	**3.33**	**3.22**			

5.2.2.2 Engineering designers – Perceptions of designers

In Task 3, the engineering design participants were asked to choose three words to describe designers in the four disciplines. Figure 5.9 shows that engineering designers used predominantly ER words, such as 'a problem solver' or 'a technical person' (blue) to describe designers in their own discipline.

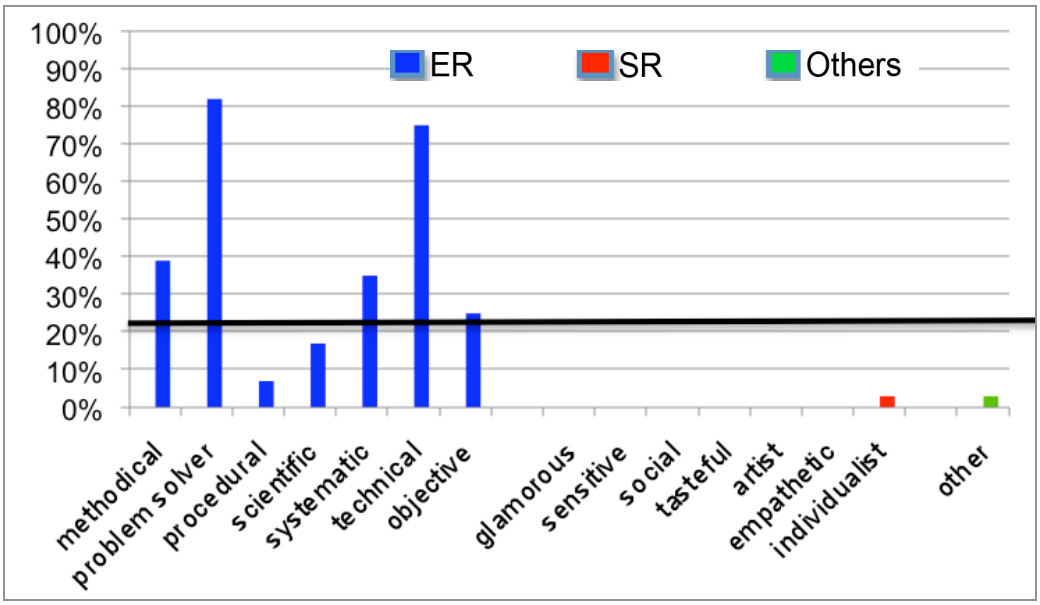

Figure 5.9 Engineering Designers by Engineering Designers

Figure 5.10 shows engineering designers were more likely to use ER words (98.7%) than SR words (1.2%) to describe designers in their own discipline. Conversely, they described fashion designers with an emphasis on SR words (97%) rather than ER words (2.7%). Both architecture and digital media designers were described with slightly more emphasis on SR words rather than ER words. In the descriptions of architecture designers, engineers used 65.3% SR words and 34.6% ER words. In the descriptions of digital media designers, engineers used 68.9% SR words and 31% ER words. Both architecture and digital media ER and SR results were above the threshold mark of 30%.

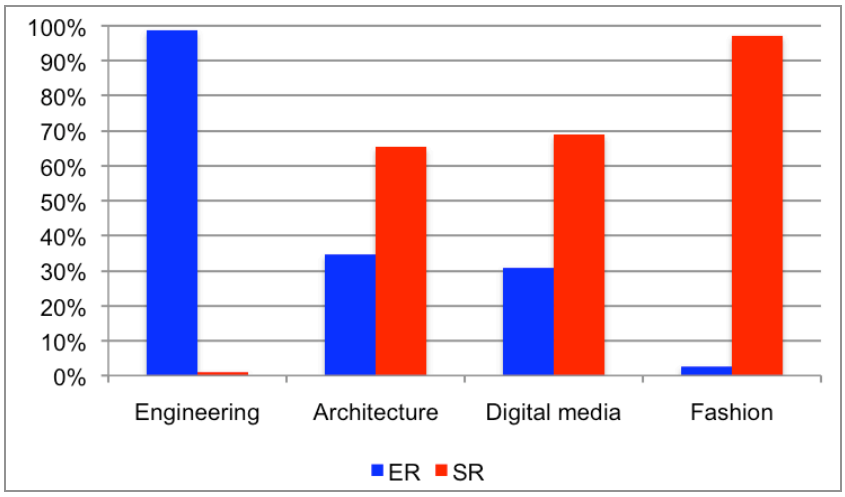

Figure 5.10 Engineering: Description of Designers

In Task 4, the engineering design participants read profiles (seven ER and seven SR profiles) of fictitious designers and were asked to select in which design profession(s) the fictitious designer is most likely to work, if any. Results shown on Figure 5.11 illustrate that engineers used more ER profiles (78.6%) to describe engineering designers rather than SR profiles (21.9%), while an emphasis on SR profiles (67.8%) rather than ER profiles (7.1%) were identified in fashion, and less so in architecture with 57.5% SR profiles and 41.3% ER profiles and digital media with 33.6% SR profiles and 39.7% ER profiles. Both architecture and digital media ER and SR results were above the threshold mark of 30%.

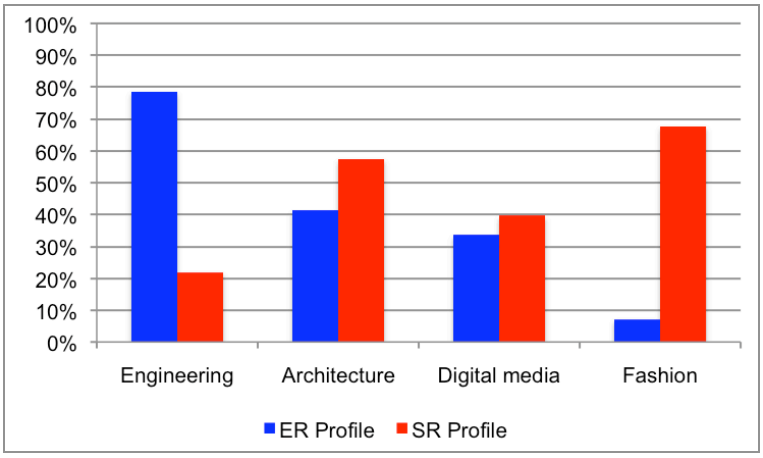

Figure 5.11 Engineering: Profiles of Fictitious Designers

5.2.2.3 Engineering designers – Strategies

In Task 5, the engineering design participants read statements and chose the frequency (always, frequently, not sure, rarely or never) of the use of ER or SR strategies in their design discipline. Engineering results showed that these designers were more likely to use ER

strategies (such as 'designers in my discipline follow methodical procedures in their design practices') rather than SR strategies. ER strategies are reported to be used both frequently (42.8%) and always (31.5%), while SR related strategies were frequently (31.5%) and always (9.3%) used by engineers (Figure 5.12).

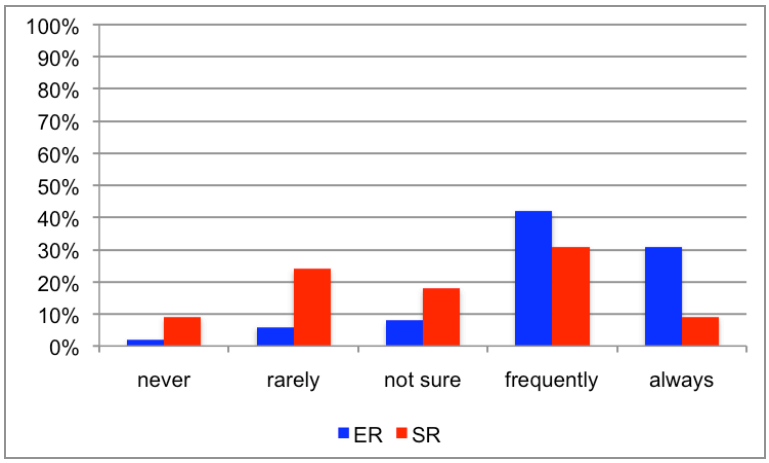

Figure 5.12 Engineering: Strategies

5.2.2.4 Summary of Engineering Results

It is possible now to conceptualise the view of design disciplines held by engineering participants. These designers characterised their own discipline as technical, driven by knowledge, methodical and systematic. Their views of engineers also agreed with their perceptions of the discipline, that is, they referred to engineering designers as problem solvers, technical, methodical, scientific and systematic persons. The types of strategies engineering designers reported to use also reflected their views of engineering and engineers, including activities such as:

> ...surf the net for what is going on in the design field around the world
> ...read technical literature/books on the subject
> ...follow methodical procedures in their design practices

The results show that engineering participants considered their discipline as strongly grounded on a knowledge code, that is, they described engineering design and designers and reported the use of strategies that were all associated with an emphasis on the epistemic relation.

However, these participants had different perceptions of the other disciplines of design in the study. Fashion was perceived as emphasising a social relation and considered strongly

grounded on a knower code. The LCT(Specialisation) codes for both architecture and digital media were not as clear as for engineering or fashion and greater variance in results existed. There seemed to exist a slightly greater emphasis on a social relation rather than an epistemic relation, but results related to these disciplines were all above the 30% threshold which would result in an elite code for both disciplines. A summary of the results for the engineering participants is shown in Table 5.4.

Table 5.4 Summary of Engineering Results

	Perceptions of Design Disciplines		Perceptions of Designers		Strategies
	Task 1	Task 2	Task 3	Task 4	Task 5
Engineering	**Knowledge**	**Knowledge**	**Knowledge**	**Knowledge**	**Knowledge**
Architecture	Elite	Elite	Elite	Elite	-
Digital Media	Elite	Relativist	Elite	Elite	-
Fashion	Knower	Knower	Knower	Knower	-

5.2.3 Fashion

5.2.3.1 Fashion designers – Perceptions of design disciplines

In Task 1, the fashion design participants chose three words to describe each design discipline. Figure 5.13 shows that fashion participants preferred using SR words, such as ‘driven by taste’ or ‘individual’ (red) rather than ER words (blue) to describe their own discipline. They were also more likely to use their own words to describe their design discipline (green) than the survey participants from other design disciplines (Figure 5.7, Figure 5.19 and Figure 5.25). Fashion designers’ emphasis on the use of their own words could be seen as an ‘expression’ of the language of this discipline. In fashion, personal dispositions are highly valued; thus, there is an increased need for individual expression. Fashion designers in the survey manifest this need by using their own words rather than selecting a word from a set of proposed options. Thus, these designers contest the expression of stronger boundaries on the epistemic relation, set by the list of words offered to them at the survey, and emphasise their desire for individual expression, that is, a stronger social relation. Further, the other words used by fashion designers also suggest an emphasis on personal disposition (e.g. creative, subjective), and, at times, these designers chose to type words in as ‘others’ even though similar terms can be found in the set based on the Controlled Vocabulary List (e.g. social, about taste). Examples of fashion

designers' use of other words include: creative, trend-driven, subjective, social, seasonal, about taste, and others.

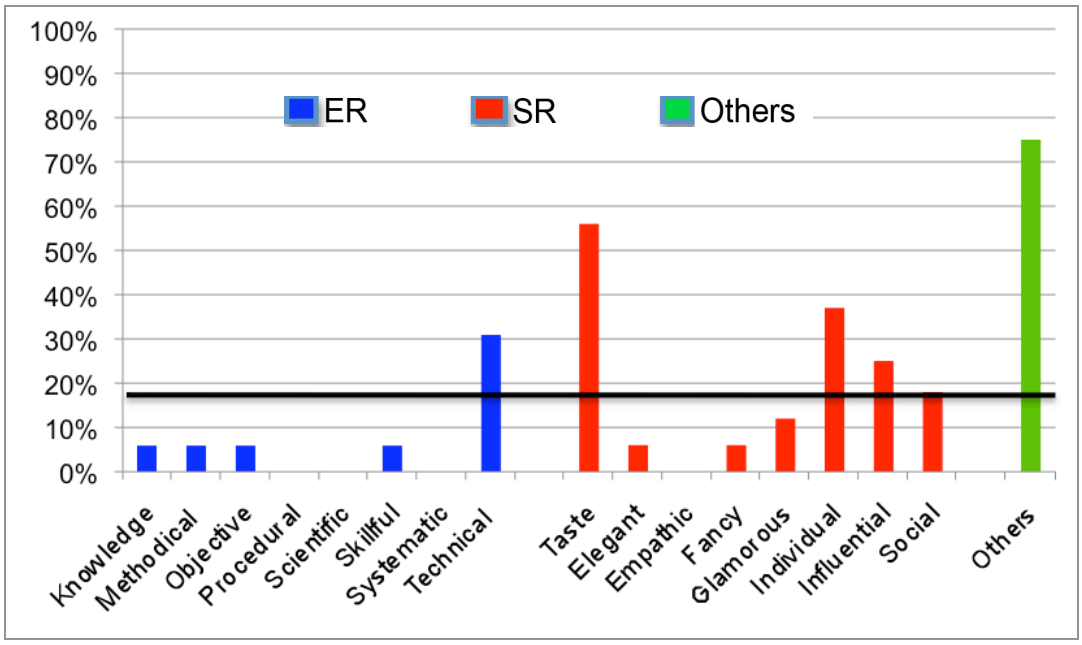

Figure 5.13 Fashion by Fashion Designers

Fashion participants emphasise the use of ER words (91.4%), such as 'technical' and 'methodical', rather than SR words (8%), such as 'driven by taste' or 'influential' when describing engineering. They also used slightly more ER words (54.8%) than SR words (45.1%) when describing architecture. There is an emphasis on SR words (60%) rather than ER words (40%) to describe digital media. They describe their own design discipline with greater emphasis on the use of SR words (77.1%) than ER words (22.8%). Both architecture and digital media ER and SR results were above the threshold mark of 30% (Figure 5.14).

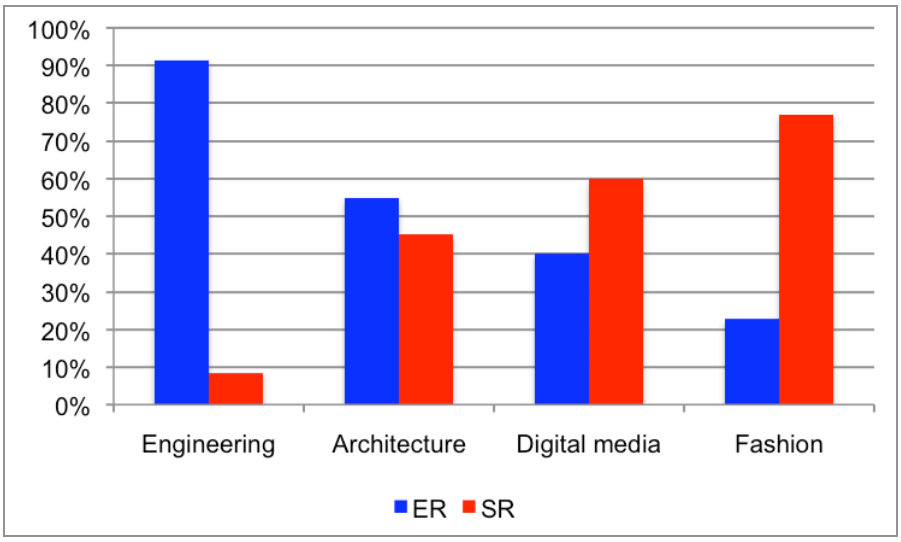

Figure 5.14 Fashion: Description of Design Disciplines

In Task 2, the fashion design participants considered the importance (not at all, not very, quite or very) of skills, taste and talent for being competent at each design discipline. The fashion mean value is 3.64 for 'skills' and 3.05 for 'taste and talent'. The results in Table 5.5 show that fashion participants perceived engineering as functioning on a knowledge code, architecture and digital media on an elite code, and their own design discipline on a knower code.

Table 5.5 Fashion: Skills & Taste + Talent

Discipline	Skills	Taste + Talent	ER	SR	LCT Code
Engineering	3.81	2.59	ER+	SR–	Knowledge
Architecture	3.68	3.15	ER+	SR+	Elite
Digital media	3.68	3.06	ER+	SR+	Elite
Fashion	***3.37***	***3.40***	***ER–***	***SR+***	***Knower***
Fashion mean for all	**3.64**	**3.05**			

5.2.3.2 Fashion designers – Perceptions of designers

In Task 3, the fashion design participants describe designers in their disciplines and in the other disciplines of the study. Similar to fashion participants' perceptions of their own discipline, Figure 5.15 shows that fashion participants also preferred using more SR words, such as 'an individual person' or 'an artist', rather than ER words, such as 'technical' or 'systematic', to describe other fashion designers. Again, they were also more likely to use their own words to describe fashion designers in comparison to other participants in the study (Figure 5.9, Figure

5.21, and Figure 5.27). Examples of other words used by fashion designers included: imaginative, problem solver, inquisitive, informed, practical, egotistical, creative person and others.

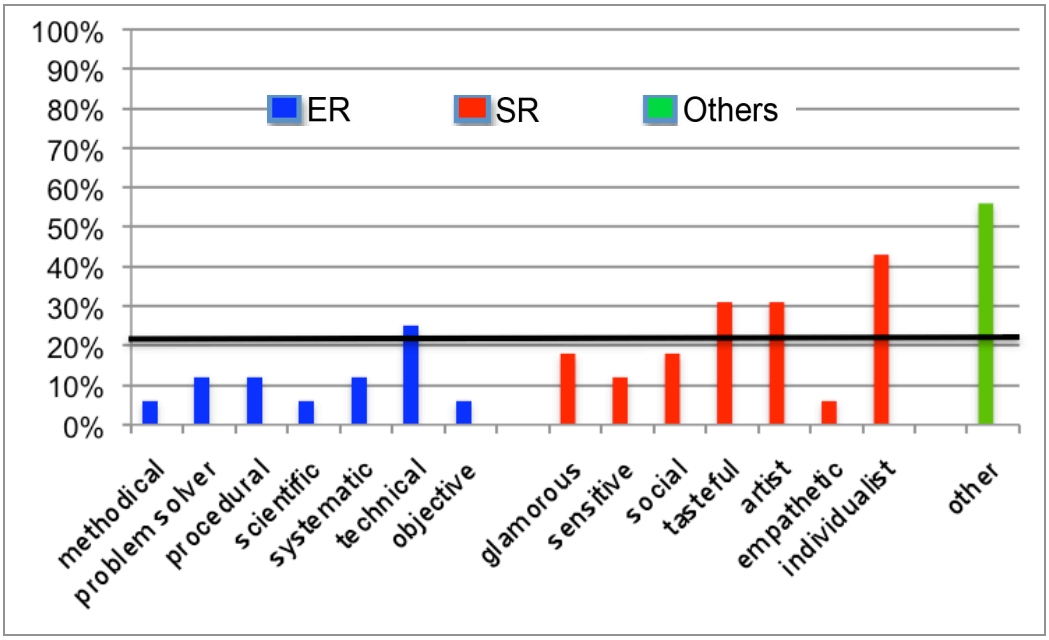

Figure 5.15 Fashion Designers by Fashion Designers

Fashion participants were more likely to use ER words (e.g. a technical, methodical person) to describe engineers and architects than SR words (e.g. a social, tasteful person). However, the emphasis on ER words was greater for their description of engineering designers, with 95.1% ER words and 4.8% SR words, than for architecture designers, with 74.1% ER words and 25.8% SR words. Both digital media and fashion designers were described with an emphasis on SR words rather than ER. Fashion designers are described with 66.6% SR words (66.6%) and 33% ER words and digital media designers are described with 57.8% SR words and 42.1% ER words. Fashion and digital media ER and SR results are above the threshold of 30%. Figure 5.16 illustrates these results:

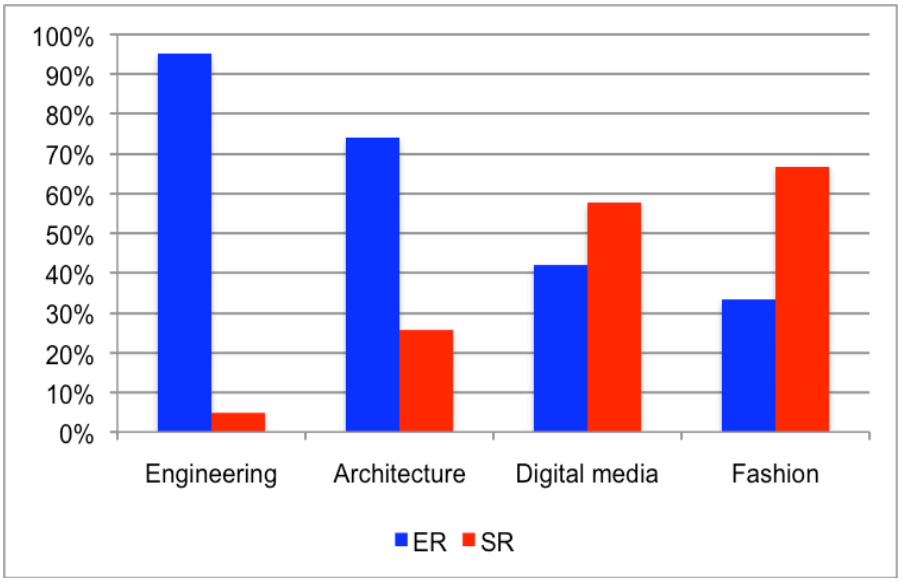

Figure 5.16 Fashion: Description of Designers

In Task 4, the fashion design participants read profiles (seven ER and seven SR profiles) of fictitious designers and were asked to select in which design profession(s) the fictitious designer is most likely to work, if any. Results shown on Figure 5.17 illustrate that fashion participants were more likely to associate ER profiles (78.5%) with engineering designers than SR profiles (23.2%). Fashion participants seem to associate more SR profiles (67.8%) rather than ER profiles (28.5%) with designers in fashion. Both SR and ER profiles were associated with architecture and digital media. Architecture designers were associated with 57.1% ER profiles and 58% SR profiles and 48.2% ER profiles and 48.2% SR profiles were associated with digital media designers. Both architecture and digital media results were above the threshold mark of 30%.

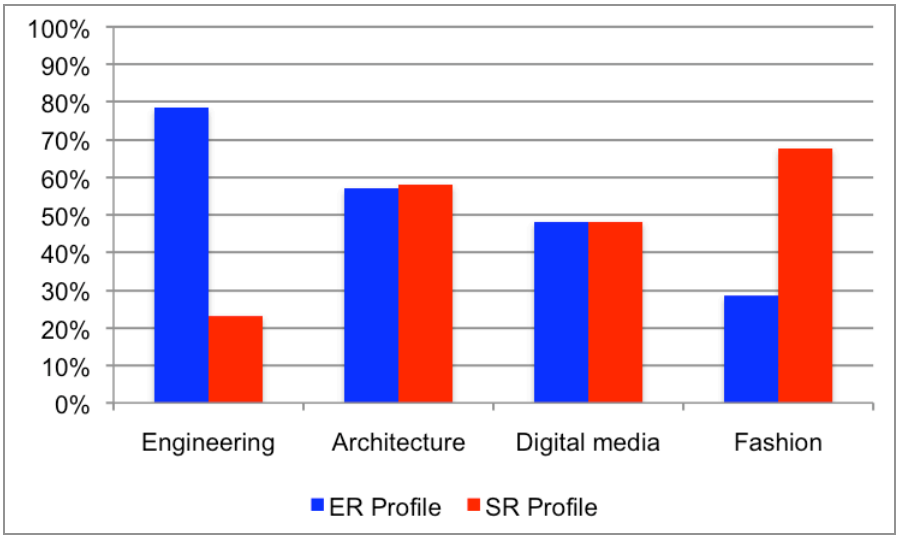

Figure 5.17 Fashion: Profiles of Fictitious Designers

5.2.3.3 Fashion designers – Strategies

In Task 5, fashion design participants read statements and chose the frequency of the use of ER (e.g. ...talk to colleagues/peers about work related matters) or SR strategies (e.g. ...draw on personal experiences to get inspiration for their design work) in their design discipline. Figure 5.18 shows fashion designers' emphasis on SR strategies, which were used in their design discipline both frequently (41.8%) and always (35.5%), in comparison with ER related strategies frequently (30.2%) and always (35.5%) used.

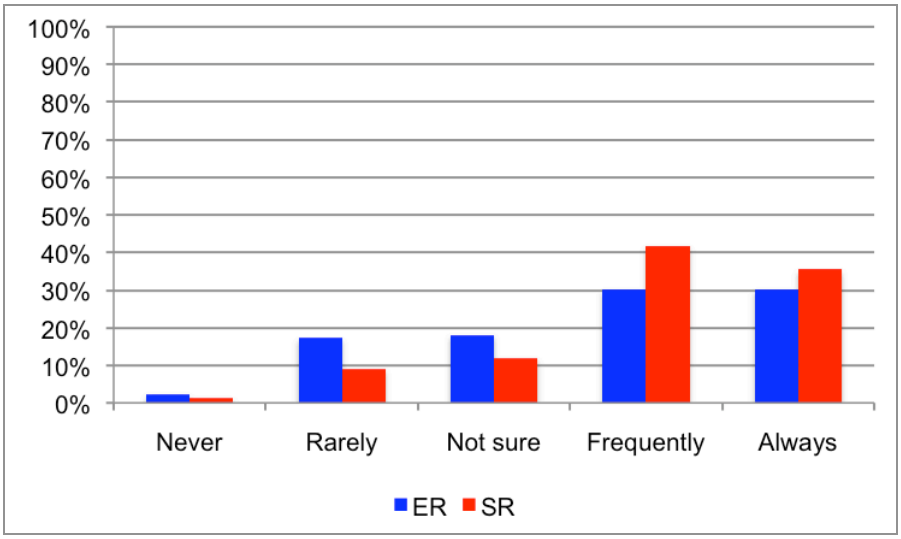

Figure 5.18 Fashion: Strategies

5.2.3.4 Summary of Fashion Results

Fashion designers characterised their own discipline as driven by taste, and to be individual and influential. They referred to fashion designers as artists or individualist and tasteful people. The types of strategies fashion designers reported to use also reinforce their views of fashion design and designers, included activities such as:

> Designers in fashion…
> ...draw on personal experiences (e.g. watching a film, talking to friends) to get inspiration for their design work)
> ...read technical literature/books on the subject
> ...expose who they are through their work

The results suggest that fashion participants perceived their discipline as strongly grounded on a knower code, that is they described fashion design and designers and reported the use of

strategies that were all associated with an emphasis on the social relation. From all the disciplines in the study these participants were also those who were more likely to opt for using their own words, rather than those provided in the survey. These participants showed a need to contest the boundaries imposed by a structured list (a stronger epistemic relation) and realise their wishes for individual expression by completing the survey with their own words, their own expression (a stronger social relation), even if their choice of expression may, at times, have been available in the proposed list.

A summary of the fashion design participants' results is shown in Table 5.6. Fashion participants considered their discipline as mostly grounded on a knower code. Engineering was seen as strongly grounded on a knowledge code. The LCT codes for both architecture and digital media suggest an elite code.

Table 5.6 Summary of Fashion Results

	Perceptions of Design Disciplines		Perceptions of Designers		Strategies
	Task 1	Task 2	Task 3	Task 4	Task 5
Engineering	Knowledge	Knowledge	Knowledge	Knowledge	-
Architecture	Elite	Elite	Knowledge	Elite	-
Digital Media	Elite	Elite	Knower	Elite	-
Fashion	***Knower***	***Knower***	***Elite***	***Knower***	***Knower***

5.2.4 Architecture

5.2.4.1 Architecture designers – Perceptions of design disciplines

In Task 1, architecture design participants describe each design discipline using three words. Different from engineering and fashion designers, architecture designers used both types of words to describe their own discipline. Figure 5.19 shows ER words (blue), such as 'skilful' and 'driven by knowledge', and SR words (red), such as 'social' and 'driven by taste', used to describe architecture by the architecture participants. Some of the comments under the 'other words' category (green) were considered as containing an emphasis on the designer, e.g. "strongly influenced by the values of the designer". These statements reflect the participants' personal views of architecture e.g. "amazing, beautiful, lasting, inspiring… cannot be described fully in words… it's a feeling you get from the appreciation of it" and e.g. "arrogant, biased,

dominating". There were also comments about architecture as the combination of a practical and subjective profession, comments that reflected a relative emphasis on both the epistemic and social relation, e.g. (architecture is) "driven by knowledge and hard work, needs inspiration from the natural world and society" and "a combination of subjective aesthetics-driven and technical knowledge".

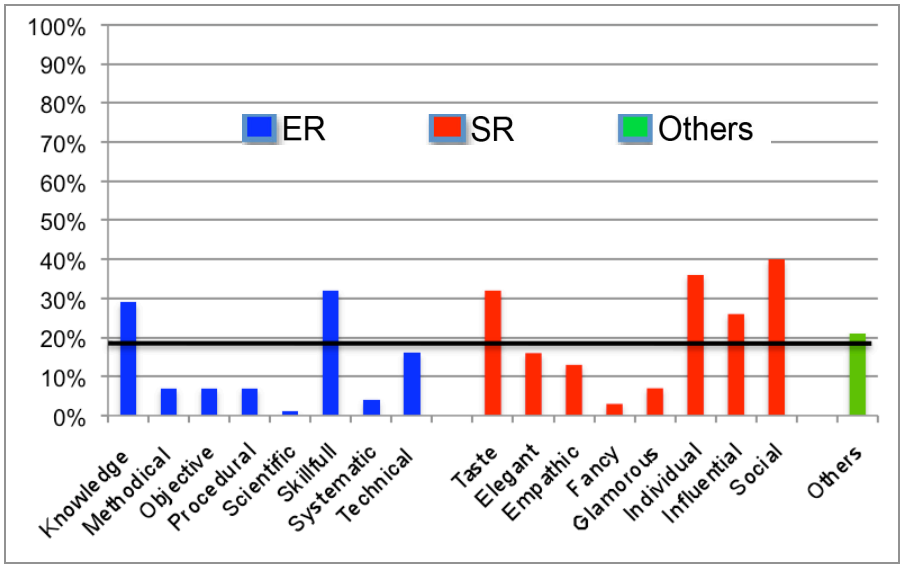

Figure 5.19 Architecture by Architecture Designers

Figure 5.20 shows architecture participants' use of ER words, such as 'technical' or 'methodical' or SR words, such as 'influential' and 'driven by taste', to describe all the disciplines in the study. The results show that architects were more likely to use ER words (97%) than SR words (2.9%) to describe engineering. They were more likely to use SR words (87.6%) than ER words (12.3%) to describe fashion. A greater emphasis on SR was also identified in the way architects described both digital media and architecture; however, the emphasis on SR rather than ER was not as strong as in fashion in both the architecture and digital media cases. Architecture was described with 61% SR words and 38.9% ER words, and the difference between SR words (47.5%) and ER words (52.4%) was smaller for digital media. In both the architecture and the digital media cases the use of ER and SR words were above the 30% threshold.

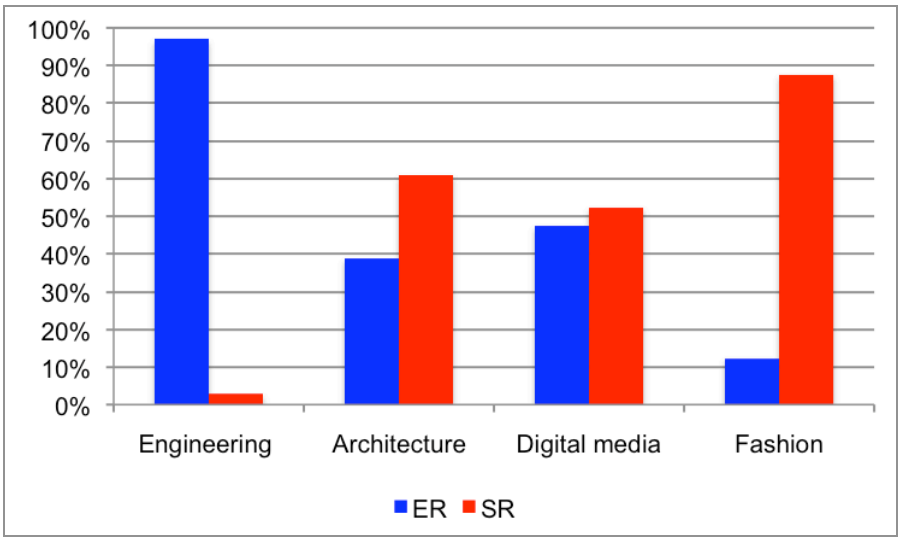

Figure 5.20 Architecture: Description of Design Disciplines

In Task 2, architecture design participants considered the importance (not at all, not very, quite or very) of skills, taste and talent for being competent at each design discipline. For Architecture, the mean value is 3.44 for 'skills' and 2.97 for 'taste and talent'. The results in Table 5.7 show that architecture participants perceived engineering as a knowledge code, digital media as a relativist code, fashion as a knower code, and their own design discipline as an elite code.

Table 5.7 Architecture: Skills & Taste + Talent

Discipline	Skills	Taste + Talent	ER	SR	LCT Code
Engineering	3.82	2.45	ER+	SR–	Knowledge
Architecture	***3.55***	***3.26***	***ER+***	***SR+***	***Elite***
Digital media	3.36	2.81	ER–	SR–	Relativist
Fashion	3.04	3.36	ER–	SR+	Knower
Architecture mean for all	**3.44**	**2.97**			

5.2.4.2 Architecture designers – Perceptions of designers

In Task 3, architecture design participants chose three words to describe designers in engineering, architecture, digital media and fashion. Similar to architecture participants' perceptions of their own discipline, Figure 5.21 shows that architecture participants used both SR words, such as 'a sensitive person' or a 'tasteful person', and ER words, such as 'a problem solver' to describe architecture designers.

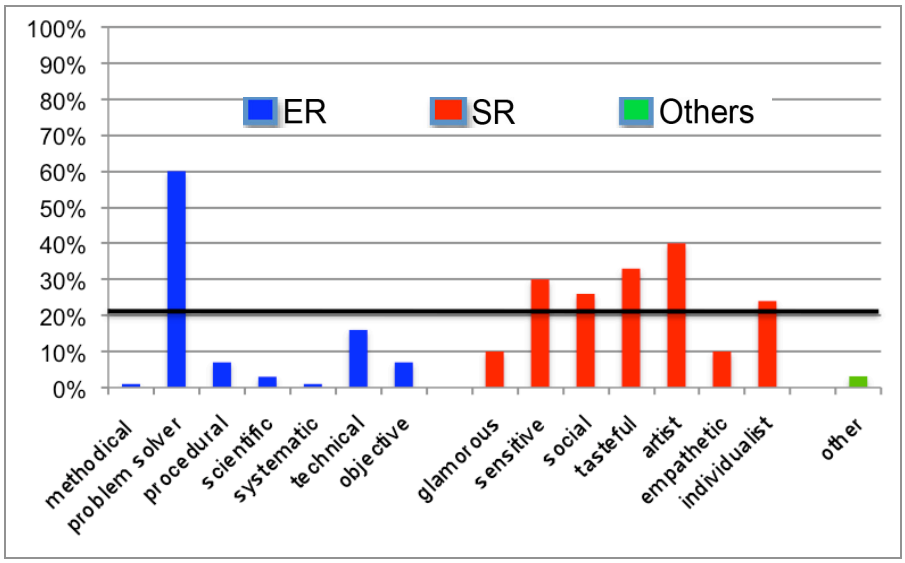

Figure 5.21 Architecture Designers by Architecture Designers

Figure 5.22 shows that architecture participants were more likely to use ER words (98.7%), such as a 'problem solver' and 'technical' to describe engineers rather than SR words (1%), such as 'a social person'. In contrast, SR words (92.5%) were overwhelmingly used to describe fashion designers than ER words (7.4%). In the description of architecture designers there is an emphasis on SR words (63.6%) rather than ER words (36.3%). A comparable distribution of ER (50.6%) and SR (49.3%) words is seen in the description of digital media. The use of SR and ER words are above the 30% mark for the descriptions of architecture and digital media.

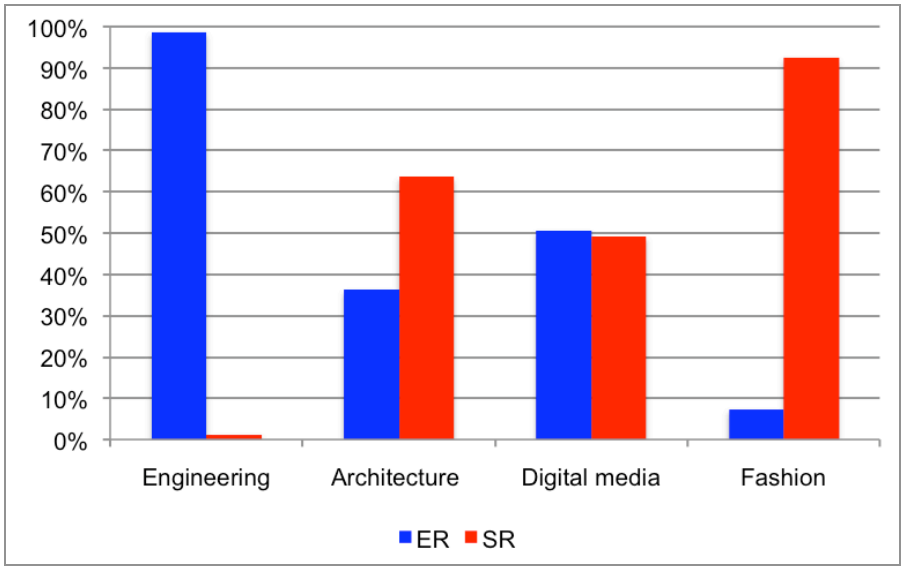

Figure 5.22 Architecture: Description of Designers

In Task 4, architecture design participants read profiles of fictitious designers and were asked to select in which design profession(s) the fictitious designer is most likely to work, if any. Results

on Figure 5.24 show that architecture participants were more likely to associate engineering designers with ER profiles (72%) than SR profiles (15.1%) and less so with digital media designers with ER profiles (36.4%) and SR profiles (25.4%). An emphasis on SR profiles (54.5%) rather than ER profiles (10.5%) was associated with fashion designers. Architecture designers were described with 65.4% SR profiles and 40.4% ER profiles (both scores for architecture were above the 30% mark).

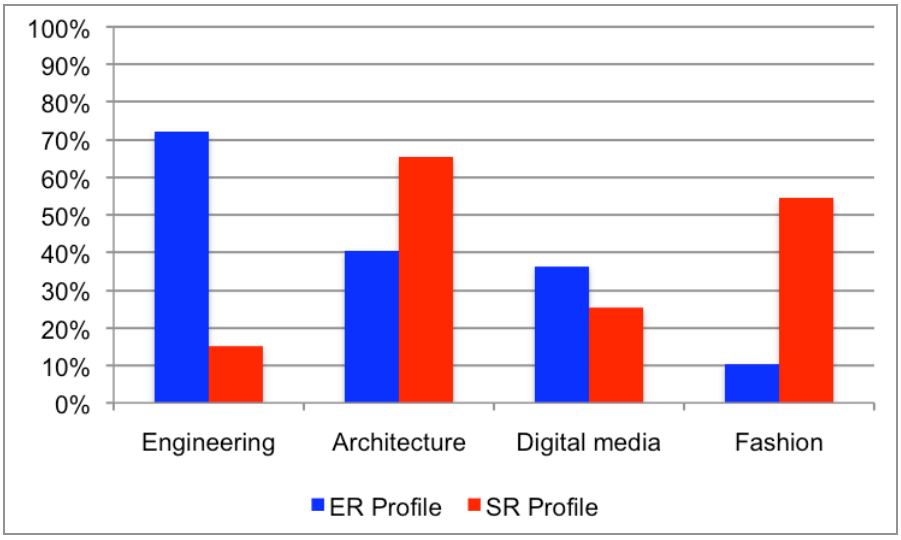

Figure 5.23 Architecture: Profiles of Fictitious Designers

5.2.4.3 Architecture designers – Strategies

In Task 5, architecture design participants read statements and chose the frequency (always, frequently, not sure, rarely or never) of the use of ER (such as '...read a professional magazine') or SR strategies (such as '...develop an 'eye' for the job, through work experience') in their design discipline. Figure 5.24 shows that SR strategies were used in this design discipline both frequently (40.8%) and always (18.4%), in comparison with ER related strategies frequently (38.2%) and always (16.4%) used in fashion.

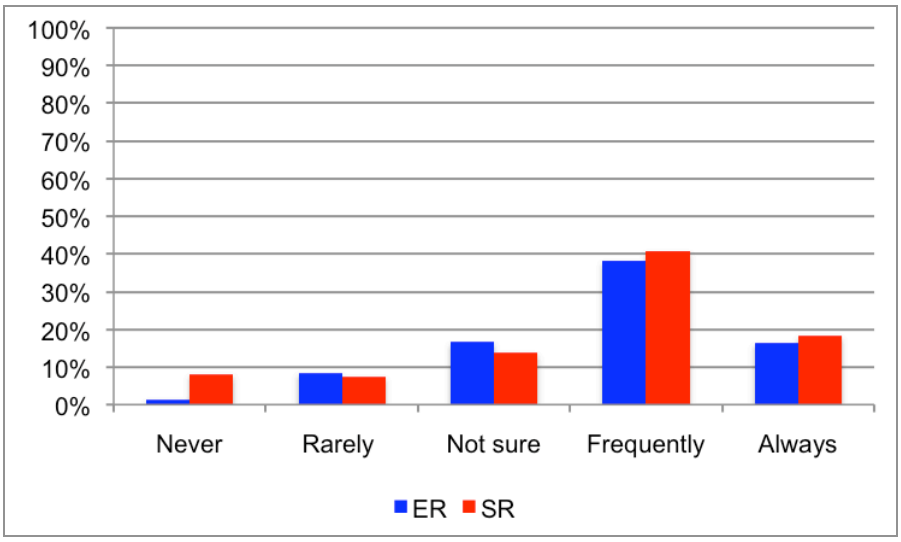

Figure 5.24 Architecture: Strategies

5.2.4.4 Summary of Architecture Results

Architecture designers described their own discipline as skilful, driven by knowledge, social and driven by taste. These participants referred to architecture designers as artists, sensitive and tasteful people, and as problem solvers. The types of strategies architecture designers reported to use included, for example:

> Designers in architecture…
>
> ...express their feelings through their design work.
>
> ...use empathy in their design work.
>
> ...design to solve problems that are currently confronted by contemporary society.
>
> ...talk to colleagues/peers about work related matters.

The results suggest that architecture participants perceived their discipline as characterised by an elite code, that is, they described architecture design and designers and reported the use of strategies that were associated with an emphasis on both the social and the epistemic relation.

A summary of architecture design participants' results is shown in Table 5.8. Overall architecture participants seemed to perceive their discipline as an elite code, if considering the threshold rule of 30% of responses above ER and SR. At times, however, a slightly greater emphasis seems to exist on responses related to the social relation. Architecture responses for digital media were also not as clear when in comparison with their results about engineering or fashion. Nevertheless, results for digital media may suggest that architecture participants

perceive this discipline as an elite code. Engineering was seen as strongly characterised by a knowledge code and fashion as a knower code.

Table 5.8 Summary of Architecture Results

	Perceptions of Design Disciplines		Perceptions of Designers		Strategies
	Task 1	Task 2	Task 3	Task 4	Task 5
Engineering	Knowledge	Knowledge	Knowledge	Knowledge	-
Architecture	***Elite***	***Elite***	***Elite***	***Elite***	***Elite***
Digital Media	Elite	Relativist	Elite	Knowledge	-
Fashion	Knower	Knower	Knower	Knower	-

5.2.5 Digital Media

5.2.5.1 Digital media designers – Perceptions of design disciplines

In Task 1, digital media design participants chose three words to describe each design discipline. Different from engineering and fashion participants, and similar to architecture participants, digital media participants used both types of words to describe their discipline. Figure 5.25 shows ER words (blue), such as 'technical', 'skilful' and driven by knowledge', and SR words (red), such as 'driven by taste', 'individual' and 'social' used to describe digital media by the digital media participants in the survey.

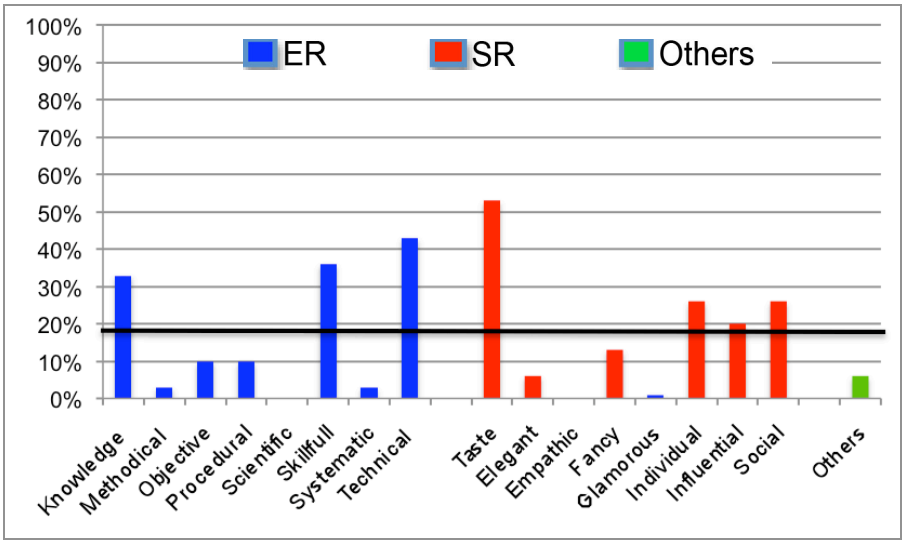

Figure 5.25 Digital Media by Digital Media Designers

Figure 5.26 shows digital media participants' use of ER or SR words to describe all the disciplines in the study. The results show that digital media designers were more likely to use

ER words (98.7%) rather than SR words (1.2%) to describe engineering. They were also more likely to use SR words (85.1%) rather than ER words (14.8%) to describe fashion. Digital media participants described architecture with 67.5% ER words and 32.5% SR words. Digital media was described with a comparable distribution of 47.1% ER and 52.8% SR words. All ER and SR results for digital media and architecture were above the 30% threshold.

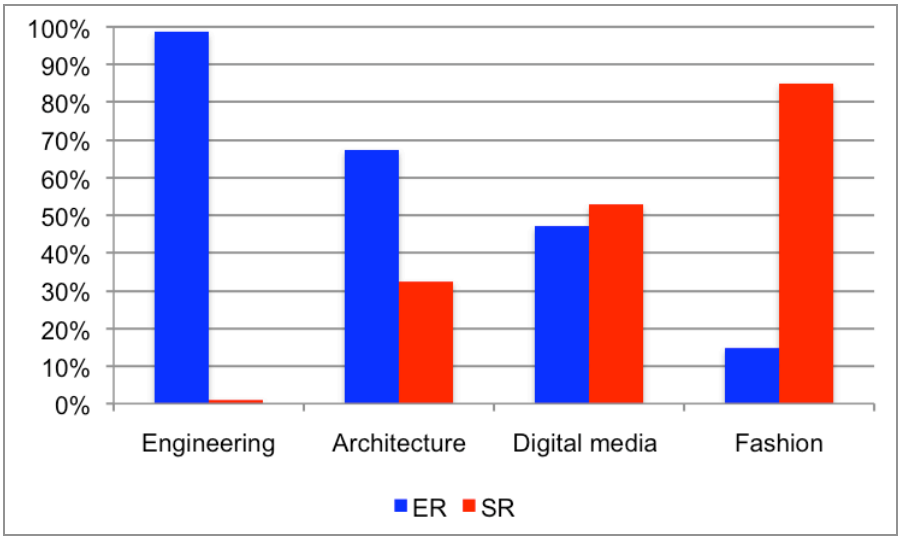

Figure 5.26 Digital Media: Description of Design Disciplines

In Task 2, digital media design participants considered the importance of skills, taste and talent for being competent at each design discipline. Digital media mean value is 3.43 for 'skills' and 3.12 for 'taste and talent'.

Table 5.9 shows that digital media participants perceived engineering and architecture as emphasising the epistemic relation rather than the social relation, that is, as a knowledge code. Digital media was seen as emphasising both the epistemic and social relations, that is, as an elite code, and fashion with an emphasis on the social relation rather than the epistemic relation, that is, as a knower code.

Table 5.9 Digital Media: Skills & Taste + Talent

Discipline	Skills	Taste + Talent	ER	SR	LCT Code
Engineering	3.72	2.67	ER+	SR–	Knowledge
Architecture	3.55	3.08	ER+	SR–	Knowledge
Digital media	***3.44***	***3.25***	***ER+***	***SR+***	***Elite***
Fashion	3	3.48	ER–	SR+	Knower
Digital media mean for all	**3.43**	**3.12**			

5.2.5.2 Digital media designers – Perceptions of designers

In Task 3, digital media design participants chose three words to describe designers. Different from engineering and fashion designers, and similar to architecture designers, digital media designers again used both types of words to describe digital media designers. Figure 5.27 shows digital media designers' use of ER words (blue), such as 'a technical person' or 'a problem solver' and SR words (red), such as 'an artist' and an individualist person' to describe designers in their own discipline.

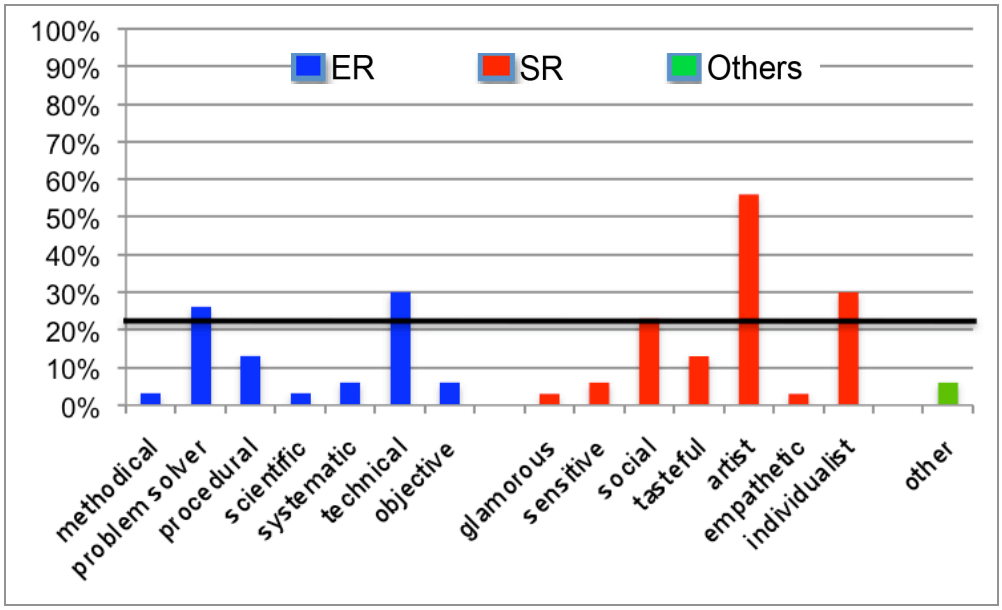

Figure 5.27 Digital Media Designers by Digital Media Designers

Figure 5.28 shows digital media participants' use of ER or SR words to describe the disciplines in the study. These results show that digital media designers were more likely to use ER words (94.2%) (e.g. a procedural person) to describe engineering rather than SR words (5.7%) (e.g., tasteful person). They used 57.9% ER words and 42% SR words to describe architecture. Digital media participants emphasised the use of SR words (89%) than ER words (10.9%) to describe fashion. A greater emphasis on SR was also identified in the way they described designers in their own discipline, however the emphasis on SR (60.2%) rather than ER (39.7%) was not as strong as in describing fashion. Again, ER and SR results for digital media and architecture are all above the 30% mark.

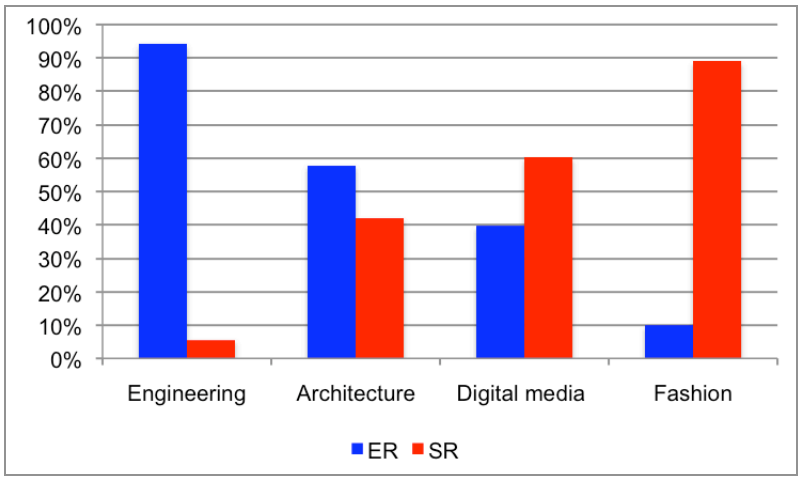

Figure 5.28 Digital Media: Description of Designers

In Task 4, digital media design participants read profiles of fictitious designers and were asked to select in which design profession(s) the fictitious designer is most likely to work, if any. Results on Figure 5.29 show that from the profiles used to describe engineering a greater emphasis is placed on ER (56.6%) rather than SR profiles (18%), while a greater emphasis on SR profiles (55.5%) rather than ER (9%) was identified in fashion. Slightly more emphasis on SR profiles (40.4%) rather than ER profiles (26.6%) was associated with architecture designers. Digital media designers were associated with 36.1% ER profiles and 42.8% SR profiles. Digital media ER and SR results were both above the 30% threshold, but only SR results were above this mark for architecture.

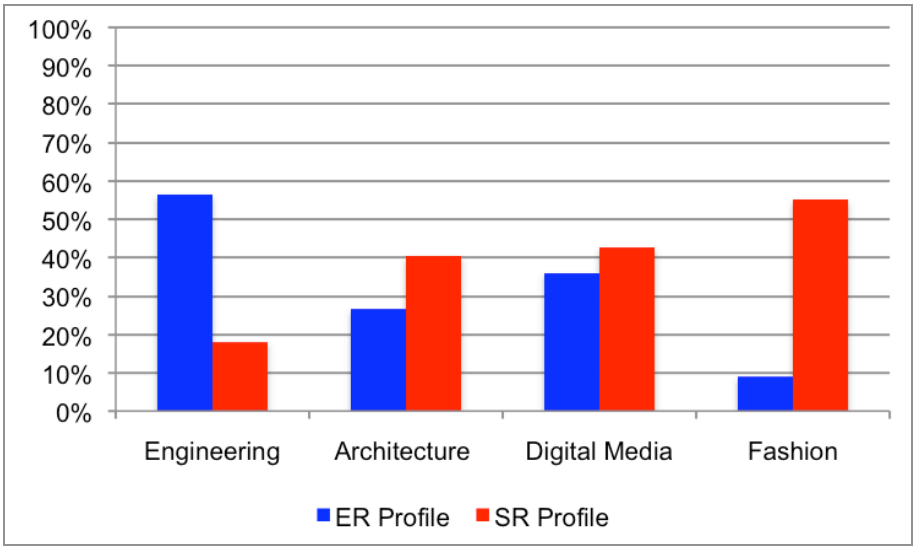

Figure 5.29 Digital Media: Profiles of Fictitious Designers

5.2.5.3 Digital media designers – Strategies

In Task 5, digital media participants read statements and chose the frequency of the use of ER or SR strategies in their design discipline. SR strategies (e.g. watching a film, talking to friends) were used in digital media design both frequently (34.1%) and always (20%), in comparison with ER related strategies (e.g. ...surf the net for what is going on in the design field around the world.') frequently (32.8%) and always (18.4%).

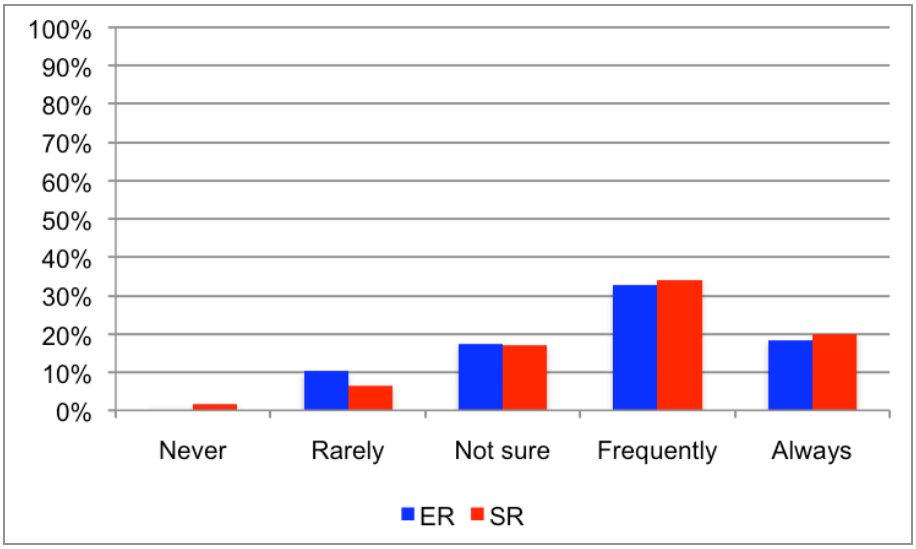

Figure 5.30 Digital Media: Strategies

5.2.5.4 Summary of Digital Media Results

Results for digital media participants showed that this discipline is described as driven by knowledge, as well emphasising an identity that is skilful, technical, driven by taste, individual and social. Digital media participants perceived designers in their own discipline as problem solvers, artists, technical and social people. Digital media designers reported the use of strategies with an emphasis on both the epistemic and the social relation. For example:

> Designers in digital media…
>
> ....talk to colleagues/peers about work related matters.
>
> ...surf the net for what is going on in the design field around the world.
>
> ...draw on personal experiences (e.g. watching a film, talking to friends) to get inspiration for their design work.
>
> ...expose who they are through their work.

The results suggest that digital media participants, similarly to the architecture participants, perceived their discipline as characterised by an elite code, that is, they used terms that were

associated with an emphasis on both the social and the epistemic relation to describe digital media design, designers and their reported use of strategies. At times, a slightly greater emphasis on social relation is noted.

A summary of digital media participants' results is shown in Table 5.10. According to the rule described in Section 3.4.4, Digital media participants seemed to consider their discipline as an elite code. However, at times a slightly higher emphasis was seen on the social relation. Results for digital media designers' perceptions of architecture were not clear sometimes suggesting an elite code, a knowledge code or a knower code. Engineering was seen as strongly grounded on a knowledge code and fashion as strongly grounded on a knower code.

Table 5.10 Summary of Digital Media Results

	Perceptions of Design Disciplines		Perceptions of Designers		Strategies
	Task 1	Task 2	Task 3	Task 4	Task 5
Engineering	Knowledge	Knowledge	Knowledge	Knowledge	-
Architecture	Elite	Knowledge	Elite	Knower	-
Digital Media	***Elite***	***Elite***	***Elite***	***Elite***	***Elite***
Fashion	Knower	Knower	Knower	Knower	-

5.3 Reviewing Model 1

Results from interviews with designers in engineering, fashion, architecture and digital media (Chapter 4) were represented in Model 1 (Figure 5.31). The X-axis (abscissa) represents values (+/–) related to the strengths of epistemic relation, and Y-axis (ordinate) represents values (+/–) related to the strengths of social relation. Each quadrant of the model corresponds to a specific LCT(Specialisation) code. In Figure 5.31, engineering is located within the knowledge code quadrant, fashion in the knower code, and architecture in the elite code. Digital media was placed in the middle, over two quadrants of the graph, to accommodate the opposing views of the LCT(Specialisation) codes identified in the interviews with the two digital media designers participating in the research.

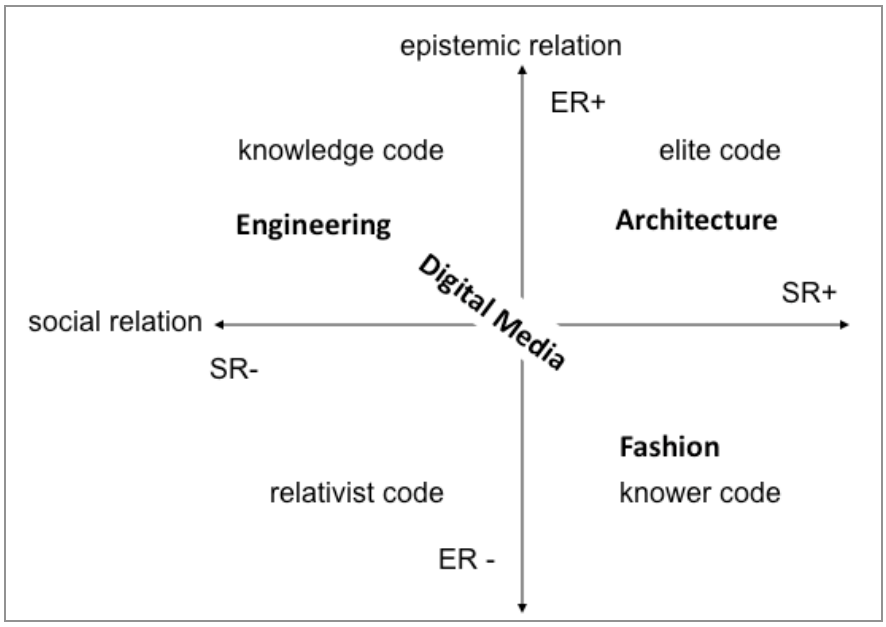

Figure 5.31 Model 1: Legitimation Code Theory and the Design Disciplines

The purpose of the survey was to explore the extent of the interview findings through the investigation of designers' perceptions of the design disciplines, designers and strategies used to indentify legitimated practices, in a wider population. The survey explored designers' views of their own disciplines, as well as the three other disciplines in the study. By integrating the views of all participant designers, it was possible to verify whether designers outside a discipline were able to recognise the values emphasised by a particular group (e.g. whether engineers were able to recognise the strengths of epistemic and social relations within fashion).

The survey results broadened and reinforced some of the interview results. Engineering was identified as characterised by a knowledge code both in the interviews and survey, not only by the engineering designers but also by all the other designers participating in the study. In addition, fashion was perceived as functioning with a knower code, according to both interviews and survey, a result reflected in the responses of all survey participants. The coding of the responses for architecture and digital media was not, however, so straightforward as for engineering or fashion.

Table 5.11 illustrates the perceptions of specialisation codes for every design discipline (based on responses from Task 2) according to respondents from engineering, architecture, digital media and fashion. The table displays in ***bold-italic*** typeface how designers of a discipline perceived their own discipline, alongside the responses of the other survey participants. These

results show engineering and fashion were characterised by all participants (that is, designers in discipline of origin and all the other designers) as respectively a knowledge and a knower code. Architecture was perceived as emphasising an elite code by designers in architecture, engineering and fashion, with only digital media designers holding different views. The table also shows the different perceptions for the conceptualisation of the LCT(Specialisation) code for digital media. While digital media designers see their own discipline as operating under an elite code, and fashion designers are able to recognise them as an elite code, both engineering and architecture respondents considered that digital media would be functioning as a relativist code.

Table 5.11 LCT Codes & Design Disciplines (Task 2)

	Engineering Respondents	Architecture Respondents	Digital Media Respondents	Fashion Respondents
Engineering Design	***Knowledge***	Knowledge	Knowledge	Knowledge
Architecture Design	Elite	***Elite***	Knowledge	Elite
Digital Media Design	Relativist	Relativist	***Elite***	Elite
Fashion Design	Knower	Knower	Knower	***Knower***

There are many possible reasons for the diversity of responses related to an LCT(Specialisation) code to both architecture and digital media. Firstly, methodological factors might have played a part with the difficulty of developing instruments to effectively measure the epistemic or social relation emphasis as proposed by the LCT theoretical model. The elite code, containing both an epistemic and a social relation emphasis, is per definition a more complex code to satisfy a normative level. Theoretically, the epistemic and social relation emphasis are supposed to be equally existent in the elite code, but quantifying perceptions is not an easy task, and only trends can be referred to. Moreover, there is a question of how much is 'enough' to qualify as a 'comparable emphasis', and for instance, would 60% epistemic relation and 40% social relation still classify as an elite code or as a knowledge code? Thus, quantifying and measuring an equal emphasis on both the epistemic and social relation requires the decision of a threshold, which is by itself an open matter for discussion. For the purposes of this research a set of rules was necessary as well as the definition of a threshold (see Section 3.4.4).

Secondly, as previously stated, digital media is still considered a relatively new discipline compared to the others. As such, it might be a discipline that is still trying to define its own identity as a group. Digital media embraces both a technological background (such as the digital encoding of audio and video) as well as an artistic one (such as the production of new media art). As a result, the discipline operates in both modes, a more scientific or empirically based background, as well as allowing for professionals who rely on the intuitiveness and sensitivity of the graphic artist. Professional societies that represent digital media professionals such as SIGCHI (Special Interest Group on Computer Human Interaction) and AIGA (American Institute of Graphic Arts) reflect these differences. For example, SIGCHI (2009) defines itself as "an international society for professionals, academics and students in human-technology and human–computer interaction", whose mission is "to advance the state of knowledge and practice in the field of human–computer interaction". In contrast, AIGA's website (2009) shows a description of a professional association for design and their mission is "to advance designing as a professional craft, strategic tool and vital cultural force." Thus, considering these associations as representative professional bodies of digital media, there are clear differences in the way they express the values of the profession. While one association places an emphasis on "knowledge and practice" the other embraces "cultural force".

Architecture's case is not the same as digital media. Through the interviews' analysis, a context that allows a more in-depth analysis of designers' discourses, architecture was identified as exhibiting an elite code. The survey results also suggested that the discipline is in fact functioning as an elite code, although a stronger emphasis on a knower code is at times noticed. In comparison to digital media however, architecture is a discipline that has been around for a much longer time; nevertheless, the language of the discipline seems to include a need to assimilate both innovation without compromising the tradition, incorporating the new or surprising without letting go of the conventional or established. The interviews showed an emphasis on the contributions of the designer as the one who will bring a difference to the design of an object, at the same time in which knowledge and pragmatism were considered essential. The surveys showed a slightly greater emphasis on the designers (social relation), but in comparison with fashion and engineering, architecture's emphasis on the epistemic and social relation would still be on the threshold of an elite code. Written responses in the survey,

such as (architecture is) “driven by knowledge and hard work, needs inspiration from the natural world and society” and “a combination of subjective aesthetics-driven and technical knowledge” corroborate the elite code for architecture.

Thus, digital media seems to function as an elite code that supports the discipline’s lack of a well defined disciplinary identity, allowing the co-existence of two sub-groups with two distinct languages under the digital media’s umbrella. On the other hand, architecture, as a more mature discipline, seems to operate on an elite code as a result of embracing a complex language. This complex language would simultaneously require emphasis on both the epistemic and social relations.

The summary results described for each discipline are combined and shown in Table 5.12. This table is based on the triangulation across data (see Table 5.4, Table 5.6, Table 5.8 and Table 5.10), which included the perceptions disciplines (Task 1 and 2), perceptions of designers (Task 3 and 4) and reported strategies (Task 5 and 6), based on responses discussed on the summaries of each discipline. Results in ***bold-italic*** show how respondents in each discipline see their discipline. Table 5.12 reflects the final results as they entered Model 2:

Table 5.12 LCT Codes & Design Disciplines (Summary Results Combined)

	Engineering Respondents	Architecture Respondents	Digital Media Respondents	Fashion Respondents
Engineering Design	***Knowledge***	Knowledge	Knowledge	Knowledge
Architecture Design	Elite	***Elite***	Elite	Elite
Digital Media Design	Elite	Elite	***Elite***	Elite
Fashion Design	Knower	Knower	Knower	***Knower***

In order to review Model 1, a decision was made to privilege the perceptions of designers from each particular design discipline, whenever there were a diversity of conceptualisations for the LCT(Specialisation) code of a discipline. The decision to privilege the perceptions of designers within the discipline take into account that results reflected in Model 2 would form the basis for the development of an e-learning environment to experience design (Design Studio). Within the environment the user could opt to experience being a designer according to the values of a certain discipline. In that way, the perceptions of designers about their disciplinary peers and

the values of their own disciplinary group were fundamental. As a result, both architecture and digital media entered the model as characterised by an elite code (Figure 5.32).

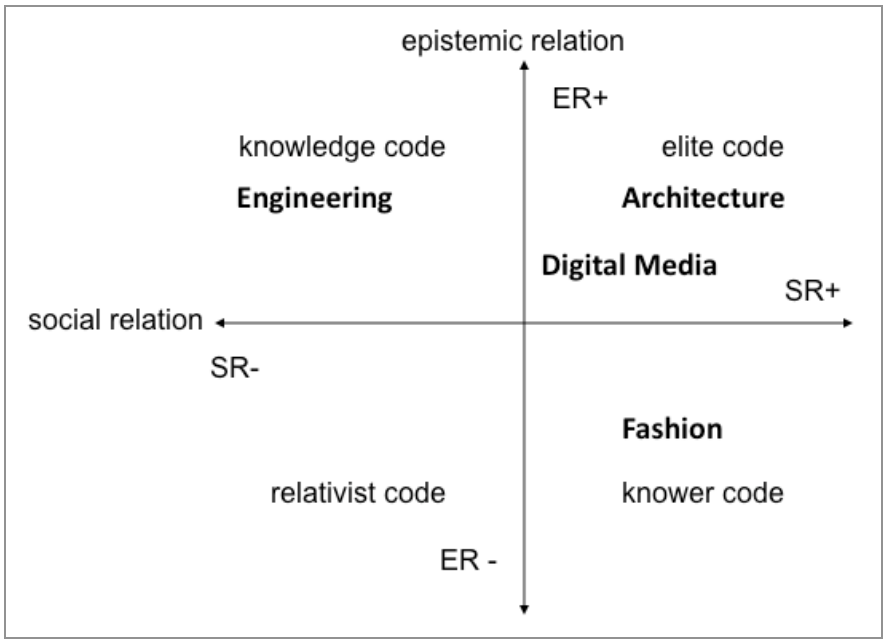

Figure 5.32 Model 2: Legitimation Code Theory and the Design Disciplines

The perceptions of the strategies used by designers in their design practices were also analysed. The results showed that designers are likely to use both the epistemic (e.g. '...design to solve problems that are currently confronted by contemporary society') and the social relation (e.g.' ...use of empathy in their design work') oriented strategies. Nevertheless, the results according to each design discipline were largely in agreement with Model 2. In this way, engineering designers are more likely to use ER–oriented strategies than any other designers. Fashion designers were more likely to use SR–oriented strategies, and digital media and architecture designers used of both types of strategies evenly distributed in their practices.

5.4 Summary of Chapter

This chapter presented and discussed results of an online survey with 139 designers in engineering, architecture, digital media and fashion. The results were analysed under the LCT(Specialisation) framework, recognising engineering as emphasising the epistemic relation and downplaying the social relation, that is, as a knowledge code. Fashion was conceptualised as a knower code, and both architecture and digital media were considered as an elite code. Strategies used by designers followed the codes of the disciplines. Engineering participants

reported to use slightly more strategies associated with the epistemic relation, rather than the social relation. Fashion participants were more likely to use strategies associated with the social relation, than the epistemic relation. Both architecture and digital media participants reported to use both types of strategies in their practices.

Model 1 presented in Phase 1 (Chapter 4) was reviewed and the survey results from Phase 2 were incorporated into the proposed Model 2 (Figure 5.32). This revised model is used as the basis for the e-learning environment, presented in Chapter 6. The new research question arising from this chapter is: *How can these results be enacted into the development of an e-learning environment to support design learners' inquiry into what is considered legitimate design practices and knowledge's?* Chapter 6 addresses this question discussing how Bernstein and LCT(Specialisation) concepts, and the empirical results from Phase 1 and 2, were practically applied in Phase 3 of this research.

CHAPTER 6 – A FIELD CENTRED LEARNING ENVIRONMENT

6.1 Introduction

This chapter discusses how Bernstein and LCT(Specialisation) concepts, and the empirical results from Phase 1 and 2, were practically applied in Phase 3 of this research. Phase 3 addressed the second research question of this study: *How can the learning of what is considered legitimate design practices and knowledges be facilitated in an informal learning context?* and its sub-question: *How can social realist principles be developed and implemented into the design of an e-learning environment?*

The gap in understanding this chapter addresses relates to the enactment of the concepts of Bernstein and LCT(Specialisation) into the development of a computer-supported learning environment. The chapter addresses this issue by presenting how these social realist approaches were applied in the development of Design Studio, the e-learning environment in which to experience design within a museum environment.

Design Studio enacts the perceptions of the basis for legitimate design practices and knowledge within four design disciplines (engineering, architecture, digital media and fashion). Its information architecture incorporates the results of the empirical study and uses Model 2 (Chapter 5) as the basis of its structure, and it incorporates Bernsteinian and LCT(Specialisation) theoretical concepts. For example, the environment is considered as a pedagogical context and it embeds different framing levels (+F, -F) in which learners are offered opportunities to choose the type of guidance they want to receive (selection), when to get advice (pacing), and where in the design cycle their design experience will start (sequencing) (see Section 6.5.1). LCT(Specialisation) concepts are embeded in the four different ways instructions are expressed in the environment (see Section 6.5.2).

The system supports learners' inquiry into legitimate design practices by inviting museum visitors to think about what is involved in the design of an object, directing them to different

sections of the museum, different resources (online or otherwise), have different strategies suggested (e.g. interact with others within the museum context) to validate their emergent design ideas, and by inviting these visitors to reflect on their experience. Design Studio offers learners an opportunity to experience how the design professions operate and provides support realising the language of the field.

This chapter first describes the context for which Design Studio was developed. Secondly, it presents the learning objectives, and describes the design process cycle and design activities that were included in the environment. Thirdly, the structure of Design Studio is then examined, with a discussion of how the theoretical concepts of Bernstein and LCT(Specialisation) combined with the empirical results were embedded in Design Studio.

6.2 Research Setting: The Powerhouse Museum

Design Studio was implemented in conjunction with the Powerhouse Museum (Sydney, Australia). The collaboration with the Powerhouse Museum aimed to explore the use of mobile systems to nurture experiential learning and informal discovery through a design experience within the museum setting. The Powerhouse Museum collection contains 385,000 objects. Museum curators, educators, and other staff, contribute to the design of exhibits and the display of objects in the collection to engage museum visitors with a variety of learning experiences. The museum addresses topics such as history, science, technology, design, industry, decorative arts, music, transport and space exploration (Powerhouse Museum, 2009). With 22 permanent and a number of temporary exhibitions, the museum offers a variety of experiences through touch-screen computers, audio phones, science experiments, virtual reality 3D theatres, performances, films, lectures and public programs. The museum hosted SoundHouse & VectorLab, recently renamed as Thinkspace, a space within the museum premises that offers structured workshops to groups of students and/or teachers. Specifically, VectorLab programs focus on using computer systems in image production and manipulation through 2D, 3D, video and motion graphics. A new program was introduced into the 3D workshops at the VectorLab, which aimed at integrating the design learning experience into the museum surroundings, that is, the various collections and exhibitions, and online resources offered in the setting. Design

Studio was incorporated into a new program to provide a design experience that would encompass active interaction with others, and to promote or encourage insights into the underlying values structuring design knowledge in our society.

The implementation of Design Studio involved re-designing the 3D workshops offered at VectorLab. In the old model, students attended a workshop within VectorLab premises, which resembled a classroom or lab experience. A teacher would demonstrate the use of a software application that could be seen on two large screens displayed in the room (see Figure 6.1). Students chose one of 15 desktop computers arranged in the room, and followed the instructors' advice individually.

Figure 6.1 VectorLab set up

As part of the re-modelling of workshops an e-learning environment was developed and the system's requirements were:

- to be implemented in a mobile device (e.g. PDAs, laptops);
- to direct learners to different sections of the museum, different resources and to suggest different strategies to be used by learners throughout their learning experience, before these learners perform the 3D design within the lab module;
- to integrate into the system's framework, Bernstein's (1977, 2000) and Maton's concepts (Maton, 2000; Moore & Maton, 2001), as well as the empirical results gathered in the exploratory phase of this research.

6.3 Learning Objectives

Design Studio's learning objective is to support the inquiry process related to the conceptualisation of the design of an object, offering users an opportunity to experience design, within an informal learning setting. Upon request, the e-learning environment suggests strategies and information, with which learners may be able to validate their own inquiry into the design of the object. These strategies and information are grounded on the research findings from Phase 1 and 2 of how the design field valorises knowledge.

6.4 Design Process Cycle and Learning Activities

Learning activities proposed within the environment were based on a canonical design process (Zhu, 2005, p. 58) as shown in Figure 6.2. The phases within the design process are:

(1) understanding the design problem

(2) coming up with a plan

(3) developing the concept[6]

(4) preliminary design; and

(5) refining design

Figure 6.2 The design and the inquiry processes

The design process parallels phases of an inquiry process. Figure 6.2 shows the inquiry process on which the design process is based:

[6] Within Design Studio 'developing the concept' is used to refer to the conceptualisation of students' emergent design ideas related to the design of a chosen object.

(1) question

(2) formulate a hypothesis

(3) investigate

(4) analyse data and summarise findings

(5) evaluate

The five phases of the inquiry process guided the formulation of learning activities and expected outcomes in Design Studio. Learners are expected to produce outcomes as a result of undertaking activities in each phase of the design process:

(1) produce a list of questions;

(2) define Goal/ Purpose/ Method;

(3) produce the design brief;

(4) produce a digital image; and

(5) re-work the digital image.

Although learning activities proposed in Design Studio were developed based upon advice from the Years 7-10 Syllabus from the Board of Studies of New South Wales (2003), there were no academic results to be derived from the experience. The proposed learning activities were only informally linked to design curriculum and students were not graded or rewarded for their performance. Thus, participants were only intrinsically motivated to complete the tasks, for example, by their interest in design or their enjoyment of the task itself.

The informal setting and character of the learning experience restricted the design of the evaluation study at the Powerhouse museum. That is, it was not possible to find an accurate way to measure what was learned as a sole result of the participants' design experience at the museum. The experience itself cannot be isolated and participants' learning and interactions with design in other settings such as school, the media, friends or others are likely to have contributed to their design experience at the museum. Thus, the five expected learning outcomes described above were not used to formally evaluate students' performance of tasks. They were only used to guide the proposed activities.

The purpose of the evaluation of the design learning experience (further discussed in Chapter 7) was to examine participants' perceptions of the design disciplines and of their interactions with Design Studio.

Figure 6.1 summarises the learning activities and the related expected outcome of each phase:

Table 6.1 Learning Activities and Outcomes

Design Step	Design Studio Proposed Activity	Outcome
Understanding the design problem	In this task you will need to list questions that you think are important and related to the design of the OBJECT[7]. First you will consider what should be taken into account in the design of the OBJECT. In this step you need to open your mind and list as many things as you can think of.	Produce a list of questions
Coming up with a plan	In this task you will be working with a list of questions related to your OBJECT. You will think of which of the questions from your list really matter and why. You will select the questions you will be working with and think about how you would answer these questions. (...) In this task you will consider: (a) the goal (i.e. the "what" of your design problem); (b) the purpose (i.e. the "why" of your design problem); (c) the methods you will use or how you will represent your ideas (i.e. the "how" of your design problem)	Defined "what" (goal), "why" (purpose) and "how" (method)
Developing the concept	To complete this task you will use the ideas you wrote under each heading (Goal/ Purpose/ Method). You will finish the three sentences written in the screen using your previous emerging design ideas. That means you will complete a sentence about: Specifications - using your objectives – a paragraph format of what was under the three headings – Goal/ Purpose/ Method. Prioritising - using the specifications above, and selecting one or two characteristics, features or factors in your design that you consider as essential in your object. Representation - elaborating about what in your design is representing the important characteristics/ features/ factors you chose in Prioritising. State how your design will express your objectives and its implications. At the end of this task you will have written a short paragraph about your design concept.	Produce the design brief
Preliminary design (Lab)	Try out the possibilities for representing your concepts. Choose the solution that best fits.	Produce a digital image
Refining design (Lab)	Change your preliminary design. Consider and try other ways of representing. Think about what you have learned from the experience, and what you could do next.	Produce a second version of a digital image

[7] The system replaces the word OBJECT by the specific type of object the user is designing (e.g. a dress, a house, a car etc.)

6.5 The Structure of the E-learning Environment

The e-learning environment was programmed in Flash®, to be installed in a mobile system (PDAs, tablet PC or MacBook), and uses short films built into the application (see Design Studio DVD).

6.5.1 Embedding Bernsteinian Concepts into the Information Architecture

Bernstein's concept of framing is embedded in the e-learning environment by offering learners an opportunity to decide whether they wanted to be more or less in control of their learning experience. By embedding different framing levels (+F, –F) in Design Studio's structure, different levels of interaction become possible. As a result, learners are offered opportunities to choose what type of guidance they want to receive (selection), when to get advice (pacing), and where in the design cycle their design experience will start (sequencing).

Learners choose to receive no guidance, partial or full guidance and can explore designing through guidance provided by a designer (whose screenplay is) based on the language of the discipline by which their particular object is designed. Alternatively, learners can choose their preferred advisor, independent of any links to a particular discipline. Table 6.2, Table 6.3 and Table 6.4 exemplify the options in the setting up stage, and their corresponding framing values:

Table 6.2 Pacing of the communication

Pacing of the Communication – When do I want to receive guidance?	
–-F	Learner never accesses advice from any advisor.
- F	Advisor briefly explains the design process, and learner chooses when to access the types of guidance.
+F	Advisor to pop when need is perceived. (Not in use)
++F	Advisor accompanies the learner throughout the experience.

Table 6.3 Selection of the communication

Selection of the Communication – What type of guidance?	
–-F	Learner receives no guidance during the design activities.
–F	Advisor shows learner the options for advice available and learner chooses which one s/he wants to access (what/why/how to do a task/ reflect).
+F	Suggest what advice I should choose in a given task. (Not in use)
++F	Advisor shows learner all the advice available explaining the design process and activities in detail. (what/why/how to perform a task/ reflect).

Table 6.4 Sequencing of the communication

Sequencing of communication – Where is the experience going to start?	
–F	Learner chooses where to start design experience (within different phases of a design cycle)
+F	Learner is guided in which phase of a design cycle the design experience will start

6.5.1.1 Types of Guidance: What, Why, How and Reflect

As previously indicated, there are different types of guidance available to learners throughout their design experiences. Guidance may be related to the goals of a given task (what), the purpose of the task (why), suggestions of strategies or ways of completing the task (how). Table 6.5 shows the types of guidance provided. For learners who have chosen 'full guidance' (see pacing and selection in previous section), information related to 'what / why / how / and reflect' is presented within the proposed learning activity. For learners who have chosen partial guidance 'what / why / how / and reflect' will be only accessed and opened in a new window in the screen, after learners command, that is the click of the button with the respective type of guidance.

Table 6.5 Type of guidance: What, why, how and reflect

Options	Type of Guidance
What?	Details what exactly is expected at task (goal)
Why?	Details the reasons for doing the task (purpose)
How?	Suggests strategies/ ways of doing task (methods)
Reflect	Shows a checklist of points to consider about the way the person performed the task

Strategies or suggestions of different ways of completing a task (how) are always subdivided into three types: 'ideas to ask other people'; 'ideas to research on the topic'; and 'objects to see within the museum'. Learners are also able to access a checklist of points to consider about the ways they performed a given task (reflect). Table 6.6 shows examples of strategies to be used by learners:

Table 6.6 Examples of Strategies

Types of "How"	Examples of strategies shown at Design Studio
Ideas to ask other people	Ask others what style of OBJECT do they like? What do they feel is important when designing OBJECT?
Ideas to research the topic	Research different materials, shapes, heights index of general population. Listen to designers opinions on http://www.powerhousemuseum.com/sydney2000games/interviews.php Podcasts and videos
Objects in the museum	Check out Inspired! (third floor), for some examples of intriguing chairs that have been designed across the times. This exhibition explores the concepts of beauty and function, style and substance, tradition and innovation. The exhibition was designed to show how values and attitudes may influence design and shape people's taste and imagination.

6.5.2 Embedding LCT(Specialisation) into the Information Architecture

Four types of design studios were created and are hosted by four different designers (played by films of characters). Concepts from LCT(Specialisation) were adapted and embedded into the characters' profiles. Learners have an opportunity to choose which type of designer they would like as a coach or advisor. Each character has a female and a male version. One designer (Roger or Rachel Rules) strongly emphasises the epistemic relation and weakly emphasises the social relation (ER+,SR–), a second one (Christopher or Christine Creative) weakly emphasises the epistemic relation and strongly emphasises the social relation (ER–,SR+), a third one (Alexander or Alexandra All) strongly emphasises the epistemic and social relation (ER+,SR+) and a fourth designer (Nicholas or Nicole Neutral) weakly emphasises both relations (ER–,SR–). Table 6.7 summarises the options displayed for learners.

Table 6.7 Types of design advisors

Advisor	Studios	ER oriented Strategies	SR oriented Strategies
Roger/Rachel Rules	Knowledge Oriented	Yes	No
Christopher/ Christine Creative	Knower Oriented	No	Yes
Alexander/Alexandra All	Elite Oriented	Yes	Yes
Nicholas/ Nicole Neutral	Relativist Oriented	No	No

Each character was given a fictitious first name and surname, but Design Studio only displays characters' first name. In Design Studio advisors introduce themselves as Roger or Rachel, Chris (used in both male and female versions), Alex (used in both male and female versions), and Nick or Nicole.

6.5.2.1 Expressing Instructions

Each character's screenplay and/or text that is displayed in the learning activities expresses different emphases on the epistemic or social relation. Table 6.8 contrasts the four types of advisors, the LCT(Specialisation) code associated with each of them, a short description of each character, and an extract from the screenplay showing how the content changes with the code even though the extracts are ostensibly about the same subject matter (how designers think). Each character enacts one of the LCT(Specialisation) codes: Roger/Rachel Rules enacts the knowledge code (ER+,SR–); Christopher/Christine (or Chris) Creative enacts the knower code (ER–,SR+); Alexander/Alexandra (or Alex) All enacts the elite code; and Nicholas/Nicole (or Nick) Neutral enacts the relativist code (ER–,SR–).

Table 6.8 Characters and screenplay

Advisor	LCT	Characteristics	Example from Design Studio script
Roger or Rachel Rules	ER+ SR–	Methodical, practical, go direct to the point Likes: puzzles, following instructions Dislikes: talking about feelings	Designers must always be aware of standard practices in their field. They need to keep up to date with what is going on and they often do that by reading and researching the topic, and exchanging ideas with their peers.
Christopher or Christine Creative	ER– SR+	Feelings, how one experiences object, people's person Likes: creative things, art Dislikes: following rules, Methodical people	Designers often need to imagine how people would experience the object they are designing. Designers need to think about what feelings such an object would evoke. It is also important to consider that different people like different things and have different ideas. By talking to others and researching on the topic you can be reminded of things you didn't think of.
Alexander or Alexandra All	ER+ SR+	Combination of refined "eye" and technical knowledge Likes: scientific programs about the universe, art, and original movies Dislikes: common place	Designers must always be aware of standard practices in their field. They need to keep up to date with what is going on and they often do that by reading and researching the topic, and exchanging ideas with their peers. Designers also often need to imagine how people would experience the object they are designing. It is important that designers think about what feelings such an object would evoke.
Nicholas or Nicole Neutral	ER– SR–	Average, common person Likes: sports, beach, BBQ Dislikes: Philosophy, nerds or sensitive people	Different people have different ideas. By talking to others or having a look at similar objects you can be reminded of things you didn't think of.

The passage illustrated in Table 6.9 is an extract from the screenplay of Roger Rules' character. The screenplay (Appendix 6) of each character adapts and enacts a LCT(Specialisation) code as described in Table 6.8. Roger Rules adapts and enacts the language of design according to an emphasis on the epistemic relation, that is, this character enacts the knowledge code. This is done by incorporating words from the Controlled Vocabulary List (Section 3.4.1 of Chapter 3) in the prose of Roger Rules: e.g. practical, methodical, following procedures.

Table 6.9 Screenplay example: Roger Rules passage

Roger Rules
"Hi, my name is Roger! I believe there is always a right way of doing things. I am a very practical kind of guy! I don't like too much talking, I usually go straight to the point... but I will be very happy in helping you out to find the best solution for your design questions. People say I am very clever and skilful, but my brilliant ideas just come out of being methodical and careful in designing, and of course being interested in stuff and reading a lot. There is a lot of knowledge developed in design, so if you just follow the rules and procedures that have been tried and tested you are guaranteed to be successful. I like doing puzzles, crosswords, following manuals and instructions, reading scientific magazines. I don't like "creative" stuff, big parties, and people who talk about "feelings" all the time."

6.5.3 Embedding Empirical Results into the Information Architecture

Findings from the interviews and surveys of designers (within engineering, architecture, digital media and fashion) were embedded into the environment. Chapters 4 and 5 discussed that designers in engineering tend to characterise their discipline as a knowledge code (ER+,SR–), whereas architecture as well as digital media designers perceived their respective disciplines as an elite code (ER+,SR+) and fashion designers, viewed theirs as a knower code (ER–,SR+). Within Design Studio, these results may be activated when or if learners choose to have an advisor assigned to them. In this case, a learner who is designing a dress, but is uncertain of which advisor to choose, would have the character (Chris Creative) which is the corresponding character associated with the results of the LCT(Specialisation) code characterised for fashion (ER–,SR+).

Results regarding strategies for identifying legitimate practices have also been adapted to be embedded within the environment. For example, survey results indicated that fashion designers were more likely to use the social relation oriented strategies rather than strategies with an emphasis on the epistemic relation (see Section 5.2.3.3 of Chapter 5). Conversely, engineering designers were more likely to use the epistemic-oriented strategies rather than those which are social-oriented (see Section 5.2.3.2 of Chapter 5). Results in the raw data of a particular strategy, for example 'Designers in my discipline draw on personal experiences (e.g. watching a film, talking to friends) to get inspiration for their design work' shows that while 68.8% of fashion designers draw on personal experiences to obtain inspiration for their design work, only 39.5% of engineering designers referred to this strategy. Within the environment, that means that Chris Creative, the ER–,SR+ advisor, will be more likely to suggest that learners draw on personal experiences than Roger Rules, the ER+,SR– advisor. This is done, for instance, by suggesting that learners reflect about their previous experiences (e.g. when in contact with similar objects, what they liked or disliked about a particular object they have seen either in real life or in a film and so on).

6.6 The Layout of Design Studio

Upon entering the environment, design learners are greeted by a host (played in short film), who introduces them to design and to the design experience they are about to embark (see Figure 6.3).

Figure 6.3 Design Studio: Host

Learners are then invited to choose the type of object they would like to design. They are offered eight options of types of objects to design. Each of these objects implicitly represents one of the disciplines in the study (e.g. the picture of a car characterises engineering, the picture of a dress characterises fashion). However, Design Studio does not explicitly state the names of the disciplines linked to the objects. Table 6.10 shows the options of types of objects learners are presented with and their associated design discipline:

Table 6.10 Options of objects to design

Object	Design Discipline
Car, Train	Engineering design
House, Chair	Architecture design
Dress, Shoes	Fashion design
3D Character, Logo/Icon	Digital media design

Subsequently, Design Studio invites learners to select a character, who will accompany them throughout the design experience, providing advice and support. Learners can choose between four male or female versions of design advisors. The screenplay of each advisor adapts

concepts from LCT(Specialisation) and empirical results, by placing slightly different emphasis (practical or subjective) in the way characters describe and talk about design (see Section 6.5.2). Alternatively, learners may choose to have an advisor assigned to them. If this option is selected, an advisor will be assigned according to their choice of object (engineering, architecture, digital media or fashion design related object as showed in Table 6.10). In order to assign the character according to the selected object, the system uses the results from the empirical data (see Section 6.5.3).

Learners are also asked to select what type of guidance they would like to receive and in what part of a design process cycle they want to start their experience (see Section 6.4). Within each of the phases of a design process, learners are invited to complete tasks, which are aimed to promote insights into the design of their chosen object. Learners have the possibility to select whether to access more information about the tasks and/or strategies in how to complete tasks, and themes for reflection after they have finished a task (see 6.5.1.1). The guidance aims to support their learning experience and provide a glimpse of ways in which learners can check whether their emergent design concepts would be legitimate within the particular design discipline from which they chose their object. Table 6.11 summarises the different layers of the e-learning environment:

Table 6.11 Design Studio Layers

Level	Content
1. Introduction	Introduction to design experience (film of Host)
2. Choose Object	Design a house, a dress, a car, a 3D character (8 objects)
2. Choose Gender	Options of male or female characters (silhouettes)
3. Choose Character (4 Studios)	Options of orientation are dependent on choice of character (film): Option 1 - Roger/ Rachel Rules (ER+SR–) Option 2 - Christopher/ Christine Creative (ER–SR+) Option 3 - Alexander/ Alexandra All (ER+SR+) Option 4 - Nicholas/ Nicole Neutral (ER– SR–) Option 5 - (Male/Female character assigned according to choice of object)
4. Selection: (choose guidance)	Option 1 - No guidance during design process (F--) Option 2 - Learner chooses what to read: what/ why/ how/ reflect (F-) Option 3 - Advice to be followed in certain task is presented (F+) (not in use) Option 4 - Design process is explained in detail, all advice (what/ why/ how/ reflect) is shown (F++)
5. Pacing: (choose guidance)	Option 1 - No access to advice from advisor (F--) Option 2 - Learner chooses when to open each type of advice (F-) Option 3 - Advisor to pop when need perceived (F+) (not in use) Option 4 - Advisor accompanies learner throughout experience (F++)
6. Design process	Understanding the design problem, Coming up with a plan, Developing the concept, Preliminary design, Refine Design
7. Sequencing: (choose where to start)	Option 1 - Learner chooses where to start experience (F-) Option 2 - Learner is guided in where to start (F+)
8. Activities	Connected to: (1) Understanding the design problem, (2) Coming up with a plan, (3) Developing the concept

Before choosing an advisor, learners watch films in which each advisor introduces himself/herself and presents the character's prescribed way of seeing design as well as 'personal information' such as the character's likes and dislikes (Figure 6.4).

Figure 6.4 Design Studio: Choose Your Advisor

Once learners have chosen an advisor they select the type of guidance (Figure 6.5): full guidance, partial guidance or no guidance.

Figure 6.5 Design Studio: Choose Type of Guidance

Learners then watch a film of their chosen advisor talking about design. The screenplay also shows a design process cycle. Learners choose where in the cycle they would like their experience to begin (Figure 6.6).

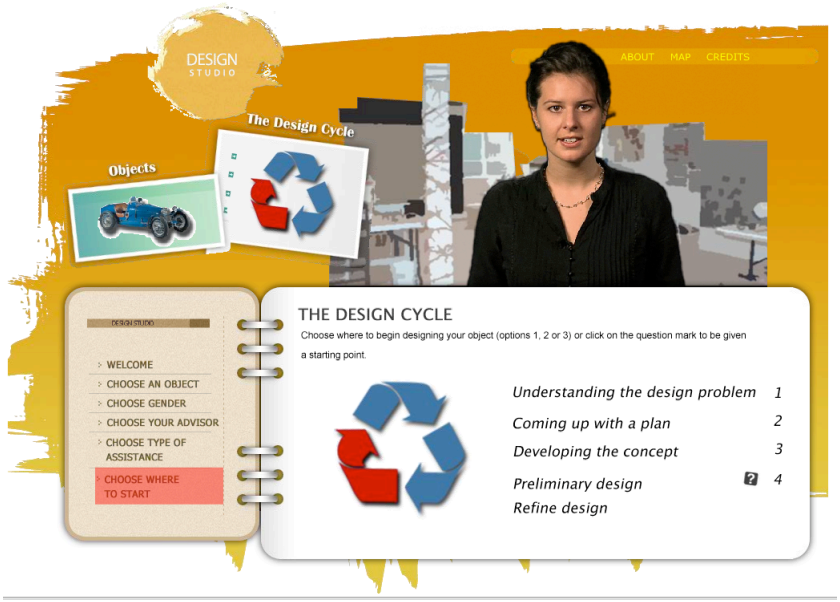

Figure 6.6 Design Studio: Design Cycle

Once learners choose the activity with which they would like to start (Understanding the design problem, Coming up with a plan or Developing the concept), the system takes the learners' options of their chosen object and type of guidance, and presents the learning activity. Learners are guided to use the museum surroundings and interact with museum visitors and others to explore ways of completing the activities proposed.

Through interaction with the system, learners may access a map which will help them locate exhibits in the museum, and read information related to the research project.

6.7 Summary of Chapter

This chapter discussed the development of Design Studio, an e-learning environment to experience the practice of design within the Powerhouse Museum context. The aim of Design Studio was to broaden museum visitors' experience providing an opportunity to experience design, situating learners in the professional context of one of the design disciplines in the study. The information architecture and interaction design of the environment were grounded in concepts derived from Bernstein's theory and LCT(Specialisation), and on empirical results from the exploratory study (Chapter 4 and 5) investigating the bases of what are considered legitimate practices and knowledge within engineering, architecture, digital media and fashion. New questions arising from this chapter relate the usefulness of Design Studio as a learning

environment to experience the valorisation of knowledge in design. The next chapter explores Year 10 students' experiences interacting with Design Studio within the Powerhouse Museum.

CHAPTER 7 : A DESIGN EXPERIENCE AT THE POWERHOUSE MUSEUM

7.1 Introduction

This chapter explores the usefulness of Design Studio (Chapter 6) after its implementation at the Powerhouse Museum and use by Year 10 students participating in workshops within the museum premises. The chapter discusses these students' interactions with Design Studio and their perceptions of the four design disciplines in the study. Students' experiences are analysed before and after the re-modelling of the 3D Workshop offered at the VectorLab in the Powerhouse Museum (Chapter 6). The gap in understanding addressed in this chapter relates to the usefulness of an e-learning environment to explore the language of a field, in particular in relation to the informal learning experiences of museum visitors. This will be addressed by discussing the analysis of data from two surveys and a group interview conducted immediately after the first and second 3D Workshops at the museum.

In order to investigate whether Design Studio supported learners' inquiry into legitimate design practices a pre- and post-qualitative evaluation was conducted with a population of Year 10 students. The pre- and post-qualitative evaluation allowed the comparison of perceptions of the design disciplines and the design experiences offered at each 3D Workshop, before and after their interactions with Design Studio. Design Studio embeds information about design and support for exploring the language of design. In addition, the e-learning environment is also used as an instrument to identify learners' perceptions of the discipline, providing the test-bed for analysis of learners' choice of object, advisor and their reasoning for choosing an advisor.

This chapter first presents and discusses students' perceptions of the four design disciplines in the study and their experiences of the first 3D workshop. Secondly, the chapter reports the findings from the second 3D workshop and students' perceptions of Design Studio. Results of each workshop are discussed at the end of each section. Thirdly, the chapter summarises the evaluation of the Year 10 students' design experience at the Powerhouse Museum.

7.2 First 3D Workshop

The first 3D Modelling Workshop was conducted on 10th September 2008. Fourteen participants from an inner city private school were selected by the school's Head of Design and Technology department to participate in the project. The workshop comprised a two-hour lecture within the VectorLab premises, in which students were taught how to use a software application (Cinema 4D) to produce and manipulate 3D images. Each student had a personal desktop computer and was able to visualise the lecturer's instructions, through two wide screens in the room (Figure 7.1). Students were shown the steps to produce a 3D image (a robot character) through interaction with the application. The syllabus of the first 3D Modelling Workshop included:

- What is 3D? Shadows and Z-space
- Manipulating the 3D graphic interface
- Creating geometric solids
- Moving, copying, cloning and rotating
- Populating a space with 3D objects
- Manipulating and modifying geometry
- Point editing
- Splines
- Colour and textures; and
- Rendering

Figure 7.1 VectorLab

Students were advised to interrupt the class if they had any questions and limited interaction with other students could also take place (in particular with the adjacent student). Once the

lecture finished, students were invited to fill out an online survey (see Appendix 7). Questions in the survey related to the participants' perceptions of design disciplines and of their design experience. Fourteen students answered the survey: 8 females and 6 males, of ages 15 to 17 years old.

7.2.1 Perceptions of Design Disciplines – PHM Workshop 1

Task 1 asked the Year 10 students to choose three words to describe each design discipline. Following the same format of the online survey with designers (Section 3.4.2 of Chapter 3), each Year 10 participant could use their own words or select words from a set containing 16 options based on the Controlled Vocabulary List (Section 3.4.1 of Chapter 3). Eight words were associated with an emphasis on the epistemic relation (e.g. driven by knowledge, methodical, objective) and eight with an emphasis on the social relation (e.g. driven by taste, elegant, empathic). Task 1 stated:

> 3D modelling is a knowledge that is learned by various professionals such as engineers, architects, digital media, fashion designers and others. However, the way that designers learn about 3D modelling and how they use 3D models may differ. Think about what you know about these professions either from your family, teachers, the media, or friends. Then please choose three words that you could use to describe these professions (you can choose your own words, or pick one from the drop down menu).

Students chose three words to complete a sentence (e.g. Engineering design is…) selecting them from a menu or by typing in their own words in the space provided. Words used by the Year 10 students to describe the design disciplines in the study are shown in Figure 7.2. The left side of the graph contains words associated with a relatively stronger epistemic relation and the right side of the graph contains words associated with a relatively stronger social relation. As illustrated in Figure 7.2, Year 10 participants preferred to use the epistemic relation oriented words (such as driven by knowledge and procedural) with less emphasis given to the social relation oriented words (such as influential and driven by taste) to describe engineering (red). Thus, engineering is mostly seen represented on the left side of the graph (epistemic relation) showing that this discipline was perceived as a knowledge code. In terms of fashion (green), the students were more likely to use the social relation oriented words rather than the epistemic

relation oriented words: the discipline is predominantly represented on the right side of the graph. These results suggest they view fashion as a knower code. Both architecture (yellow) and digital media (blue) appear in both sides of the graph, suggesting students perceived these design disciplines as more likely to emphasise both the epistemic and social relations, that is, as an elite code. These results indicate that Year 10 students characterised the design disciplines in accordance with the same specialisation codes as the designers did in the previously conducted survey (Figure 5.2 of Chapter 5).

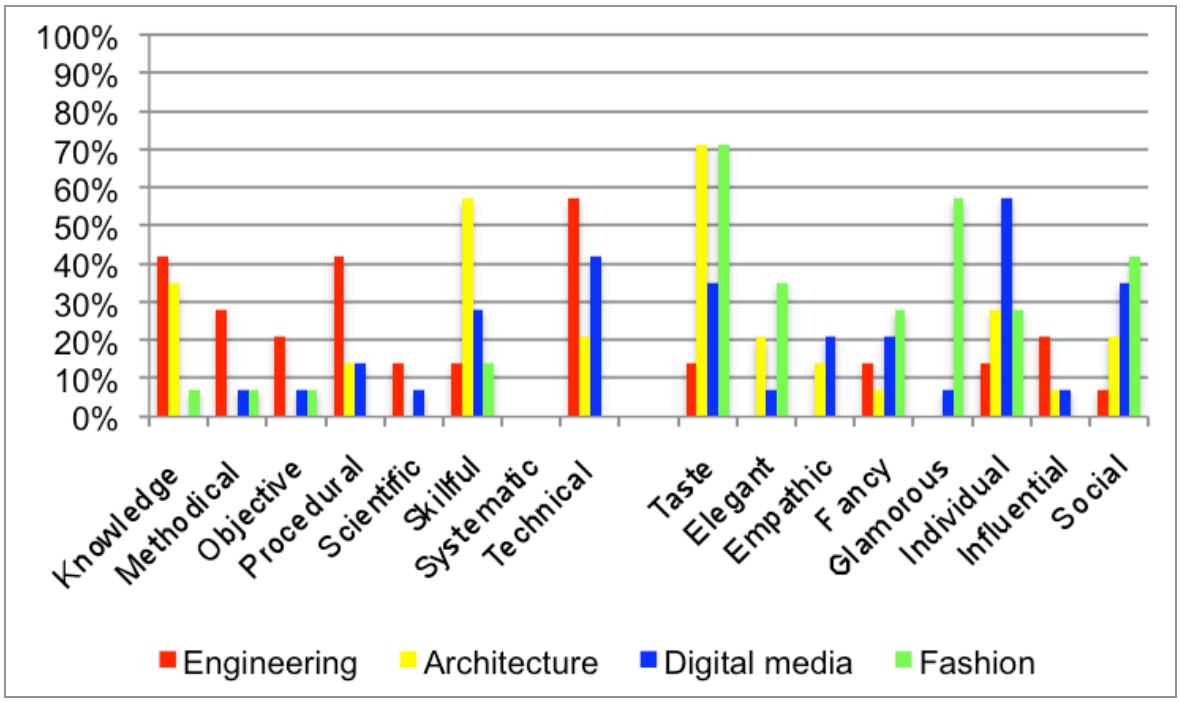

Figure 7.2 Engineering, Architecture, Digital media, Fashion design is... (Year 10)

7.2.2 Perceptions of Design Experience – PHM Workshop 1

In Task 2, Year 10 participants were asked to evaluate their design experience using a five point Likert Scale (from strongly agree to strongly disagree) to grade statements related to their experience. The question stated:

> Consider your overall experience during the workshop. Then choose the option that best describe what was like for you

The following statements were randomly presented:

> As a result of the workshop…
> I have a better idea of how designers evaluate their design thinking
> I found the content of the workshop useful

I learned how to organise my design ideas
I was able to develop my design ideas
I was happy with the guidance provided
I was happy with the activities proposed
I was able to define design ideas to work with at the lab
I learned about points and perspectives I can consider when designing an object
I felt supported in the design experience

Figure 7.3 illustrates Year 10 students' impressions of their first design experience at the Powerhouse Museum (Workshop 1). The graph shows that most students were satisfied with the proposed activities, felt supported during the design experience and were satisfied with the guidance provided. Participants were less satisfied about learning how to organise their design ideas.

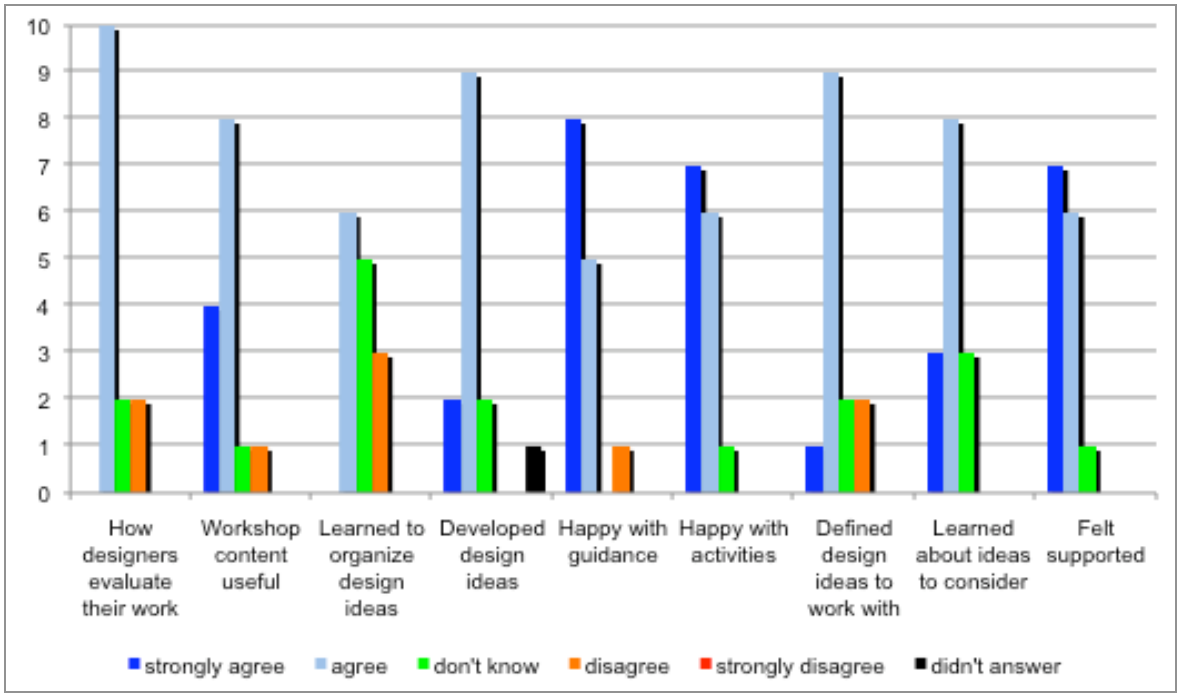

Figure 7.3 Perceptions of Design Experience: Workshop 1

In addition, Task 3 asked the Year 10 participants to write about their perceptions of the design experience. Positive aspects reported included the 'fun' of the experience, the practicality of learning how to use the application, and the 'hands on' approach. Two students also referred to gaining design knowledge, such as how "3D design is widely used in many different businesses". Negative aspects included the lack of time to complete the task (mentioned by four students), as well as difficulties in understanding concepts. Contradicting the results

obtained with the Likert Scale (see Figure 7.3), two students reported feeling lost and confused but did not elaborate.

7.2.3 Summary of Results from PHM Workshop 1

Overall, Year 10 students participating in Workshop 1 seemed to perceive the codes of each design discipline as characterised by the results in Model 2 (Figure 5.32 of Chapter 5), that is as in accordance with results obtained from 139 designers through analysis of the online survey (Chapter 5). This will be further discussed during the analysis of Workshop 2. Engineering was perceived as a knowledge code, fashion as a knower code and both architecture and digital media design were perceived as operating on an elite code. Most Year 10 participants reported that they were satisfied with the design experience at the VectorLab and enjoyed learning to interact with the 3D modelling application (Cinema 4D). This is not a surprising result, that is, most learning activities would be likely to be perceived as enjoyable by the students. Nevertheless, when asked to comment on the experience through an open-ended question, some participants reported feeling lost, confused and having difficulties in comprehending concepts.

7.3 Second 3D Workshop

The second 3D Modelling Workshop was conducted on 17th October 2008. Fourteen participants from the same inner city private school were selected again by the school's Head of Technology and Design department to participate in the project. Twelve participants had attended Workshop 1 but two participants were attending the workshop for the first time. Thirteen Year 10 students answered the survey questionnaire.

7.3.1 Experiencing Design and Design Studio

In the VectorLab premises, students were introduced to the e-learning environment (Design Studio) with a brief demonstration of how to use the application. The students had an opportunity to ask questions and were then requested to group into pairs. Each pair was given a MacBook with an installed version of Design Studio. Students attending the workshop for the first time were advised to find a partner who had attended the previous workshop.

Year 10 students were instructed to choose any location within the museum grounds to start their design experience. They were given one hour to explore the museum premises and to interact with Design Studio. During this time, the researcher wandered around the museum and was available to answer questions or to assist with problems, but no support was requested. Once the hour expired, students went back to VectorLab and were invited to fill out an online survey (see Appendix 8). Questions in the survey related to their perceptions of design disciplines, perceptions of the design experience and interaction with Design Studio. These Year 10 students also participated in an open discussion about their design experience, conducted immediately after the survey. The discussion was audio-taped and transcribed for analysis.

7.3.2 Interaction with Design Studio – PHM Workshop 2

Design Studio suggests eight types of objects participants can choose to design: chair, house, 3D character, icon, car, train, dress or shoes (see Section 6.6. of Chapter 6). Table 7.1 shows the types of objects the Year 10 students chose to design: two participants chose to design a chair, eight chose to design a dress, two chose a 3D character and one participant reported having chosen a car.

Table 7.1 Type of Object

Object	Value
Chair	2
Dress	8
3D Character	2
Car	1

Year 10 students could manipulate the frequency of advice that Design Studio was to provide during the design experience. They could choose from being guided all the time, being guided on request or never guided (see Section 6.5.1 of Chapter 6). Table 7.2 shows that the majority of participants (10) chose to receive guidance only on request, two chose guidance all the time, and one went through the design experience with no guidance.

Table 7.2 Frequency of Advice

Frequency of advice	Value
All the time	2
Just on request	10
Never	1

Design Studio provided support via a design advisor chosen by each pair of students interacting with the e-learning environment (see Section 6.5.2 of Chapter 6). Six participants chose male advisors while seven reported having preferred the female versions. The results of the chosen male and female advisors are reported in Table 7.3. and Table 7.4 respectively. Each table also displays the corresponding LCT(Specialisation) code related to each advisor. Note that although one participant reported he or she had received 'no guidance', all thirteen respondents of the survey picked an advisor.

Table 7.3 Male Advisors

LCT	Male Advisor	Value
Elite	Alexander	2
Knower	Christopher	2
Knowledge	Roger	2
Relativist	Nick	0

Table 7.4 Female Advisors

LCT	Female Advisor	Value
Elite	Alexandra	5
Knower	Christine	2
Knowledge	Rachel	0
Relativist	Nicole	0

Participants were asked about their reasons for choosing an advisor. All actors playing the advisors' parts in Design Studio wore black plain clothes to minimise bias of a choice based on appearance of the advisor. Nevertheless, six Year 10 participants reported that their choice was based on 'looks' and four of them reported that their choice was made by 'chance' (see Table

7.5). Two participants based their choice on ‘personality’. Two participants mentioned design ideas as a deciding factor and one participant referred to a best match of advisor according to his/her choice of object.

Table 7.5 Reasons for Choosing Advisor

Reasons for choosing advisor	Value
Looks	6
Personality	2
By chance	4
Design ideas	2
Advisor suited the object	1
Other	1

Although most Year 10 students refer to ‘looks’ or ‘chance’ as their main reason for choosing an advisor, eight out of the thirteen students answering the survey seemed to have chosen the advisor according to the LCT(Specialisation) code in which the discipline of their chosen object derived (see Table 7.6). This suggests that participants may not be totally aware of why their choice went to a specific advisor; nevertheless, they seem to characterise the discipline’s code in accordance to Model 2 in an intuitive but perhaps ‘unconscious’ manner. That is, they appear to recognise the disciplines’ codes, even though they did not articulate that explicitly.

Table 7.6 Advisor + Reasoning + Object

Advisor + Reasoning + Object	Advisor + Object in accordance to discipline
Alex + looks + chair	Yes
Alex + looks + dress	No
Alex + looks and no reason + 3D	Yes
Alex + no reason + 3D	Yes
Alex + no reason + dress	No
Alex + object + car	No
Alex + personality and ideas + chair	Yes
Chris + looks + dress	Yes
Chris + looks + dress	Yes
Chris + other + dress	Yes
Chris + personality and ideas + dress	Yes
Roger + looks + dress	No
Roger + no reason + dress	No

Results shown in Table 7.7 illustrate that four out of the six Year 10 participants who chose an advisor based on 'looks' were also designing a dress. As fashion design is a discipline in which appearance is known as an important asset, their choice may be connected to what participants consider as being expected within the discipline. In other words, the Year 10 students may be following the perceived 'values' of the discipline in a tacit way.

Table 7.7 Reasoning + Object

Reasoning + Object	Value
looks + chair	1
looks + dress	4
looks and no reason + 3D	1
no reason + 3D	1
no reason + dress	2
object + car	1
other + dress	1
personality and ideas + chair	1
personality and ideas + dress	1

7.3.3 Perceptions of the Design Disciplines – PHM Workshop 2

Year 10 participants were asked to consider how important the following would be within the discipline from which their object derived:

- skills, procedures and specialist knowledge
- natural born talent
- taste or a developed 'feel' for it

This question adapts Task 2 of the online survey with designers (see Section 3.4.2 of Chapter 3) to investigate whether students perceived the discipline of their chosen object as emphasising skills, procedures and specialist knowledge (emphasis on the epistemic relation) or designers' taste and talent (emphasis on the social relation). Results were qualitatively analysed.

7.3.3.1 Engineering object – Car

One participant reported designing (or body styling) a car. This participant considered taste as quite significant to design a car, whereas skills and talent were not reported as being as important. This result does not agree with previous findings from Workshop 1, in which participants identified engineering as a discipline characterised as a knowledge code (ER+, SR–). However, this result does not necessarily mean that this Year 10 student would not identify engineering as a knowledge code. In fact, there are many reasons why one might approach a design experience of an object using a different 'language' from the one emphasised within the discipline by which the object typically is designed. As both relations are always present in any field or discipline, only the degree of emphasis differing, this Year 10 student could have been interested in exploring aspects connected to the social relation (e.g. taste) in his/her design experience.

7.3.3.2 Fashion object – Dress

Results related to fashion objects suggest that the discipline was perceived as an elite code, in which both skills and taste were considered important in order to be successful at this design profession. Six out of the eight respondents considered skills important, and seven out of the eight respondents considered taste or talent as important to be successful in this profession.

Although both skills and background of the designer would be present in any profession, skills in addition to taste and talent seem to be similarly considered as being quite important in fashion.

7.3.3.3 Architecture object – Chair

Only two participants chose to design a chair. Results shown suggest that one of the respondents perceived architecture as emphasising taste, with skills being not very important, which in terms of the LCT(Specialisation) code would translate as a knower code. The other respondent viewed architecture as emphasising both skills and taste, which suggests the participant characterises architecture as an elite code. This latter participant perceived the LCT(Specialisation) code as being in accordance with the results from the designers' online survey.

7.3.3.4 Digital media object – 3D Character

Results related to the digital media object show that skills in addition to taste and talent were considered important by the two students designing a 3D character. These results suggest that the discipline was perceived as characterised by the elite code. A result that suggests both respondents characterised digital media using the same LCT(Specialisation) code in accordance with the results from the designers' online survey.

7.3.4 Perceptions of the Design Experience – PHM Workshop 2

Year 10 participants were asked to use a five point Likert Scale (from strongly agree to strongly disagree) to consider the following statements in relation to their design experience. These statements were randomly presented to them:

I was happy with having a choice of advisor
I was happy with my choice of object
I was happy with the activities proposed
I was happy with the guidance provided
I learned how to organise my design ideas
I learned about points and perspectives I can consider when designing an object
I feel I have a better idea of how designers evaluate their design practices
I was able to define design ideas to work with at the lab

I felt supported in the design experience

I found the content of the environment useful

The results show that most Year 10 participants were again satisfied with their experience, in particular with the opportunity to personalise the design experience by choosing their advisor and an object to design. Participants reported they were able to define ideas to work with, they learned how to organise their design ideas, and learned about perspectives to consider in their design of an object. Most of the participants reported having found the content of the e-learning environment useful and reported feeling supported during the design experience. Nevertheless, participants still seemed mostly unsure when asked whether they had a better idea of how designers evaluate their practices (see Figure 7.4 Perceptions of Design Experience: Workshop 2):

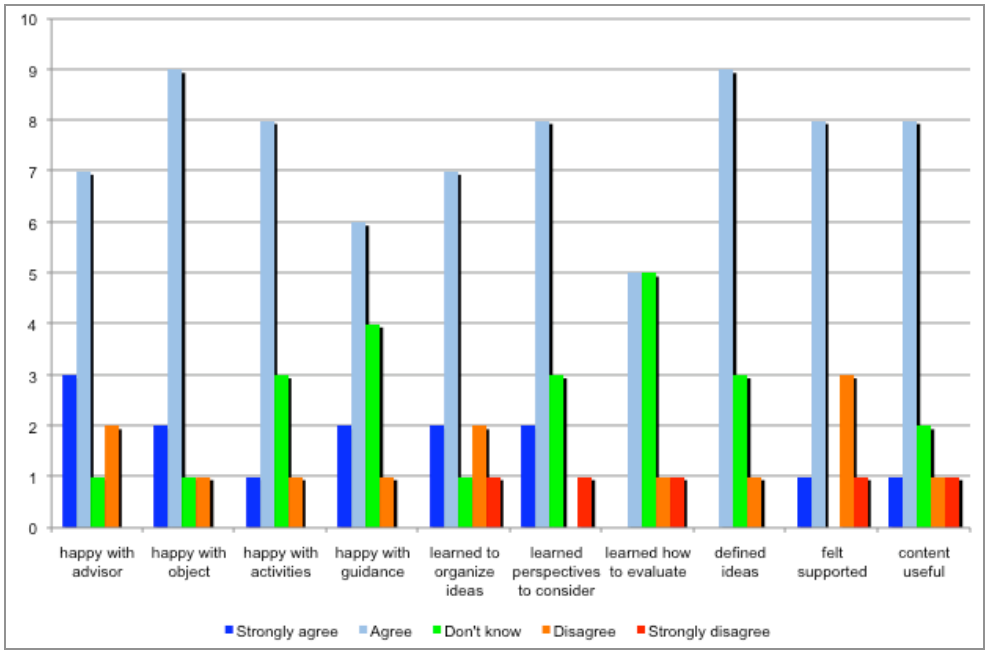

Figure 7.4 Perceptions of Design Experience: Workshop 2

The survey protocol also asked Year 10 participants to contribute their impressions of the design experience in writing. Positive aspects included the opportunity of being assisted in the conceptualisation of their design (mentioned by seven participants), and working in partnership (Figure 7.5 Working in Partnership) so that they could share and exchange ideas. They also reported that the e-learning environment was easy to understand and use.

Figure 7.5 Working in Partnership

Participants enjoyed the interaction with museum displays and the freedom of 'going off on their own' to explore ideas within the museum environment (Figure 7.6). Negative aspects were the lack of battery (one of the laptops was only partially charged) and usability issues within the e-learning environment such as the lack of a back button. One student reported a need for more direction and explanation during activities.

Figure 7.6 Participants Exploring the Museum Collection

Group Interview

After the Year 10 students completed the survey, they had an opportunity to reflect on their design experience in the lab with the researcher and the VectorLab's manager. Positive aspects of the design experience mentioned by students were that the experience promoted a new understanding of the museum environment, taking into account a design perspective, that is, as a place to gather ideas for their own designs. Through the guidance received in

interaction with Design Studio, participants felt they were helped to make connections between the design pieces within the museum collection and to understand how they could use these ideas for their own designs. They reported feeling engaged throughout the experience, commenting on the 'hands on' factor. The drawbacks mentioned were again the lack of a back button, and lack of battery.

The teacher who was accompanying the students also made positive remarks about Design Studio. She asked the VectorLab's manager whether resources like this could be made available on the Powerhouse Museum website. She added:

> the level of information and prompts available to the user is very helpful. Being advised to think beyond the minimum requirements is encouraging greater creative scope and consideration of alternatives to a single idea.

7.3.5 Summary of Design Experience – PHM Workshop 2

Most students (eight out of thirteen participants) seemed to tacitly follow the language of a design discipline, often selecting an object and a corresponding design advisor from the same design discipline, in accordance to the survey results in the empirical study. However, when students were asked to justify their choice of a design advisor, it is not clear if they were aware of the existence of tacit 'rules of the game' within the disciplines. For instance, six students stated that their selection was based on the advisors' appearance rather than the advisors' 'message', and three students said their choice was due to 'no special reason'. Only one student affirmed that the selection of the design tutor was due to the fact that s/he seemed the right type of advisor according to their chosen object. One possible interpretation for this data is that participants had some intuitive understanding of design, that is, they were able to recognise its characteristics, but they were less sure how these were realised in practice.

Another interpretation is that participants' did not think too much about their choices due to a lack of motivation in completing the tasks. The design experience required that participants were intrinsically motivated to complete the tasks. There were no academic rewards or punishments for their performance or their interactions with Design Studio. As a result, students could have chosen an advisor without too much consideration just due to the lack of positive stimulus or nothing to lose associated with their performance.

Moreover, these results might reflect students' choice of object to design. Among the participants, seven students were designing a fashion object and the majority of answers associated with advisors' appearance might relate to their awareness of the 'language' of this design profession. The expression of a person's taste, emphasised in fashion design, may be enacted by the choice of 'looks' as a valuable asset.

The students participating in the field study were considered to be design learners, particularly when in comparison to tertiary students of design or design professionals. As such, these students have not been fully socialised in the language or codes of the disciplines. Nevertheless, there is an assumption that most of these students would have had a degree of exposure to design, either through school curriculum related to design and technology, the media or within other settings for informal learning of design, such as a museum of design. Thus, these Year 10 students came to the design experience with an understanding of design and the design experience at the Powerhouse Museum and other further exposures to the codes of a discipline, are likely to affect their perceptions of the disciplines changing the way they understand design as a process.

The students preferred the museum visit when guided by the e-learning tool rather than without. They appreciated the e-learning environment suggestions of which exhibits and objects they could visit, and the idea of using the museum collection to obtain insights for their own designs. They also commented that they enjoyed working in partnership and found it useful to share different viewpoints with others. Negative aspects of the experience related to usability and technology factors.

7.4 Summary of Chapter

This chapter explored Year 10 students' perceptions of a design experience mediated by Design Studio and the Powerhouse Museum surroundings. The chapter discussed students' participation in two workshops within the museum and their interactions with Design Studio (in the second workshop). Results suggest that most Year 10 students who participated in this research followed the 'language' of the design discipline of their chosen object, although not necessarily always aware of their choice. Results also show that students were able to use the

museum environment to explore their ideas and were satisfied about their experiences in interacting with Design Studio. They appreciated the e-learning environment suggestions of which exhibits and objects they could visit, and the idea of using the museum collection to obtain insights into their own designs.

The next chapter revisits the contribution claims of this research, reflects back on the results from Phase 1, 2 and 3 of this study and discusses new directions for this research.

CHAPTER 8 : CONCLUSIONS AND FUTURE DIRECTIONS

8.1 Summary of Thesis

Social realist approaches, such as those of Basil Bernstein and Karl Maton, consider knowledge as social but that it is also possible to see knowledge in an objective manner (Moore, 2004; Maton & Moore, 2010). These approaches were particularly relevant for the present study because they allowed for the understanding of design knowledge as an object, providing concepts to analyse the diverse forms that knowledge may take in the different design disciplines. This thesis draws on these social realist approaches to examine the production of knowledge within the field of design, particularly focusing on four design disciplines: engineering, architecture, digital media and fashion design. The research investigates the basis for what is considered legitimate design practices and works of design, as shown by the way the participants of different disciplines valorise both legitimate knowledge and legitimate knowers in their fields (Maton, 2000; Moore & Maton, 2001).

The research first draws on one of the dimensions of Legitimation Code Theory - Specialisation - to analyse the four disciplines of design (Maton, 2000; Moore & Maton, 2001). Results from interviews and surveys showed that achievement in engineering was more likely to be perceived as based on technical and objective attributes (a knowledge code), whereas achievement in fashion is often described as reliant on the designers' dispositions (knower code). Architecture and digital media were perceived as emphasising both, on the one hand, procedures, skills and, on the other hand, attributes of the knower, such as dispositions (elite code).

Secondly, the social realist approach was applied, in a generative way, into the last phase of this research. That is, the approach was used in the development of an e-learning environment: Design Studio. Concepts derived from Basil Bernstein's theory (1977, 2000) and LCT(Specialisation), in addition to the empirical results from how the design field

conceptualises knowledge, were incorporated into Design Studio. Design Studio aimed at supporting learners to understand the language of the design field and to experience design within an informal learning setting. The proposed 'design experience' uses both Design Studio and museum surroundings to take the learner through an inquiry process connected to the design of an object, supporting the learner's own investigation. A group of Year 10 students attended two design workshops at the Powerhouse Museum. In the second workshop these students experienced design mediated by their interactions with Design Studio and the Powerhouse Museum's displays and collection. Year 10 students reported they appreciated the support provided by Design Studio and the chance to look at the museum collection 'with a purpose', that is, as inspiration for their own design processes and for the form of their designed objects.

In the concept of language of descriptions, Bernstein highlights the importance of making explicit the relations between empirical data and theory (Bernstein, 2000). One of the gaps in understanding addressed by this research relates to the lack of research instruments to uncover the nature of knowledge within disciplinary contexts and tools to support their translation into an informal learning experience. Although a number of studies using Legitimation Code Theory are emerging in the research literature (Doherty, 2008; Lamont & Maton, 2008, 2010; Luckett 2009; McManara, 2009; Shay 2008), examples of specific tools to investigate LCT(Specialisation) concepts are still relatively rare, because of the emergent nature of the approach. LCT(Specialisation) is a relatively recent development in the sociology of education and knowledge. This thesis presented a detailed account of how this study's language of description was developed (Chapter 3) and made explicit the procedures undertaken to establish connections between empirical data and theory. Lessons learned in the process of constructing instruments with which the theory could be tested were discussed, along with the necessary changes undertaken to adjust them. Using a sequential approach, one phase of the research was fed into the next. The use of mixed-methods allowed for exploring LCT(Specialisation) concepts within qualitative and quantitative methods, and incorporated multiple triangulations to explore the validity of findings. The research triangulated sources of data gathering (e.g. designers, design educators, tertiary students of design) as well as the

methods used (e.g. interviews, surveys, observations). Table 8.1 summarises this research triangulation of data, source and method.

Table 8.1 Triangulation

Data	Source	Method
Perceptions of disciplines Perceptions of designers Strategies	Designers Museum of Design Staff	Interviews
Perceptions of disciplines (2 tasks) Perceptions of designers (2 tasks) Strategies (2 tasks)	Designers Design Educators Tertiary Students of Design	Survey
Perceptions of disciplines	Year 10 Students	Software Survey Group interview Observation

The research employed a Bernsteinian approach to the research process, which resulted in:

- the development of the study's language of description to map concepts to empirical data (Chapter 3);
- a method to assign LCT(Specialisation) concepts into a list of words (Controlled Vocabulary List) (Chapter 3).

The method showed the procedures used to link LCT(Specialisation) theoretical concepts to terms used to describe professions and professionals. Meanings attributed to each word in the list were examined in relation to its association to the description of a discipline that emphasises knowledge and/or knowers. Words in the Controlled Vocabulary List were incorporated in multiple questions within the survey phase (Chapter 5), as well as the development of the screenplay (Appendix 6) and design activities in Design Studio (Chapter 6).

This chapter discusses the implications of the findings of this research. The chapter begins by discussing the implications of the social realist analysis of the design field. The chapter firstly discusses how the findings about the bases for legitimacy within engineering, architecture, digital media and fashion reverberate within professional design practices, design education and lay audiences. Secondly, the chapter revisits the Bernsteinian approach to this research, and its generative use, with the formulation of the Controlled Vocabulary List. Thirdly, the

chapter discusses implications related to the development of Design Studio with the formulation of guidelines to be used by developers interested in using a social realist approach within other e-learning environments. Finally, the chapter explores the limitations of and future directions for this research.

8.2 Implications of Findings

8.2.1 Legitimate Design: Values and Code Clashes within the Field

As discussed in Chapter 2, LCT(Specialisation) is concerned with "what makes actors, discourses and practices special or legitimate" in a given context (Maton, 2007, p.98). LCT(Specialisation) claims that the basis for legitimacy rests on *knowledge* (or skills) that is valuable to know and on *who* is an ideal actor, within a given context. This research applied LCT(Specialisation) concepts to the analysis of the basis of legitimate knowledge and knowers within the four design disciplines in this study. The interviews (Chapter 4) and survey results (Chapter 5) illustrated how a range of different measures of achievement characterises the field of design and that designers from different disciplines have distinct measures or 'specialisation codes'. As a result, disciplines in the field practice design differently not only because of the different content knowledge that is required to perform the associated tasks in the design of an object, but also because of the way that knowledge is valued in each discipline. Evidence from the interviews, the online survey and the research literature agree in relation to showing the differences in the way values and beliefs about design practices are expressed within the disciplines of design in this study.

Chapter 2 discussed that researchers in the design field are able to recognise the existence of differences in the interpretation of design activities and the knowledge required to undertake them (Dorst & Dijkhuis, 1995; Dorst, 2008a, 2008b; Papanek, 2001) and explored the significance of the field's disagreements over what should count as relevant within and amongst the design disciplines and their practitioners. To this point, research analysis of the design disciplines tend to keep the debate at a surface-level of the specific sets of content knowledge required to design in a given discipline (e.g. engineering or architecture). Thus, they miss the essence of these debates, or the reason for these differences, which exist in the *form* taken by

the knowledge that is valued, cultivated and more generally emphasised within a discipline. These varied practicing versions of design exhibit what is ultimately labelled as scientific or artistic sensibilities within the field (Dorst & Dijkhuis, 1995; Dorst, 2008a, 2008b; Papanek, 2001). The present study argues that the debate is not over what the content of design is; rather the debate is over what form of design knowledge is valued.

Essentially, this research considers the differences in design practices as a reflection of the various values and beliefs held by a design discipline. Research by Strickfaden and colleagues (2006) explored how designers' values, beliefs and mores are used as a seedbed for designers' concept generation and for design. In other words, Strickfaden et al. recognise that designers' practice embody designers' values, but the authors do not make explicit how these values reflect and shape the social disciplinary context of design disciplines.

Thus, the present research acts to fill a void in the current analysis existent within the field of design. That is, scholars do not go beyond the recognition of the existence of differences in design practices or the recognition that design practices embody values and beliefs, and as a result they offer only a partial account of the design field. Lacking in the design research literature is an analysis of design knowledge and practices in an objective manner, to understand the *nature* of knowledge in design. The present study contributes to the research developments in the field, using social realist approaches to explore the different forms knowledge takes in the field of design. LCT(Specialisation) allowed this research to conceptualise the distinct trajectories as affected and influenced by the bases for legitimacy within each discipline, whether a discipline is underpinned by a knowledge code, knower code or elite code. The analysis in this thesis discussed how designers from each discipline view the field of design and its practices through different lenses. The underlying principles structuring these different views can be analysed in terms of specialisation codes to show how each discipline is dominated by a particular code. Within a discipline, any designer has some level of individual agency to adopt a different emphasis on the dominating code of the discipline, so nuances may be found in individual descriptions of a particular designer.

Research findings in Chapter 4 and 5 illustrated how participants in this study consistently characterise engineering design as valorising technical and objective attributes (knowledge

code). Not just engineering participants but also participants from within the disciplines of architecture, digital media and fashion (Chapter 5). This emphasis on the epistemic relation, rather than the social relation, resonates with the research literature in engineering. For example, Sheppard and colleagues (2006) view knowledge as an object or, as the authors consider, as a "secondary product of work" (p. 433). In education, similar emphasis is expressed and engineering students are trained to apply "scientific principles to solve engineering problems" (Dym, 2006, p. 423). In Chapter 7, Year 10 students participating in the design experience at the Powerhouse Museum, also characterised engineering as a knowledge code. Thus, the form of knowledge valorised within engineering was characterised by the same specialisation code within the interviews, survey, research literature and by design learners (e.g. Year 10 students). However, this was not the case for all the disciplines in the study. For example, the research findings (Chapter 4 and 5) indicated that architecture participants characterise their discipline as valorising both, procedures, skills and, attributes of the knower, such as dispositions (elite code). Nevertheless, the perceptions of a relative stronger emphasis on both the epistemic and social relations varied across the other designers participating in the study (e.g. engineering, digital media, fashion designers) and not all of them considered architecture as emphasising both relations. In addition, research literature related to architecture education does not necessarily reflect this characterisation. Descriptions of the 'studio' scenario, often used to teach architecture students (Goldschmidt, 2003; Schön, 1983, 1987), seem to place an emphasis on developing dispositions of the knower. For example, architectural studios are said to facilitate students' 'absorption' of attitudes and values, as well as knowledge (Goldschmidt, 2003); and to involve a form of coaching that aims at awakening the learners' own sensibility (Schön, 1983). There are, in other words, struggles within each discipline over which code predominates. Such struggles may be more or less apparent within different disciplines. Nevertheless, this thesis focused on the level of the disciplines, which comprise design and differences between those disciplines. At this level, substantive differences in the valuation of knowledge exist between disciplines, and this thesis discussed how designers' practices may be influenced by an image of the knowledge they perceive as valued.

These codes also reverberate within professional bodies and schools of design (Carvalho et al., 2009). This is noticeable, for example, through the analysis of the way professional societies and schools of design publicly describe their own disciplines to audiences. The disciplines' values and how they organise themselves socially, as well as the expectations as to how practitioners within the discipline orient themselves towards the discipline are all intertwined in the way professional bodies and schools of design describe the profession.

The ways designers perceive knowledge and the ways they determine what type of knowledge is valuable in a particular discipline is crucial within design education. Chapter 2 discussed the importance of design learners understanding the 'rules of the game' within the discipline they are entering, that is, how to 'recognise' and 'realise' the relevant meanings particular to a design discipline (Bernstein, 1977, 2000). Chapter 7 explored design learners' (Year 10 students) perceptions of the design disciplines in the study. These research findings suggest that most Year 10 students 'intuitively' follow the language of a design discipline in accordance to the survey results in the empirical study. However, even though the Year 10 participants appear to recognise the disciplines' codes, they are not able to articulate that explicitly, thus, it is not clear whether they are aware of the existence of tacit 'rules of the game' within the disciplines. The problem with a scenario where design learners are able to recognise genuine design but are less sure about how these are realised in practice, is that only a partial learning of design is taking place. In order to develop the meta-cognitive skills necessary to succeed as designers, design learners need to both recognise and realise the relevant meanings within the discipline. That is, to become successful designers, learners need to be able to identify genuine design work and practices, in addition to be able to produce design work and practice design themselves according to what is expected within the field.

The conceptualisation of design knowledge and education though the social realist approaches (Bernstein, 1977, 2000; Maton, 2000; Moore & Maton, 2001) offered a way of understanding why some design students may encounter more difficulties than others, and that is, they may be struggling to understand the 'unwritten rules' of a design discipline. By understanding the differences in design practices as shaping and reflecting designers' different beliefs and values about knowledge and knowers in a discipline, it is possible to advance the debates within the

field. It allows for the consideration of interventions to address problems related to these debates in the production and reproduction of knowledge within the field and in teaching and learning.

8.2.2 Social Realist Principles within an E-Learning Environment to Experience Design

This research developed a way to generatively apply the theoretical concepts from Bernstein's theory and LCT(Specialisation) into the development of an e-learning environment. This research views e-learning environments as 'pedagogical contexts' (Bernstein, 2000), containing transmitters (e.g. instructional designers and stakeholders involved in the development of the system) and acquirers (e.g. learners or users) of knowledge. Essentially, every e-learning environment reflects a particular way of communicating knowledge, so that the system itself would not be neutral. Instructional designers often draw on existent design patterns[8], principles and processes to help the development of well–crafted systems (Van Duyne et al., 2003). However, current guidelines and standards do not appear to provide support for learners in establishing connections between the knowledge of a field and the social context in which this knowledge is produced and reproduced. Guidelines and standards used by instructional designers tend to lack information about how they may express the language of a field within these environments, or how to incorporate features to help learners in understanding what is valued as meaningful within a particular field (Van Duyne et al., 2003). Such guidelines either assume that learners already understand the language of a field, that is, its norms and codes, or that learners will 'pick it up', or that there is none to be learned.

The social realist approaches applied in the development of Design Studio (Chapter 6) may be generalised and used by developers and instructional designers, linking the theories of sociology of education to the interaction design and content design of other e-learning environments. The conscious awareness of social realist factors by e-learning or instructional designers may help to produce meaningful learning experiences and thus, benefit learners.

[8] Design patterns are usually descriptions or templates used by web or instructional designers that address how to solve a general problem. Designers developing a website, for example, will use a pattern to address a problem, and build and adapt it. A design pattern can usually be used in many different scenarios.

However, aspects related to the practical implementation of the approach may be an issue for these designers. In a recent study, Yanchar et al. (2009) examined instructional designers' views and use of theories in their practice and found that designers valued theory as a way of sense-making, gaining useful ideas, or as a mental checklist to use in their work. Nevertheless, these designers also reported that theories tend to be too abstract, complex, and difficult to apply in instructional design. In particular, the instructional designers reported they struggled to understand how abstract theoretical representations fit contextual design problems.

Instructional designers and developers are often responsible for the design of the features and functionalities of the context of the learning experience, that is, they are responsible for how the activities and information about the learning experience will be displayed and used by learners. Therefore, these professionals play a fundamental role in the development of computer-supported learning systems, and it is important that they understand that there is a difference between 'the subject matter' and 'the language of the field' of the subject. For example, learning a science subject (e.g. chemistry) and how science concepts are communicated (e.g. through hypothesis testing) is different from learning a humanities subject (e.g. music) and how music concepts are communicated (e.g. through music appreciation). Results from Year 10 students' interactions with Design Studio suggest that the use of social realist approaches in the development of e-learning environments may successfully support learners to explore and learn about what is valued within a discipline (Chapter 7). In order to guide instructional designers or developers in the practical implementation of a social realist approach to e-learning design, a set of guidelines is described below. These guidelines summarise the five main steps of the approach used in this research.

Step 1: Identify the bases of legitimacy of knowledge of a field

In Step 1 the developer considers the type of knowledge valued within the field from which the content of the e-learning environment is based. S/he will gather information about how the field valorises knowledge by investigating what is considered meaningful or special within that particular field. This analysis may involve interviews or surveys with professionals in the field and/or an examination of how professional and educational associations (e.g. tertiary institutions or professional bodies) in the field express their values through their written material.

Step 2: Define ways for expressing the 'language of legitimation' of the field

This step works towards combining the information to be displayed in the e-learning environment (or the content of the environment) with the language of the field. This may involve writing a script (or selecting types of characters) to be displayed in the environment, which will reflect the language of the field. If the content comes from a field that valorises knowledge as an object (e.g. physics), activities and information displayed will need to reflect those values, that is, they may have an emphasis on being objective, methodical or practical. For example, offering templates, explaining steps in a methodical way, or offering activities that will develop learners' skills. On the other hand, if the content comes from a field that valorises actors (e.g. visual arts), activities and information displayed may incorporate an emphasis on subjective experiences. For example, suggest that learners use their own experiences as part of an activity, identifying key people in the field and learning their specific practices, or encouraging learners' personal reflections about an activity.

It is assumed that the content ('what') to be displayed (and the topic) has been decided. This step is about 'how' the information will be displayed and features that the designer may use to reflect the language of a field. The designer or developer will work on defining ways in which the content may be expressed based on the results of the research in Step 1. Thus, the design of the e-learning environment takes into account the particular ways that knowledge is often reproduced in the field.

Step 3: Embed different pathways through the learning experience based on Bernstein's concepts (e.g. pacing, selection, sequencing)

In this step, the designer embeds different learning scenarios into the e-learning environment. Learners are given the ability to control how their learning experience will be. That is, learners may choose different ways of exploring the content of the environment by manipulating the type of information to be assessed (selection), the timing when s/he will assess the information (sequencing), or whether they would like to be guided in their choices (pacing). For example, the learner may be guided in having an experience that is grounded in the language of the field or to experiment with alternative approaches. This may be deployed by incorporating options into the environment that the learner chooses to follow: in an e-learning environment about

'physics', for example, the designer may incorporate activities that use a prescribed approach (based on the language of the discipline) or to experiment with other perspectives that have a more subjective appeal (e.g. watching a clip and then reflecting about being a practitioner in the field).

Step 4: Explain the background of the field

In Step 4, the designer develops an explanatory section contextualising the field of study related to the topic or content of the environment. That is, the designer develops a section explaining what the field is about, why people do the work developed in this field, examples of activities performed by the professionals in this field and so on. For example, in an e-learning environment about 'mathematics', such as the website 'mathletics' (2009), other aspects of the field may be made explicit, in addition to children's access to learning activities related to the acquisition of mathematical concepts (e.g. identifying shapes, patterns). Such a website could include an explanatory section about mathematics: What is mathematics? Why do people need mathematics? How people work with mathematics? This section aims at helping the learner to develop an understanding of the field. The section does not need to be extensive, and can include a summarised adapted version of findings from Step 1. The designer may use headings such as 'what', 'why', 'how' and 'reflect' to define the content of this explanatory session.

Step 5: Where to go from here

E-learning environments should also always contain guidance on where learners can acquire more information on the subject with links to relevant theories in the field (if the language of a discipline emphasises the epistemic relation), professionals in the field (if emphasising the social relation) as well as professional associations or institutions within the field.

The five steps or guidelines described above are based on the approaches used in the development, implementation and evaluation of Design Studio (Chapter 6). Design Studio incorporates social realist approaches into its framework by allowing the manipulation of the way the learning experience may take place (pacing, selection and sequencing), allocating different possibilities and choices for the learner in the ways instructions are expressed. At the same time that Design Studio offered support for a learning experience in design, the system

was also used as a test bed to analyse Year 10 students' perceptions of the design field. Year 10 participants appear to recognise the disciplines in the study characterised as the same codes of specialisation from research findings in Phase 2 of this research (Chapter 4 and 5). These learners, however, were not able to articulate reasons for their choices explicitly, thus, it was not clear whether they recognise tacit 'rules of the game' within the disciplines. Thus, the results suggest that Year 10 participants were likely to 'enact' the language of the design disciplines in a somewhat 'intuitive' manner. Overall, these visitors reported insights into new ways of considering the museum collection by examining the objects displayed in an exhibition 'with a purpose' (Chapter 7).

The setting for the design experience with Design Studio, the museum context, is also viewed as a pedagogical context (Bernstein, 2000), and thus similarly to formal contexts for education, museums of design are not neutral. These settings are social learning contexts (Grek, 2007), often reproducing values as established within a field. For example, analysis of interviews with museum staff in this study considered that curatorial decisions take into account the language of the disciplines, including design bodies as stakeholders or sponsors of a particular design exhibition or event. Although museum displays may be seen as an expression of the values of a discipline, museums do not seem to orient visitors into how the field valorises that particular object as valuable. The museum learning experience supported by Design Studio, offered museum visitors an opportunity to think about, inquire about and experiment with the language of the design field by considering what is involved in the design of an object, which is grounded in the language of the field.

8.3 Limitations of this Study and Future Research

Methodological limitations of this study relate to the development of instruments to effectively measure the epistemic or social relation emphasis as proposed by the LCT(Specialisation) model. In particular, the elite code, containing both an epistemic and a social emphasis, was a more complex code to satisfy. Theoretically, the epistemic and social emphases are intended to be 'equally' existent in the elite code, but, as discussed in this thesis, quantifying perceptions is an abstract concept, and only trends can be reflected (Chapter 5). There is a methodological

question of how much is 'enough' to qualify as a 'comparable emphasis'. For example would 60% epistemic and 40% social still classify as an elite code or as a knowledge code? Quantifying and measuring the 'equal emphasis' on both the epistemic and social relation requires the establishment of a threshold. Unfortunately, the theoretical model does not provide tools to clarify what a reasonable threshold would be, or in other words, what would correspond to a 'comparable emphasis'. Further studies related to this research may focus on developing research tools based on the Controlled Vocabulary List to explore the quantity and frequency of terms used to characterise disciplines as elite code. For example, further examination of the use of the Controlled Vocabulary List amongst other disciplines characterised as elite code could prove fruitful.

Another limitation of this research is that the design field encompasses many other disciplines besides engineering, architecture, digital media and fashion, which were not addressed. This was a necessary step to narrow the scope of the project. Other design disciplines might express their values under different specialisation codes, which were not part of the discussion in this thesis. Future research in this area could extend the model proposed in this research, and provide a more complete picture of the valorisation of knowledge in the field. It may be of particular importance to prioritise future studies to those disciplines of design that are likely to have a greater impact on the future of modern society, such as sustainable design.

In addition, this research mainly focused on designers' perceptions of the basis for legitimate knowledge and knowers, rather than on design curricula, design objects or institutional bodies representing or expressing design knowledge. A complementary development of this research would therefore include an emphasis on a knowledge-oriented methodology, for example by analysing design curricula including lectures and assessment instruments, within engineering, architecture, digital media and fashion. Future research may apply Legitimation Code Theory to examine written (e.g. descriptions of units of study) and spoken (e.g. lecture transcripts) language, focusing on the particular ways language may be expressed within a field. A similar instrument to the Controlled Vocabulary List can be developed and tailored to the analysis of terms and meanings used in descriptions of units of study. This research draws on one dimension of the 'legitimation device', Specialisation. However, four other dimensions are also

part of Legitimation Code Theory: Autonomy, Density, Temporality and Semantics (Maton, 2005, 2009). These different dimensions of the device offer insights into different aspects of intellectual and educational fields. By bringing these other dimensions into the examination of the design field, other perspectives will be added into the model proposed by this research. Semantics, for example, explores ideas of segmented and/or cumulative building of knowledge within fields (Maton 2009), and could be used to understand differences in the expressions of the 'design language' and its implications within design curricula and pedagogy.

This research identified the design field as characterised by a variety of legitimation codes of specialisation. A comparative analysis between design and other fields may shed further light on design and may also extend the theoretical concepts. In particular, it is worth considering how disciplinary fields with multiple operating LCT(Specialisation) codes, negotiate the various claims for legitimacy within their collaborative practices. In psychology, for example, similar to design, a range of disciplines forms the field, such as health psychology, educational psychology, forensic psychology, organisational psychology or clinical psychology and others. Within each of those, sub-orientations may exist, such as a cognitive, systemic or an analytical approaches. The field is constantly expanding and newer specialist areas are emerging, such as media psychology, political psychology or sports psychology. The psychology field also often relates to other fields, such as education, business, law or psychiatry. An analysis of the forms of knowledge valorised in psychology, may show, as in design, that different disciplines emphasise the epistemic or social relation differently. For example, some disciplines may privilege a more subjective approach and others a objective way of understanding people, their behaviours, and mind. Parallels may be hypothesised between the ways specialisation codes are expressed within the field of design and the way it may be in other fields, such as in psychology. Legitimation Code Theory is already being used to explore the nature of knowledge within different intellectual and educational fields, such as nursing and music (McNamara, 2009; Lamont & Maton, 2008, 2010). A parallel comparison between design and other fields may provide insights into how fields that accommodate multiple operating codes under a common umbrella, are likely to position themselves, and the effects of multiple co-existing codes in the field's knowledge and practices. Such understanding may, for example, contribute to devising pedagogical strategies relating to teaching and learning within multi-disciplinary fields.

Another limitation of this research is that Design Studio is one example of a social realist perspective that can be brought into the development of computer-supported learning environments. Future research in this area may use Legitimation Code Theory dimensions such as Specialisation, for example, to aid instructional designers to write a design pattern for educational e-learning environments. The guidelines proposed in this research (Section 8.2.3) can form the foundations for a design pattern to support learners in understanding what is considered legitimate practices and knowledge within a field.

Moreover, the informal learning character and setting of the design experience did not allow for a formal evaluation to be conducted, and therefore it was not possible to assess what exactly participants learned as a result of their interactions with Design Studio. Only a limited evaluation of Design Studio was carried out based on participants' perceptions of their experience. Further research in the field may adapt the content of Design Studio to develop an e-learning environment to be implemented within a formal educational setting. The more controlled setting may be more conducive for the measurement and evaluation of learning outcomes derived from interactions with an e-learning environment that embeds social realist principles.

In addition, Design Studio offers only one example of a way to support museum visitors in their investigations about a field, but other ways of exploring the links between the object and the valorisation of knowledge within a discipline should be explored. Further research in the field may examine alternative ways to offer visitors opportunities to explore how fields decide the significance of objects as symbols to express their disciplinary value. For example, researchers may explore and adapt the guidelines in Section 8.2.3 to develop exhibitions, seminars or guided learning visits, thus bringing a social realist perspective into discussions on the topic to lay audiences. In doing so, museums will be exploring ways of incorporating a sociological perspective into their educational roles.

8.4 Conclusion

In this research, a systematic approach to understanding the basis of achievement in the field of design revealed that engineering, architecture, digital media and fashion are disciplines of design characterised by different legitimation codes of specialisation. The research examined

design knowledge within the practices and contexts of its production to identify how designers recognise and realise legitimate knowledge and legitimate knowers. The research expanded the debates within the design field shifting the discussions from the surface level of what displays of knowledge distinguish the design disciplines (e.g. empirical evidence, first-person accounts) towards a deeper understanding of what constitutes valuable design activities and the form of knowledge required to undertake them. The nature of the specialist knowledge often differs, within the various design disciplines, yet the field still holds its main identity as the 'design field', simultaneously accommodating different measures of achievement. Clashes do exist, with important implications for design professionals, design education and lay audiences. The conceptualisation of how knowledge and knowers are specialised within design may lay the foundations to address problems related to the production and reproduction of knowledge within a field that is characterised by multiple specialisation codes, in particular, within its teaching and learning.

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Research Study

SOCIOLOGY OF LEARNING IN DESIGN

Interviews (Protocol Questions)

Part 1 – Personal Background

a. What year were you born? _____

b. Sex:
[ ] female
[ ] male

c. Where were you born? _____

d. How long have you been living in Australia? _____

e. Highest University qualification (if applicable):
[ ] Not applicable
[ ] Bachelors
[ ] Post Grad. Cert.
[ ] Post Grad. Dip.
[ ] Honours
[ ] Masters
[ ] PhD

f. What is the title of your degree? (e.g. MSc in Educational Psychology)_____

g. What is your present position? _____

h. How many years have you been working in this field? _____

i. How many years have you been at your current job? _____

j. Do you see your socio-economic background as being:
[ ] disadvantaged
[ ] middle class
[ ] wealthy

Interview Questions

1. Has your family's background influenced your career's choice? Please explain.

2. Has your family's background influenced your career's success?

Part 2 – Design Field

3. How would you describe your design discipline to someone that is new to the field?

4. What would be the most important information a new person entering your discipline should know about working in the field? What should a new person entering your discipline do prior to entering the field?

5. How do new ideas flow into your field? How does new knowledge come into being generated in your design discipline?

6. How do new ideas get to be accepted or incorporated (legitimized) into your discipline?

7. Would you say that ideas generated within other disciplines or fields are easily accepted into your discipline?

8. Do you collaborate with others from related disciplines? What strategies do you use to make this a successful collaboration? Would these strategies be different if the collaboration only involved people from your own discipline?

9. How would you describe other design disciplines (engineering, architecture, digital media and fashion)? What are the differences between these design disciplines?

10. Can you tell me three words that define your field?

Part 3 – Designers

11. When you started to work/ thought about working as a designer, what did you think was needed to become a designer?

12. How would you describe a designer? What are the essential characteristics that a designer must have? What qualities do you look for on a prospective employee/partner? What qualities a student who is considering studying your field should have?

13. Do you think the image of a designer that you have just described has changed overtime? How was this image when you started as a new designer?

14. In your view, what would be the difference between a designer and a great designer? How do you identify a great designer? How does your discipline determine who a great designer is?

15. Do you think the characteristics needed for a designer in your discipline are the same needed in other design disciplines (e.g. engineering, architecture, digital media, fashion design)?

16. Do you think being a designer in your field is the same as in other related design disciplines (engineering, architecture, digital media and fashion design)?

Part 4 – Strategies related to design practices and work

17. What are the characteristics of an interesting, original, valid, genuine work in your discipline? Can you give me an example?

18. What is the most interesting piece of work in your discipline? What makes this a great piece of work?

19. How do you evaluate your own work?

20. How do you evaluate the practice of other designers?

21. Do you think you would use similar strategies to identify a great designer in other design disciplines? (e.g. engineering, architecture, digital media, fashion design?)

22. How do you keep up to date with what is going on your field? (Do you often read specific magazines, attend specific venues, network with colleagues?)

23. Consider what strategies and tactics you use in order to recognize genuine working practices in your discipline. Read the statements below and then please place a tick on how often you would usually do each of them.

In my working practice I…	**Frequently**	**Occasionally**	**Not Sure**	**Rarely**	**Never**
…consult scientific journals.					
…participate in conferences.					
…read a professional magazine.					
…visit local museums, galleries.					
…attend specific venues (e.g. Design 2006).					
…I use experiences acquired when I was traveling abroad.					
…have a mentor.					
…talk to colleagues/peers.					
…talk to others from related fields.					
…get an outside perspective by talking to friends and others.					
… surf on the net for what is going on in my field around the world.					
…read technical books on the subject.					
… read about the life and work of successful professionals.					
…do a self examination/evaluation.					
…write a list of ideas of things to do/work on.					
…try to devise goals and follow a plan.					
...do self assessment/monitoring of my achievements and goals.					
… reflect on my own processes and practice.					
…try to maintain a happy working environment with others.					
	Frequently	**Occasionally**	**Not Sure**	**Rarely**	**Never**

In my working practice I…					
… respect and pay attention to what others say and do.					
…try to solve arguments/misunderstandings as soon as they arise.					
…compliment people's good performances and contributions.					
…try to include own motivations and interests in my practice.					
…try to maintain an emotionally safe working environment.					
… try to keep an open mind to new and different ideas.					
…belong to a discussion forum.					
…try to work collaboratively with colleagues from same discipline.					
…try to work collaboratively with others from different disciplines.					

24. Please consider the importance of the following statements to each design discipline (engineering, architecture, digital media, fashion):

In your opinion how important are the following for being good at	**Not at all important**	**Not very important**	**Quite important**	**Very important**
1. Engineering Design				
Skills, techniques and specialist knowledge				
Natural born talent				
Taste, judgment or a developed 'feel' for it				
2. Architecture Design				
Skills, techniques and specialist knowledge				
Natural born talent				
Taste, judgment or a developed 'feel' for it				

In your opinion how important are the following for being good at **3. Digital Media Design**	**Not at all important**	**Not very important**	**Quite important**	**Very important**
Skills, techniques and specialist knowledge				
Natural born talent				
Taste, judgment or a developed 'feel' for it				
4. Fashion Design				
Skills, techniques and specialist knowledge				
Natural born talent				
Taste, judgment or a developed 'feel' for it				

Sociology of learning in design

1. Sociology of Learning in Design

PARTICIPANT INFORMATION STATEMENT

(1) What is the study about?
The title of this study is Sociology of Learning in Design. The study explores how those who are new to the design field learn about this specialized knowledge, within an informal environment. The research will identify strategies and tactics used by new designers, in their informal and collaborative exchange to learn in/about engineering, architecture, digital media and fashion design. It will then identify ways of supporting those strategies within an ICT-mediated learning environment.

(2) Who is carrying out the study?
The study is being conducted by Lucila Carvalho and will form the basis for her degree of PhD in Architecture at The University of Sydney under the supervision of Dr. Andy Dong, Key Centre of Design Computing and Cognition, Faculty of Architecture.

(3) What does the study involve?
This survey is asking general views of the design field. You will just need to access the online website (by clicking the button below) and fill the information as requested.

(4) How much time will the study take?
It will take you around 10 to 15 minutes.

(5) Will anyone else know the results?
The results of these studies and the survey may be published in reports and professional conferences. In any use of the data generated in this study, you will not be identified. No use of the material obtained during the study will make your identification possible. All interview and survey data will be destroyed seven years after the conclusion of the study.

(6) What if I require further information?
When you have read this information, you may wish to contact Lucila Carvalho and discuss it further and she will be happy to answer any questions you may have. If you would like to know more at any stage, please feel free to contact Dr Andy Dong at the University of Sydney.

If you have any questions about this project, please contact either of the researchers:
Lucila Carvalho – PhD Student
Tel: (02) 9351 2053; Fax: (02) 9351 3031; E-mail: lucila.carvalho@student.usyd.edu.au
Dr Andy Dong – Research Supervisor
Tel: (02) 9351 4766; Fax: (02) 9351 3031; E-mail: adong@arch.usyd.edu.au

Any person with concerns or complaints about the conduct of a research study can contact the Senior Ethics Officer, Ethics Administration, University of Sydney on (02) 9351 4811 (Telephone); (02) 9351 6706 (Facsimile) or gbriody@mail.usyd.edu.au (Email).
This information sheet is for you to keep

2. CONSENT

By clicking the NEXT button below I am giving my consent and I acknowledge that:

1. The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

2. I have read the Participant Information Statement and have been given the opportunity to discuss the information and my involvement in the project with the researcher/s.

3. I understand that I can withdraw from the study at any time, without affecting my relationship with the

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researcher(s) now or in the future.

4. I understand that my involvement is strictly confidential and no information about me will be used in any way that reveals my identity.

3. Background Information

Age:

Gender:

- ◯ Female
- ◯ Male

You were born in:

- ◯ Australia
- ◯ Other country (please specify)

4. Background Information (cont.)

Design disicpline that you belong to (please tick just one):

- ◯ Engineering
- ◯ Architecture
- ◯ Digital media
- ◯ Fashion

You are:

- ☐ Undergraduate student
- ☐ Postgraduate student
- ☐ Staff member

How many years have you been working and/or studying in this design discipline?

- ◯ Less than 5 years
- ◯ Between 5 and 10 years
- ◯ More than 11 years

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Do you see your socio-economic background as being:

- ◯ Disadvantaged
- ◯ Neither disadvantaged nor wealthy
- ◯ Wealthy

5. Perceptions of design disciplines

Consider what you know about engineering, architecture, digital media and fashion design, either from your work, study, family, friends or the media. Then please choose three words that you could use to describe these design disciplines.

You can write your own words or pick from the list through the drop down menu.

Engineering design is...

Choose 3 words from list: [ ] [ ] [ ]

Or write your own words:

[ ]

Architecture design is...

Choose 3 words from list: [ ] [ ] [ ]

Or write your own words:

[ ]

Digital media design is...

Choose 3 words from list: [ ] [ ] [ ]

Or write your own words:

[ ]

Fashion design is...

Choose 3 words from list: [ ] [ ] [ ]

Or write your own words:

[ ]

6. Perceptions of design disciplines (cont.)

In your opinion how important are the following for being good at:
(Please place a tick on the appropriate box)

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ENGINEERING design:

	Not at all	Not very	Quite	Very
Skills, techniques and specialist knowledge	◯	◯	◯	◯
Natural born talent	◯	◯	◯	◯
Taste, judgment or a developed 'feel' for it	◯	◯	◯	◯

ARCHITECTURE design:

	Not at all	Not very	Quite	Very
Skills, techniques and specialist knowledge	◯	◯	◯	◯
Natural born talent	◯	◯	◯	◯
Taste, judgment or a developed 'feel' for it	◯	◯	◯	◯

DIGITAL MEDIA design:

	Not at all	Not very	Quite	Very
Skills, techniques and specialist knowledge	◯	◯	◯	◯
Natural born talent	◯	◯	◯	◯
Taste, judgment or a developed 'feel' for it	◯	◯	◯	◯

FASHION design:

	Not at all	Not very	Quite	Very
Skills, techniques and specialist knowledge	◯	◯	◯	◯
Natural born talent	◯	◯	◯	◯
Taste, judgment or a developed 'feel' for it	◯	◯	◯	◯

7. Perceptions of designers

Consider the designers you have met either from your work, study, family, friends or the media. Then please choose three words that you could use to characterize engineers, architects, digital media designers and fashion designers.

You can choose your own words or pick from the list through the drop down menu.

An engineering designer is...

Choose 3 words from list: [ ] [ ] [ ]

Or write your own words:

[ ]

An architecture designer is...

Choose 3 words from list: [ ] [ ] [ ]

Or write your own words:

[ ]

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A digital media designer is...

Choose 3 words from list:

Or write your own words:

A fashion designer is...

Choose 3 words from list:

Or write your own words:

8. Perceptions of designers (cont.)

The statements below relate to fictitious people. Please tick the box that you think correspond to the design profession the person might work in (you can tick as many boxes as you wish):

This profile most sounds like a person who might work in...

	Engineering	Architecture	Digital Media	Fashion Design
When N. has a problem at work, s/he prefers to search for a solution in a book or by searching the net.	☐	☐	☐	☐
G. is a knowledgeable person. His/her favorite pass time is reading scientific magazines.	☐	☐	☐	☐
H. is a very practical down to earth sort of person. This is always reflected in her/his work practice.	☐	☐	☐	☐
D. loves solving puzzles. The harder the puzzle, the better it is for her/him. Problem solving skills are very much needed in the type of work s/he does.	☐	☐	☐	☐
E. really understands other people's feelings. S/he can easily put her/himself in other people's shoes.	☐	☐	☐	☐
F. is a gifted person, born with special talent to do what s/he does.	☐	☐	☐	☐
K.'s parents are highly educated. S/he grew up knowing that one day s/he would be doing an university degree and be a professional her/himself.	☐	☐	☐	☐
L. is a highly skilled person who has developed skills by studying and working really hard.	☐	☐	☐	☐
B. is always reading. S/he even reads manuals of any new product s/he acquires.	☐	☐	☐	☐
A. has traveled a lot and this traveling experience is reflected in her/his work.	☐	☐	☐	☐
I. recognizes the value of beauty. In her/his profession one certainly needs a great sense of taste.	☐	☐	☐	☐
J. is a very technical and methodical person. That is why s/he chose this sort of work.	☐	☐	☐	☐
M. is a sensitive person and knows when her/his work is completed because it just feels right.	☐	☐	☐	☐
C. loves talking to people and is a master of social networking. S/he is always invited to parties.	☐	☐	☐	☐

9. Strategies related to design practices and work

Read the statements below and then please place a tick on the box that better describes how these statements apply to designers in YOUR design discipline.

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Designers in my discipline...

	Always	Frequently	Not sure	Rarely	Never
...belong to a discussion forum to maintain a social network with people who have similar interests.	◯	◯	◯	◯	◯
...develop an 'eye' for the job, through work experience.	◯	◯	◯	◯	◯
...consult scientific journals.	◯	◯	◯	◯	◯
...talk to colleagues/peers about work related matters.	◯	◯	◯	◯	◯
...design to solve problems that are currently confronted by contemporary society.	◯	◯	◯	◯	◯
...belong to a discussion forum to have access to ideas in the field.	◯	◯	◯	◯	◯
...socialize with colleagues and peers.	◯	◯	◯	◯	◯
...read technical literature/books on the subject.	◯	◯	◯	◯	◯
...talk to people from related fields about work matters.	◯	◯	◯	◯	◯
...express their feelings through their design work.	◯	◯	◯	◯	◯
...read a professional magazine.	◯	◯	◯	◯	◯
...reproduce their refined judgment in their design work.	◯	◯	◯	◯	◯
...read about the life of successful professionals in their disciplines.	◯	◯	◯	◯	◯
...follow methodical procedures in their design practices.	◯	◯	◯	◯	◯
...surf the net for what is going on in the design field around the world.	◯	◯	◯	◯	◯
...expose who they are through their work.	◯	◯	◯	◯	◯
...participate in conferences to maintain a social network with colleagues.	◯	◯	◯	◯	◯
...draw on personal experiences (e.g. watching a film, talking to friends) to get inspiration for their design work.	◯	◯	◯	◯	◯
...visit local museums and galleries to refine their taste and appreciate other designers' ideas or work.	◯	◯	◯	◯	◯
...base their work in devising goals and following a plan.	◯	◯	◯	◯	◯
...develop skills by reading about cutting edge work developed in the field, and/or participating in training courses and workshops.	◯	◯	◯	◯	◯
...visit local museums and galleries to be informed of other designers' ideas or work.	◯	◯	◯	◯	◯
...keep an open mind to new and different ideas.	◯	◯	◯	◯	◯
...participate in conferences to listen to new ideas in the field.	◯	◯	◯	◯	◯
...reflect characteristics of their personal background (e.g. being from certain culture or gender) in their design work.	◯	◯	◯	◯	◯
...use of empathy in their design work.	◯	◯	◯	◯	◯
...reveal issues confronted by their culture in their work.	◯	◯	◯	◯	◯

10. Your strategies or comments

Are there any strategies or comments you would like to add?

Pilot Study 1 List

Architecture	Engineering	Digital Media	Fashion	Positive	Negative
Beautiful Elegant Powerful Outstanding Elaborated Elite Snobby	Brainy Difficult Clever Technical Old-fashioned Essential Methodical Scientific	Crazy Creative Contemporary Innovative Modern Solitary Privileged	Adorable Artistic Exciting Glamorous Social Fancy Stimulating	Curious Different Important Superior Unusual	Average Boring Impossible Sleepy Stupid Grotesque Dull
Adorable, Artistic, Average, Boring, Beautiful, Brainy, Crazy, Clever, Contemporary, Creative, Curious, Different, Difficult, Dull, Elaborated, Elegant, Elite, Essential, Exciting, Fancy, Glamorous, Grotesque, Important, Impossible, Influential, Innovative, Methodical, Modern, Old-fashioned, Outstanding, Powerful, Privileged, Procedural, Scientific, Sleepy, Snobby, Social, Solitary, Stimulating, Stupid, Superior, Technical, Unusual					

Knowledge	Knower	Elite	Relativist
Brainy Clever Difficult Methodical Procedural Scientific Technical	Artistic Beautiful Creative Elegant Exciting Fancy Glamorous Influential Social	Artistic Brainy Clever Elegant Elite Exciting Fancy Glamorous Influential Outstanding Powerful Privileged Snobby Superior	**Neutral** Average Contemporary Modern Unusual **Positive** Adorable Curious Different Important Unusual **Negative** Boring Impossible Sleepy Stupid Grotesque Dull
Adorable, Artistic, Average, Boring, Beautiful, Brainy, Crazy, Clever, Contemporary, Creative, Curious, Different, Difficult, Dull, Elaborated, Elegant, Elite, Essential, Exciting, Fancy, Glamorous, Grotesque, Important, Impossible, Influential, Innovative, Methodical, Modern, Old-fashioned, Outstanding, Powerful, Privileged, Procedural, Scientific, Sleepy, Snobby, Social, Solitary, Stimulating, Stupid, Superior, Technical, Unusual			

Final list: Adorable, Artistic, Average, Boring, Beautiful, Brainy, Crazy, Clever, Contemporary, Creative, Curious, Different, Difficult, Driven by knowledge, Driven by natural talent, Driven by taste, Dull, Elaborated, Elegant, Elite, Essential, Glamorous, Grotesque, Important, Impossible, Individual, Influential, Innovative, Methodical, Modern, Objective, Old-fashioned, Outstanding, Partial, Powerful, Privileged, Procedural, Relative, Scientific, Sleepy, Snobby, Social, Solitary, Standard, Stupid, Subjective, Superior, Technical, Unusual

Pilot Study 2 List

Please read the list of adjectives and expressions below. Then choose where to place each adjective/expression from the list following the descriptions of each category. You may use the same adjective/expression on more than one category. Space is provided for you to add your own adjectives if you wish.

1. Adorable,
2. Artistic,
3. Average,
4. Boring,
5. Beautiful,
6. Brainy,
7. Crazy,
8. Clever,
9. Contemporary,
10. Creative,
11. Curious,
12. Different,
13. Difficult,
14. Driven by knowledge
15. Driven by natural talent
16. Driven by taste
17. Dull,
18. Elaborated,
19. Elegant,
20. Elite,
21. Essential,
22. Exciting,
23. Fancy,
24. Fun,
25. Forward-thinking,
26. Glamorous,
27. Great,
28. Grotesque,
29. Important,
30. Impossible,
31. Individual
32. Influential,
33. Innovative,
34. Interesting
35. Methodical,
36. Modern,
37. Objective
38. Old-fashioned,
39. Outstanding,
40. Partial
41. Powerful,
42. Privileged,
43. Procedural,
44. Relative
45. Scientific,
46. Sleepy,
47. Snobby,
48. Social,
49. Solitary,
50. Standard,
51. Stimulating,
52. Stupid,
53. Superior,
54. Technical,
55. Unusual

	List here adjectives/expressions that could be used to describe a discipline that emphasizes technical content, skills and/or techniques.	**List here adjectives/expressions that could be used to describe a discipline that emphasizes personal or social dispositions, aptitudes and attitudes.**	**List here adjectives/expressions that could be used to describe a discipline that do not emphasize technical content, skills nor social dispositions, aptitudes and attitudes. These adjectives might describe a discipline in a neutral, positive or negative way.**
Complete here with adjectives from the list			**Neutral**
			Positive
			Negative
Use this space for your own adjectives.			

Pilot Study 3

Instructions:

Think of jobs in which skills, techniques and specialist knowledge are REALLY important, in order to be successful at the job.

Now, I want you to think about jobs in which personality or the person's background are REALLY important, in order to be successful at the job.

In this exercise, I ask you to read the words in the flashcards and decide whether you associate these words with a job in which skills, techniques and specialist knowledge are really important, or whether you associate the word with a job in which the personality or the person's background are really important. Or whether you could associate the word with both of them, or neither of them.

Don't think too hard, just go with your gut feeling, and place the word under each heading.

Instructions 2:

Now think about the professional that works in the jobs in which skills, techniques and specialist knowledge are REALLY important, in order to be successful at the job.

And again think about the professional that works on the jobs in which personality or the person's background are REALLY important, in order to be successful at the job.

In this exercise, I ask you to read the words in the flashcards and decide whether you associate these words with a person who works in the job in which skills, techniques and specialist knowledge are really important, or whether you associate the word with a person who works in a job in which the personality or the person's background are really important. Or whether you could associate the word with both of them, or neither of them.

Again, don't think too much, just go with your gut feeling, and place the word under each heading.

Screenplay

By

Lucila Carvalho

INTRODUCTION TO DESIGN EXPERIENCE

Hello and welcome to “Design Studio”!

There are many ways designers think about design, and different strategies designers use in their practices. Here we will help you to have a little go at being a designer. We will help you to think about what is involved in designing an object, and what strategies you can use to check whether your design thinking is well rounded.

Before you start you need to choose: what type of design adviser you would find more helpful, how often you would like to be helped, and what sort of object you want to design!...

Click here and one adviser will be assigned to you, depending on what type of object you would like to design.

CHOOSE AN OBJECT TO DESIGN

First, think about what sort of object you would like to design. Then click on your choice...

CHOOSE GENDER

Now, click on one of the figures below to choose your design adviser.

CHOOSE A CHARACTER

Roll your mouse over one of the advisers on the bottom left of the page and click on each adviser to hear about them. Click on the “?” sign if you are not sure of what character would best help you and we will help you to choose.

INTRODUCING ROGER/RACHEL RULES

Hi, my name is Roger!

I believe there is always a right way of doing things. I am a very practical kind of guy! I don’t like too much talking, I usually go straight to the point... but I will be very happy in helping you out to find the best solution for your design questions.

People say I am very clever and skillful, but my brilliant ideas just come out of being methodical and careful in designing, and of course being interested in stuff and

(CONTINUED)

reading a lot. There is a lot of knowledge developed in design, so if you just follow the rules and procedures that have been tried and tested you are guaranteed to be successful.

I like doing puzzles, crosswords, following manuals and instructions, reading scientific magazines.
I don’t really like “creative” stuff, big parties, and people who talk about "feelings" all the time.

You can choose the way I will guide you through out your design experience by clicking in one of the options, or you can go back to hear about the other characters. Click on the last button if you want to go through the design experience with no advice.
If you choose Option 1, I will go with you in detail about how to approach the design process.
If you choose Option 2, I will briefly explain the design process, and if you need more advice, I will still be around.
And if you choose Option 3 you will go directly to the design experience, and go through the design process with no tips or advice from any designers.

If you are not sure, you can choose to go back to listen and choose another designer.

INTRODUCING CHRIS CREATIVE

Hi, my name is Chris!

I believe the basis to good design is on one’s own creativity and personal expression. Each design piece says something about the person who creates it. There is not a set way of doing things and I definitely don’t believe in rules. The best way to learn design is from a master/apprentice sort of relationship, which means “learn by doing” rather than from a book. I like chatting and exchanging ideas with others so I will happily share my ideas about design with you. I think that if you want to be a good designer, you will need to use your own intuition and develop a certain “eye” for it. I will guide you through ways you can get that.

I love brainstorming ideas, creative things, looking at beautiful art, talking to talented people. I don’t like following rules, technical stuff and methodical people.

You can choose the way I will guide you through out your design experience by clicking in one of the options, or you can go back to hear about the other characters. Click on the last button if you want to go through the design experience with no advice.

(CONTINUED)

If you click on Option 1, I will go with you in detail about how to approach the design process.

If you click on Option 2, I will briefly explain the design process, and if you need more advice, I will still be around.

If you click on Option 3 you will go go back to choose another designer.

And if you click on Option 4 you will go directly to the design experience, and go through design process with no tips or advice from any designers.

INTRODUCING ALEX ALL

Hi, my name is Alex!

I believe a good designer needs to follow a process with specific procedures. BUT at the same time the designer also needs to put him/herself into their work. Basically you need a combination of great sensibility with a refined eye for designing, as well as skills and technical knowledge. My friends say I am a privileged person because I can successfully mix knowledge and talent within my design practice. I think that to be a good designer you will need to learn how to use your personal abilities and intuition in addition to skills and knowledge. But only a few people can do this successfully. Are you one of them? I will help you to figure out how you can best do that!

I love scientific programs about the universe or the human body, creative art, going to the cinema to watch foreign and independent films. I don’t like anything average, or common place.

You can choose the way I will guide you through out your design experience by clicking in one of the options, or you can go back to hear about the other advisers. Click on the last button if you want to go through the design experience with no advice.

If you click on Option 1, I will go with you in detail about how to approach the design process.

If you click on Option 2, I will briefly explain the design process, and if you need more advice, I will still be around.

If you click on Option 3 you will go go back to choose another designer.

And if you click on Option 4 you will go directly to the design experience, and go through design process with no tips or advice from any designers.

INTRODUCING NICK NEUTRAL

Hi, my name is Nick!

I am what you would call an "average common guy"! I got into design because I was curious about innovative stuff. I quickly picked up some design skills and knowledge without too much effort. I believe anyone can effectively do the type of design work I do, because nothing really special is needed. My work is no different from the work other people do. I am a simple guy and enjoy simple good things in life. I like electronic gadgets, watching sports, going to the beach and spending time with my friends. I don’t like philosophy, too many rules, people that are too sensitive or nerds.

You can choose the way I will guide you through out your design experience by clicking in one of the options, or you can go back to hear about the other characters. Click on the last button if you want to go through the design experience with no advice.

If you click on Option 1, I will go with you in detail about how to approach the design process.

If you click on Option 2, I will briefly explain the design process, and if you need more advice, I will still be around.

If you click on Option 3 you will go go back to choose another designer.

And if you click on Option 4 you will go directly to the design experience, and go through design process with no tips or advice from any designers.

NOT SURE WHICH ADVISER TO CHOOSE?

CHOOSE WHERE TO START THE DESIGN EXPERIENCE (ALL ADVISORS)

Design involves figuring out ways of transforming knowledge and ideas into an object or product.

The design process is not always straight forward or simple, but often starts with designers trying to understand the design problem. Based on their understanding of the

(CONTINUED)

problem designers will come up with a plan, and develop a concept, to then produce a preliminary design of an object. This preliminary design will often change and be re-worked many times.

This means that designing may involve a cycle of understanding the problem, planning, developing the concept many times, before the actual design of the final product is achieved.

Here, you can choose to start your design experience at different phases of a design cycle. Choose where you would like to start your design experience:

Click on Option 1 - if you want to start on "Understanding the design problem"
Click on Option 2 - if you want to start on "Coming up with a plan"
Click on Option 3 - if you want to start on "Developing the concept"
Click on Option 4 - if you want to be guided on your choice.

UNDERSTANDING THE DESIGN PROBLEM (ROGER RULES)

Great! Lets start the design of the OBJECT!

First, think about all the objectives you want your OBJECT to meet. What do you want your OBJECT to do?
What it will look like? Who will it appeal to?

In this task you will need to list questions that you think are important and related to the design of the OBJECT. First you will consider what should be taken into account in the design of the OBJECT. In this step you need to open your mind and list as many things as you can think of.

Types of questions that you may ask:
Who is going to use the OBJECT?
When is the OBJECT going to be used?
Where is the OBJECT going to be used?
What is the purpose of the OBJECT?
How is this OBJECT going to be used?
How do people usually use a similar OBJECT?
What sort of material can I use?

At the end of this task you will need to come up with a list of questions. Write your questions in the space provided in the screen.

You will need these questions for the next phase of your design experience.

UNDERSTANDING THE DESIGN PROBLEM - WHAT? (ROGER RULES)

What is the “Understanding the design problem” task?

In "Understanding the design problem" you will write down a number of questions that you think would be relevant to the particular object you chose to design.

There are a number of factors designers need to take into account, when first thinking about the OBJECT they are going to design. As in a standard design practice, you must consider what might affect the product, objectives or characteristics of the OBJECT that you can change, and what could be affected by these changes.

As an example, let’s say you were designing a house. You might ask yourself:

1) What is this building for?
Is this a house for a family, an office, a school?
If this is a house for a family, how big is this family? How many rooms does the house need to have to accommodate all in the family? Could some of the children share a bedroom?

2)How is this building going to be used?
Is this a holiday house, or a house that people will be living in everyday?
Does the family often have visitors?
Does the family like having parties?

3) Where is the building located?
Is this a beach place or in the countryside? How is the climate in the region? Does it rain a lot? Snow? Is it a tropical place?

All these factors may affect the design of a house. In the same way, there are a number of factors that may affect the design of your OBJECT.

So think about factors that may affect the design of your OBJECT, and write down questions that would be relevant for the specific object you are designing.

UNDERSTANDING THE DESIGN PROBLEM - HOW? (ROGER RULES)

How to do the "Understanding the design problem" task?

Designers must always be aware of standard practices in their field. They need to keep up to date with what is going on and they often do that by reading and researching the topic, and exchanging ideas with their peers. You might consider some of the strategies below helpful.

(CONTINUED)

Strategies for finding objectives to consider:

Ideas to ASK other people:
You could define a set of questions to ask other museum visitors or the teachers of your workshop. Make sure you ask the same question to at least 3 people, so you can see and compare how others may have different ideas. Record their answers in a notebook, and try to record as they talk, so you don’t forget what exactly they said.

If you were designing a house you may try to ask other museum visitors and your teachers, for example:
(a) What do you think might affect the design of a building?
(b) What can be changed in the design of a building?
(c) What would your ideal house look like?
(Click here to see a template for asking questions)

Ideas to RESEARCH the topic:
You may choose research what other designers have considered when designing your object. For example if you are designing a chair, it may be relevant to look at the different materials, shapes, heights index of the general population.

You can research for some designers’ opinions on what topics to consider when designing a chair. You can choose to look at some related professional magazines or perhaps do a search on Google images. Make sure you record the information you are gathering.
(Click here to see a template you could use in your research).

Ideas to look within the MUSEUM:
You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

(Click here to see a template of points to pay attention on the visit).

UNDERSTANDING THE DESIGN PROBLEM - WHY? (ROGER RULES)

Why to do the "Understanding the design problem" task?

By asking these questions you are narrowing down your "design problem". This will help you to define what exactly you are going to be working on, the characteristics that are going to be present in the object you are designing. In other words, you are starting to define your ideas of what your design is going to look like, how it will be made and how it works, by considering different aspects of the product, and by making choices.

UNDERSTANDING THE DESIGN TASK - REFLECT (ROGER RULES)

Reflecting on the way you performed this task is an important part of "Understanding the design problem" task.

Ask yourself:
Are the ideas I came up in my list related to the objectives?
Does my list report on obvious characteristics related to the objectives?
Have I been methodical in coming up with the characteristics in my list?
Have I checked whether others think my ideas are relevant?

COMING UP WITH A PLAN (ROGER RULES)

Here in the screen are important questions related to the design of your OBJECT. These questions express characteristics that you will work with in this "Coming up with a plan" task.

In this task you will need to think of which of the questions from your list really matter and why. You will select the questions you will be working with and think about how you would answer these questions.

In this way you are "coming up with a plan" for the design of the OBJECT you are working on. You are formulating what it will be important to consider and why it is important.

And also you are thinking of ways you could actually represent your ideas (and solve the problem) in your design of the OBJECT. This task will help you to think about:

(a) the goal (i.e. the "what" of your design problem)
(b) the purpose (i.e. the "why" of your design problem)
(c) the methods you will use or how you will represent your ideas (i.e. the "how" of your design problem)

At the end of this task you will need to sort the answers to your questions under the "what", "why" and "how" headings in the screen. You may have more than one response under each heading. At this point, just think about under which heading you would place each of your thoughts. Whether the question/answer relates to the goal of your OBJECT, the purpose of the OBJECT or the methods you will use in your design of your OBJECT?

Use the space provided to type in your ideas.

COMING UP WITH A PLAN - WHAT? (ROGER RULES)

What is the “coming up with a plan” task?

At the end of the "coming up with a plan" task you will have a list of the important things you decided you must consider in your design. These are important characteristics that you think might affect the design of the OBJECT, characteristics that you can change, and what could be affected by these changes.

For example:
You answered the question - What is this object for? - with:
This is a holiday house.
You answered the question - Where is this object? - with:
In a beach tropical place.
You answered the question - Who is going to use this object? - with:
This house is for a family of 4 (two adults and two children under five)
You answered the question - What do the users of this object like? - with:
They often enjoy having friends around, outdoor living, and day activities. They do not have pets.

So in this task you will choose to place your answers under the different headings. For example, in the "what" category you would have: "a family house".

Goal (what) - a family house
Purpose (why) - used for holidays
Method (how) - include outdoor spaces, tiled floor, barbecue area

Here are some other examples:
Goal (what) - a summer dress
Purpose (why) - to be used in summer/spring in everyday activities
Method (how) - will include floral patterns, cotton material, and will have no sleeves

Goal (what) - an animation character
Purpose (why) - to be used in a cartoon TV series.
Method (how) - include funny features (e.g. big nose, flower hat), bright colors appealing to children.

Goal (what) - a bridge
Purpose (why) - to transport people and cars from one side of a river to the other
Method (how) - use materials, such as concrete and iron, to cope with high weight.

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Here you are starting to be specific about what exactly is the "design problem" you are working on. You are narrowing down and making choices.

COMING UP WITH A PLAN - HOW (ROGER RULES)

How to do the "Coming up with a plan" task?

This task is about figuring out the characteristics of the OBJECT. Strategies for "Coming up with a plan":

Ideas to ASK other people:

Write a list of activities you think people do when in contact with the object you are designing. For instance if it is a holiday house, what activities would people like to do (e.g. barbecues, playing football in the garden, outdoor lunches)?

Then ask three different people (your teachers, friends, or museum visitors) whether they agree with these activities. How often would they do these? Which ones are more important or less important?

Or write down a list of characteristics of a holiday house (e.g. veranda, barbecue area, tiled floors, boat ramp, pool, air conditioning). Then ask three different people whether they agree with these characteristics? Which ones are more important or less important?

Ideas to RESEARCH the topic:
You may choose to have a look at what other similar objects looks like. If you are designing a house, you may look at some specialized magazines, go to an internet site that has holidays houses for rent. You can research for some designers’ opinions on what topics to consider when designing a holiday house.
Register the characteristics you find interesting.

Ideas to look within the MUSEUM:
You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

COMING UP WITH A PLAN - WHY? (ROGER RULES)

Why to do the “Coming up with a plan” task?

In "coming up with a plan" you are defining the characteristics that are going to be present on the product

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and why they are there. In this task you are making choices and thinking about the reasons why you are incorporating these characteristics in your design. You are starting to develop your design concept.

COMING UP WITH A PLAN - REFLECT (ROGER RULES)

Reflect on the way you performed this task
Ask yourself:
Do the ideas make sense?
Do the reasons I have stated for incorporating these ideas make sense and seem plausible?
Have you thought about what is your goal?
Have you thought about the “why” of your design? What is the purpose of your design?
Have you thought about the methods you will be using?
Or how you could represent your ideas?

DEVELOPING THE CONCEPT (ROGER RULES)

In the previous task you sorted out your design ideas under three headings: Goal (or “what”), Purpose (or “why”) and methods (or “how”). In the "developing the concept" task you will elaborate on these ideas and write the design brief.

The brief is a written summary which breaks down concepts and assign ways you could use to represent each aspect in your design. In your brief you will need to address:
(a) the specifications of your design (what are the objectives you selected to work with e.g. use your answers from the Goal, Purpose and/or Method headings, completed on the previous task)
(b) prioritize the objectives (select which objectives need to be worked on first)
(c) define ways you could represent them (state how you are applying your ideas to meet the objectives)

To complete this task you will use the ideas under each heading (Goal/Purpose/Method). At the end of this task you will have written a short paragraph about your design concept.

Complete each sentence (Specification, Prioritizing and Representation) in the screen:

Specifications (use your objectives - a paragraph format of what was under the three headings - Goal/Purpose/Method),

Prioritizing (use the specifications above, and select one or two characteristics, features or factors in your design

(CONTINUED)

that you consider as essential in your object),

Representation (elaborate about what in your design is representing the important characteristics/features/factors you chose in Prioritizing. State how your design will express your objectives and its implications).

DEVELOPING THE CONCEPT - WHAT? (ROGER RULES)

What is the "developing the concept" task?

The objective of this task is to break the concepts down and assign ways of representing each aspect into your design.

For example, if you were designing a house you may have determined that:

Goal (what) - a family house
Purpose (why) - used during holidays
Method (how) - include outdoor spaces, tiles, barbecue area

So in this task you will elaborate further these ideas, transforming these headings into a paragraph. For instance, choosing to design "a holiday house" may mean that the family won’t live their everyday life in the house, right? What are the implications of that? Will this affect your design, and influence on the size of the property? Or think about what areas of the property that can be larger or smaller? How does this may affect the choice of materials?

Here you will use your Goal/ Purpose/ Method, and write a little more about your design ideas. You will establish what concepts you are working with and imagine ways you could represent those:

Specifications - I AM DESIGNING A... holiday house in beach tropical place. House is for a family of 4 (two adults and two children under five). Family often enjoys having friends around.

Prioritizing - THE MOST IMPORTANT ASPECT OF THE OBJECT I AM DESIGNING IS THAT there are plenty of open spaces rather than enclosed ones. Although the children are young, the family will need room to grow. Also, space to have friends as they enjoy visitors.

Representation - Open spaces WILL BE REPRESENTED IN MY DESIGN BY USING/CONSIDERING or incorporating a balcony and by emphasizing open common areas, like larger living spaces or dinning spaces, places where the family and visitors

(CONTINUED)

might enjoy sometime together, and outside areas (e.g. garden or barbecue area). I will also include an extra closed “activity room”, which could become extra bedroom in future.

DEVELOPING THE CONCEPT - HOW? (ROGER RULES)

How to do the “Developing the concept” task?

Strategies for "Developing the concept":

Ideas to ASK other people:
Make a list/ or use your list (if done in previous task) of the characteristics of the object you are designing and reasons why these characteristic are there (e.g. a barbecue area, because people on holidays often have barbecues; or a veranda, because beach houses often possess an outside covered area where people can relax and be protected from the sun). Show others your list asking what they think of the goals you are working with and why? Ask whether they have suggestions for other ways you could represent an aspect of your object?

Ideas to RESEARCH the topic:
Use your list of the characteristics of the object you are designing and reasons why these characteristic are there. Check how other similar objects look like. In your list, tick on the characteristics that are often present in these similar objects. Check for different ways you could represent your ideas.

Ideas to look within the MUSEUM:
You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT)

DEVELOPING THE CONCEPT - WHY? (ROGER)

Why to do the “Developing the concept” task?

"Developing the concept" is about formulating how your design could meet the objectives.

The design brief ensures that important characteristics are considered and questioned before designing.

The design brief states the characteristics that are going to be present on your design, and it specifies why they are there, and how you are going to represent them. The design brief is expressing the choices you have made and gives reasons why you are incorporating certain characteristics in your design. The design brief defines possible ways to represent certain characteristics in your design.

The brief is often written in consultation with a client and provides a point of reference for both parties.

DEVELOPING THE CONCEPT - REFLECT (ROGER RULES)

Reflect on the way you performed this task

Ask yourself:

Have you come up with the specifications of your design (your design brief)?

Have you prioritized the objectives that you will be taking into account first and thought about why?

Have you analyzed different ways that you could represent them?

PRELIMINARY DESIGN (OR EMBODIMENT)(ROGER RULES)

Well, you are now ready to put your ideas in to practice! Here is a summary of the activities you went through, and your design briefing.

Your next step is to go to the 3-D software and try to represent your ideas.

Remember, however, that design is not a linear process. Designers may have to come back many times to further develop their conceptual ideas. You are welcome to comeback and re-do the activities.

Or just go on and give it a go!

UNDERSTANDING THE DESIGN PROBLEM (CHRIS CREATIVE)

Great! Lets start the design of the OBJECT!

In the early stages of their work, designers often think about the objectives they want their object to meet. For example, what do you want your OBJECT to do? What will it look like? Who will it appeal to?

In this task you will need to place yourself in the shoes of someone using the OBJECT and think how it would feel like. You need to brainstorm some ideas and come up with questions that you think are important and related to the design of the OBJECT. Try to consider what you should take into account in the design of the OBJECT. In this step you need to open your mind.

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Types of questions that you may ask:
Who is going to use the OBJECT?
When is the OBJECT going to be used?
Where is the OBJECT going to be used?
What is the purpose of the OBJECT?
How is this OBJECT going to be used?
How do people usually use a similar OBJECT?
What sort of material can I use?

At the end of this task you will need to come up with questions. Write your questions in the space provided. You will need them for the next phase of your design experience.

UNDERSTANDING THE DESIGN PROBLEM - WHAT? (CHRIS CREATIVE)

What is the “Understanding the design problem” task?

In "Understanding the design problem" you need to think of questions that would be relevant to the particular object you chose to design.

There are a number of factors designers need to take into account, when first thinking about the OBJECT they are going to design. As a designer you must consider what might affect the product, objectives or variables that you can change, and what could be affected by these changes.

As an example, let’s say you were designing a house. You might ask yourself:

1) What is this building for?
Is this a house for a family, an office, a school?
If this is a house for a family, how would the family feel at this house? Or just imagine the house is for your family. If you were living in this house, what characteristics would be important for you?

2)How is this building going to be used?
Is this a holiday house, or a house that people will be living in everyday?
What would you expect to see in a holiday house?
Would you like the idea of having visitors or guests?
Do you imagine yourself using the house for parties? What sort of activities do you see yourself doing in this house?

3) Where is the building located?
Is this a beach place or in the countryside? What do you expect from a beach house? Or a countryside house? Do you imagine yourself in a hot tropical place or on the snow?

(CONTINUED)

All these factors may affect the design of a house. In the same way, there are a number of factors that may affect the design of your OBJECT.

So reflect on characteristics that may affect the design of your OBJECT and think of questions that would be relevant for the specific object you are designing: "who will use your object?", "how will be used?", "where will be used?"

UNDERSTANDING THE DESIGN PROBLEM - HOW? (CHRIS CREATIVE)

How to do the "Understanding the design problem" task?

Designers often need to imagine how people would experience the object they are designing. Designers need to think about what feelings such an object would evoke. It is also important to consider that different people like different things and have different ideas. By talking to others and researching on the topic you can be reminded of things you didn’t think of. You might consider some of the strategies below helpful.

Strategies for finding objectives to consider:

Ideas to ASK other people:

If you are designing a house you could ask others for example, what style of houses do they like? What do they feel is important when designing a house? What do they like the most about their own houses?

Ask someone to close their eyes and think about their favorite house or building. Then, ask them to describe it to you, and what do they like about the place and why?

You may use of some brainstorming techniques and play a little game with someone. Here you say a word: "holiday house" and ask the person to say what their first thought is. Then you can explore with the person what is the meaning of their association. For example, if you say "holiday house", the first thing a person may say is "relaxing" or "hammock". So you can chat about in what ways this person may relax on holidays, and get some ideas to incorporate in your design.

You may try either asking about the object itself or ask for their views about some of the characteristics you may have thought about including in your design.

Ideas to RESEARCH the topic:

You may choose to have a look at what others have thought of when designing a house, for example how do they

(CONTINUED)

feel about or their preferences for different materials or shapes. You could do a google image search for "architecture" and see what you get.

You can research for some designers opinions on what topics to consider when designing. You could listen or read to interviews of designers:

http://www.powerhousemuseum.com/sydney2000games/interviews.php

http://www.designboom.com/interviews.html

Look at some podcasts and videos:

http://www.powerhousemuseum.com/whatson/videos_podcasts.asp

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

UNDERSTANDING THE DESIGN PROBLEM - WHY? (CHRIS CREATIVE)

Why to do the “Understanding the design problem” task?

By asking these questions you are narrowing down your “design problem”. This will help you to define what exactly you are going to be working on, the characteristics that are going to be present in the object you are designing. In other words, you are starting to define your ideas of what your design is going to look like, how it will be made and how it works, by considering different aspects of the product, and by making choices.

UNDERSTANDING THE DESIGN PROBLEM - REFLECT (CHRIS CREATIVE)

Reflecting on the way you performed this task is an important part of "Understanding the design problem" task.

Ask yourself:

- How do I feel about the ideas in my list? Are my ideas related to the topic?
- Have I been creative in coming up with not so obvious characteristics in my list?
- Have I asked others about their ideas?
- Have I checked whether others think my ideas are relevant?

COMING UP WITH A PLAN (CHRIS CREATIVE)

Here in the screen are questions related to the design of your OBJECT. These questions should reflect characteristics that you will work with in this "Coming up with a plan" task.

In this task you will consider which of the questions from your list really matter and why. Choose the questions you will be working with and think about what would be the answers to these questions.

In this way you are "coming up with a plan" for the design of the OBJECT you are working on. You are thinking about what it will be important to consider in your design and why it is important. And also you are thinking of ways you could actually represent your ideas (and work out the problem) in your design of the OBJECT. This task will help you to think about:

(a) the goal (i.e. the "what" of your design task)
(b) the purpose (i.e. the "why" of your design task)
(c) the methods you will use or how you will represent your ideas (i.e. the "how" of your design task)

At the end of this task you will need to place your questions/answers under the "what", "why" and "how" headings. Don't worry if you have more than one question/answer under the headings. The important here is just to consider whether a question/answer relates to the goal of your OBJECT, the purpose of your OBJECT, or the methods you could use in your design of your OBJECT.

COMING UP WITH A PLAN - WHAT? (CHIRS CREATIVE)

What is the "coming up with a plan" task?

At the end of the "coming up with a plan" task you will come up with a list of important things you feel you must include in your design. These are important variables that you think might affect the design of the OBJECT, variables that you can change, and what could be affected by these changes.

For example:

You may have decided you would like to design a holiday house located in a beach tropical place. Lets say this house could be for a family of 4 (two adults and two children under five). Would you say the family would enjoy having friends around? Would they like outdoor living, and day activities? Do you think they may have pets?

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So one of your questions were "what is this object for?" to which you answered: "a family holiday house". "House" and "Family" may relate to the type of building you are designing or in other words, defines what your object is, it is the GOAL of your design. "Holiday" relates the PURPOSE of your design, it defines what people will do as they interact with your OBJECT.

Here you are starting to be specific about what exactly is the "design problem" you are working on. You are narrowing down and making choices.

As a result you could have:
Goal (what) - a family house
Purpose (why) - to be used for holidays
Method (how) - include outdoor spaces, tiled floor, barbecue area

Here are some other examples with other objects:
Goal (what) - a summer dress
Purpose (why) - to be used in summer/spring in everyday activities
Method (how) - will include floral patterns, cotton material, and will have no sleeves

Goal (what) - an animation character
Purpose (why) - to be used in a cartoon TV series
Method (how) - include funny features (e.g. big nose, flower hat), bright colors appealing to children.

Goal (what) - a bridge
Purpose (why) - to transport people and cars from one side of a river to the other
Method (how) - use materials, such as concrete and iron, to cope with high weight.

Here you are starting to be specific about what exactly is the "design problem" you are working on. You are narrowing down and making choices.

COMING UP WITH A PLAN - HOW? (CHIRS CREATIVE)

How to do the "Coming up with a plan" task?

Strategies for "Coming up with a plan":

Ideas to ASK other people:
Chat with others about what sort of activities they do as they come across the type of OBJECT you are designing. For example if you are designing a house ask What do people do on their holiday houses? Explore their feelings and what sort of activities they like doing?
What sort of holiday houses they enjoy, or what

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sort of houses they think are beautiful and pleasant? How should these houses look like and why?

Ideas to RESEARCH the topic:
Wonder around and look at how other similar houses look like. Access an internet site that rents holiday houses and pick your favorite. Close your eyes and imagine yourself there, as if you were on holidays in this particular house. Think about how you would enjoy and what you would do in a beach holiday in that house. You can research for some designers interviews on what topics to consider when designing a holiday house.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

COMING UP WITH A PLAN - WHY? (CHRIS CREATIVE)

Why to do the “Coming up with a plan” task?

In "coming up with a plan" you are defining the characteristics that are going to be present on the product and why they are there. In this task you are making choices and thinking about the reasons why you are incorporating these characteristics in your design. You are starting to develop your design concept.

COMING UP WITH A PLAN - REFLECT (CHRIS CREATIVE)

Reflect on the way you performed this task

Ask yourself:
How do I feel about my ideas? Do they make sense?
Do the reasons I have stated for incorporating these ideas make sense and seem plausible?

Have you thought about what is your goal?
Have you thought about the “why” of your design? What is the purpose of your design?
Have you thought about the methods you will be using? Or how you could represent your ideas?

DEVELOPING THE CONCEPT (CHRIS CREATIVE)

In the "developing the concept" task you will expand your ideas and write the design brief.

The brief is a written summary which states the concepts you are working with and how you will represent your ideas in your design. In your brief it is important that you think about:

(a) the specifications of your design (what are the objectives you selected to work with e.g. use your answers from the Goal, Purpose and/or Method headings, completed on the previous task)

(b) prioritize the objectives (select which objectives need to be worked on first)

(c) define ways you could represent them (state how you are applying your ideas to meet the objectives)

In this task you will explore the ideas you have been working with, that means your Goal, Purpose and Methods. At the end of this task you will have written a short paragraph about your design concept.

Complete each sentence (Specification, Prioritizing and Representation) in the screen:

Specifications (think about your objectives and write a paragraph format of your ideas about the Goal, Purpose and Methods),

Prioritizing (think about what you have written in the specifications above, and choose one or two characteristics, features or factors in your design that you consider as being crucial or essential to people who are interacting with your object),

Representation (elaborate about what in your design is representing the important characteristics/features/factors you chose in Prioritizing. Show how your design will express your objectives and its implications).

DEVELOPING THE CONCEPT - WHAT? (CHRIS CREATIVE)

What is the "developing the concept" task?

The objective of this task is to reflect about and expand the concepts you have been working with. You want to think of ways of incorporating or representing each aspect into your design:

For example, if you were designing a house you may have decided that:

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Goal (what) - a family house
Purpose (why) - used during holidays
Method (how) - include outdoor spaces, tiles, barbecue area

In this task it is important to open your mind to expand these ideas. You may further explore the implications of your choices. For instance, choosing to design "a holiday's house" may mean that the family won't live their everyday life in the house, right? What would that mean? How would you feel if you were in this family and in this holiday house? Would you like your holiday house to be a large or a small property? Or think about what areas of the property you would like to be larger or smaller? Would you like a big lounge or veranda? How would you like to feel in this house, fresh, a breeze coming in? How would this affect the choice of materials or your design?

Here you will use your Goal/Purpose/Method and write a little more about your design ideas. You will need to reflect on what concepts you are working with and imagine ways you could represent those:

Specifications - I AM DESIGNING A... holiday house in beach tropical place. House is for a family of 4 (two adults and two children under five). Family often enjoys having friends around.

Prioritizing - THE MOST IMPORTANT ASPECT OF THE OBJECT I AM DESIGNING IS THAT there should be plenty of open spaces rather than enclosed ones. Although the children are young, the family will need room to grow. Also, space to have friends as they enjoy visitors.

Representation - Open spaces WILL BE REPRESENTED IN MY DESIGN BY USING/CONSIDERING or incorporating a balcony and by emphasizing open common areas, like larger living spaces or dinning spaces, places where the family and visitors might enjoy sometime together, and outside areas (e.g. garden or barbecue area). I will also include an extra closed "activity room", which could become extra bedroom in future.

DEVELOPING THE CONCEPT - HOW? (CHRIS CREATIVE)

How to do the "Developing the concept" task?

Strategies for "Developing the concept":

Ideas to ASK other people:
Chat to others about your ideas. How do they feel about the ideas you are working with and why? Ask whether they have suggestions for other ways you could represent an

(CONTINUED)

aspect of your OBJECT? What other ways could be used to represent an aspect of your OBJECT?

Ideas to RESEARCH the topic:
Reflect about your choices of the characteristics of the object you are designing. Have a look at how other similar objects look like. Consider how do you feel about the characteristics present in these similar objects. Think about different ways you could represent your ideas.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

DEVELOPING THE CONCEPT - WHY? (CHIRS CREATIVE)

Why to do the "Developing the concept" task?

"Developing the concept" is about considering how your design ideas could meet the objectives.

The design brief summarizes the characteristics that are going to be present on your design, and it specifies why they are there, and how you are going to represent them. The design brief is expressing the choices you have made and gives reasons why you are incorporating certain characteristics in your design. The design brief defines possible ways to represent certain characteristics in your design.

DEVELOPING THE CONCEPT - REFLECT (CHRIS CREATIVE)

Reflect on the way you performed this task

Ask yourself:

How do you feel about the specifications of your design (your design brief)?

Have you prioritized the objectives that you will be taking into account. Have you thought about why they are there?

Have you considered different ways that you could represent them?

PRELIMINARY DESIGN (OR EMBODIMENT)(CHRIS CREATIVE)

Well, you are now ready to put your ideas in to practice! Here is a summary of the activities you went through, and your design brief.

Your next step is to go to the 3-D software and try to represent your ideas.

Remember, however, that design is not a linear process. Designers may have to come back many times to further develop their conceptual ideas. You are welcome to comeback and re-do the activities.

Or just go on and give it a go!

UNDERSTANDING THE DESIGN PROBLEM (ALEX ALL)

Great! Lets start the design of the OBJECT!

First, you want to think about all the objectives you want your OBJECT to meet. What do you want your OBJECT to do? What it will look like? Who will it appeal to?

In this task you will need to list questions that you think are important and related to the design of the OBJECT. Try to consider what you should take into account in the design of the OBJECT. Place yourself in the shoes of someone using the OBJECT. In this step you need to open your mind and list as many things as you can think of.

Types of questions that you may ask:
Who is going to use the OBJECT?
When is the OBJECT going to be used?
Where is the OBJECT going to be used?
What is the purpose of the OBJECT?
How is this OBJECT going to be used?
How do people usually use a similar OBJECT?
What sort of material can I use?

At the end of this task you will need to come up with a list of questions. Write your questions in the space provided. You will need them for the next phase of your design experience.

UNDERSTANDING THE DESIGN PROBLEM - WHAT? (ALEX ALL)

What is the “Understanding the design problem” task?

In "Understanding the design problem" you will write down a number of questions that you think would be relevant to the

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particular object you chose to design.

There are a number of factors designers need to take into account, when first thinking about the OBJECT they are going to design. As a designer you must consider who will be using your product, what might affect the product, objectives or characteristics of the OBJECT that you can change, and what could be affected by these changes.

As an example, let’s say you were designing a house. You might ask yourself:

1) What is this building for?
Is this a house for a family, an office, a school?
If this is a house for a family, how big is this family? How many rooms does the house need to have to accommodate all in the family? Could some of the children share a bedroom? How would the family feel at this house? Or just imagine the house is for your family. If you were living in this house, what characteristics would be important for you?

2) How is this building going to be used?
Is this a holiday house, or a house that people will be living in everyday? What would you expect to see in this type of house? Would you like the idea of having visitors or guests?
If this was your holiday house, what sort of activities do you see yourself doing in this house? Would you like to have visitors? Parties?

3) Where is the building located?
Is this a beach place or in the countryside? How is the climate in the region? Does it rain a lot? Snow? Is it a tropical place?

All these factors may affect the design of a house. In the same way, there are a number of factors that may affect the design of your OBJECT.

So open your mind and think about factors that may affect the design of your OBJECT, and write down questions that would be relevant for the specific object you are designing. Some examples of questions: “who will use your object?”, “how will be used?”, “where will be used?”

UNDERSTANDING THE DESIGN PROBLEM - HOW? (ALEX ALL)

How to do the "Understanding the design problem" task?

(CONTINUED)

Designers must always be aware of standard practices in their field. They need to keep up to date with what is going on and they often do that by reading and researching the topic, and exchanging ideas with their peers.

Designers also often need to imagine how people would experience the object they are designing. It is important that designers think about what feelings such an object would evoke. It is also relevant to consider that different people like different things and have different ideas. By talking to others and researching on the topic you can be reminded of things you didn't think of. You might consider some of the strategies below helpful.

Strategies for finding objectives to consider:

Ideas to ASK other people:

You could define a set of questions to ask other museum visitors or the teachers of your workshop. Make sure you ask the same question to at least 3 people, so you can see and compare how others may have different ideas. Record their answers in a notebook. Make sure to record as they talk, as you might forget what exactly they said if you leave it for later on.

If you were designing a house you may try to ask other museum visitors and your teachers, for example:
(a) What do you think might affect the design of a building?

(b) What can be changed in the design of a building?
(c) What would you ideal house look like?

(Click here to see a template for asking questions)

Chat with people about what style of houses they like. What do they feel is important when designing a house? What do they like the most about their own house?

Ask someone to close their eyes and think about their favorite house or building. Then, ask them what do they like about the place and why?

You may use of some brainstorming techniques and play a little game with someone. Here you say a word: "holiday house" and ask the person to say what their first thought is. Then you can explore with the person what is the meaning of their association. For example, if you say "holiday house", the first thing a person may say is "relaxing". So you chat about in what ways this person may relax on holidays.

Ideas to RESEARCH the topic:

(CONTINUED)

You may choose to research what other designers have considered when designing an object like your. For example the different materials, shapes, heights index of the general population. Try to investigate how do these designers feel about their design or their preferences for different materials.

You can research for some designers opinions on what topics to consider when designing a chair. You can choose to look at some related professional magazines or perhaps do a search on Google. You may try to listen or read some interviews with designers on these websites:

http://www.powerhousemuseum.com/sydney2000games/interviews.php

http://www.designboom.com/interviews.html

Look at some podcasts and videos:

http://www.powerhousemuseum.com/whatson/videos_podcasts.asp

If you think you would like to record the information you are gathering, click here to see a template you could use in your research.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

(Click here for see a template to use on the visit).

UNDERSTANDING THE DESIGN PROBLEM - WHY? (ALEX ALL)

Why to do the "Understanding the design problem" task?

By asking these questions you are narrowing down your “design problem”. This will help you to define what exactly you are going to be working on, the characteristics that are going to be present in the object you are designing. In other words, you are starting to define your ideas of what your design is going to look like, how it will be made and how it works, by considering different aspects of the product, and by making choices.

UNDERSTANDING THE DESIGN PROBLEM - REFLECT (ALEX ALL)

Reflecting on the way you performed this task is an important part of "Understanding the design problem" task.

Ask yourself:
Are the ideas I came up in my list related to the objectives?
Does my list report on obvious characteristics related to the objectives?
Have I been methodical in coming up with the characteristics in my list?
Have I checked whether others think my ideas are relevant?

Have I been creative in coming up with not so obvious characteristics in my list?

Have I asked others about their ideas?

COMING UP WITH A PLAN (ALEX ALL)

Here in the screen are important questions related to the design of your OBJECT. These questions express characteristics that you will work with in this "Coming up with a plan" task.

In this task you will need to think of which of the questions from your list really matter and why. You will select the questions you will be working with and think about the answers to these questions.

In this way you are "coming up with a plan" for the design of the OBJECT you are working on. You are formulating what it will be important to consider and why it is important. And also you are thinking of ways you could actually represent your ideas (and solve the problem) in your design of the OBJECT. This task will help you to think about:
(a) the goal (i.e. the "what" of your design problem)
(b) the purpose (i.e. the "why" of your design problem)
(c) the methods you will use or how you will represent your ideas (i.e. the "how" of your design problem)

At the end of this task you will need to sort your questions/answers under the "what", "why" and "how" headings in the screen. Don’t worry if you have more than one question/answer under the headings. At this point, just think about under which heading you would place each of your thoughts or ideas. Whether a specific question/answer is related to the goal of your OBJECT, the purpose of your OBJECT or the methods you could use in the design of your OBJECT.

Use the space provided to type in your ideas.

COMING UP WITH A PLAN - WHAT? (ALEX ALL)

What is the “coming up with a plan” task?

At the end of the "coming up with a plan" task you will have a list of the important things you decided you must consider in your design. These are important characteristics that you think might affect the design of the OBJECT, characteristics that you can change, and what could be affected by these changes.

For example:
You answered the question - What is this object for? - with: This is a holiday house.
You answered the question - Where is this object? - with: In a beach tropical place.
You answered the question - Who is going to use this object? - with: This house is for a family of 4 (two adults and two children under five)
You answered the question - What do the users of this object like? - with: They often enjoy having friends around, outdoor living, and day activities. They do not have pets.

So in this task you will choose to place your answers under the different headings. For example, in the "what" category you would have: "a family house".

Goal (what) - a family house
Purpose (why) - used for holidays
Method (how) - include outdoor spaces, tiled floor, barbecue area

Here are some other examples:

Goal (what) - a summer dress

Purpose (why) - to be used in summer/spring in everyday activities

Method (how) - will include floral patterns, cotton material, and will have no sleeves

Goal (what) - an animation character
Purpose (why) - to be used in a cartoon TV series. Method (how) - include funny features (e.g. big nose, flower hat), bright colors appealing to children.

Goal (what) - a bridge

(CONTINUED)

Purpose (why) - to transport people and cars from one side of a river to the other

Method (how) - use materials, such as concrete and iron, to cope with high weight.

Here you are starting to be specific about what exactly is the "design problem" you are working on. You are narrowing down and making choices.

COMING UP WITH A PLAN - HOW (ALEX ALL)

How to do the "Coming up with a plan" task?

This task is about figuring out the characteristics of the OBJECT. Strategies for "Coming up with a plan":

Ideas to ASK other people:

Write a list of activities you think people do on a holiday house (e.g. barbecues, playing football in the garden, outdoor lunches). Then ask three different people (your teachers, friends, or museum visitors) whether they do these activities in holiday houses? How often would they do these? Which ones are more important or less important? Explore their feelings and what sort of activities they like doing.

Or write down a list of characteristics of a holiday house (e.g. veranda, barbecue area, tiled floors, boat ramp, pool, air conditioning). Then ask three different people whether they agree with these characteristics? Which ones are more important or less important? What sort of holiday houses they like? What sort of houses they think are beautiful and pleasant. Ask them to think of their best experience of a holiday house. Then explore with them what was special about that holiday house.

Ideas to RESEARCH the topic:

Have a look at what other similar houses look like. You may look at some specialized magazines, go to an internet site that has holidays houses for rent. Close your eyes and imagine yourself there, as if you were on holidays in this particular house. Think about how you would enjoy and what you would do in a beach holiday in that house. You can research for some designers interviews on what topics to consider when designing a holiday house.

Take notes of the characteristics you find interesting and why they are interesting.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

COMING UP WITH A PLAN - WHY? (ALEX ALL)

Why to do the “Coming up with a plan” task?

In "coming up with a plan" you are defining the characteristics that are going to be present on the product and why they are there. In this task you are making choices and thinking about the reasons why you are incorporating these characteristics in your design. You are starting to develop your design concept.

COMING UP WITH A PLAN - REFLECT (ALEX ALL)

Reflect on the way you performed this task

Ask yourself:
How do I feel about my ideas? Do the ideas make sense?
Do the reasons I have stated for incorporating these ideas make sense and seem plausible?

Have you thought about what is your goal?
Have you thought about the “why” of your design? What is the purpose of your design?
Have you thought about the methods you will be using? Or how you could represent your ideas?

DEVELOPING THE CONCEPT (ALEX ALL)

In the "developing the concept" task you will elaborate or expand your ideas and write the design brief.

The brief is a written summary which breaks down concepts and assign ways you could use to represent each aspect in your design. In your brief you will need to address:
(a) the specifications of your design (what are the objectives you selected to work with e.g. use your answers from the Goal, Purpose and/or Method headings, completed on the previous task)
(b) prioritize the objectives (select which objectives need to be worked on first)
(c) define ways you could represent them (state how you are applying your ideas to meet the objectives)

To complete this task you will use the ideas under each heading (Goal/Purpose/Method). At the end of this task you

(CONTINUED)

will have written a short paragraph about your design concept.

Complete each sentence (Specification, Prioritizing and Representation) in the screen:

Specifications (use your objectives - a paragraph format of what was under the three headings - Goal/Purpose/Method),

Prioritizing (use the specifications above, and select one or two characteristics, features or factors in your design that you consider as essential in your object),

Representation (elaborate about what in your design is representing the important characteristics/features/factors you chose in Prioritizing. State how your design will express your objectives and its implications).

DEVELOPING THE CONCEPT - WHAT? (ALEX ALL)

What is the "developing the concept" task?

The objective of this task is to break the concepts down and assign ways of representing each aspect into your design.

For example, if you were designing a house you may have determined that:

Goal (what) - a family house
Purpose (why) - used during holidays
Method (how) - include outdoor spaces, tiles, barbecue area

So in this task you will reflect on this ideas and elaborate further on them, transforming these headings into a paragraph. For instance, choosing to design "a holiday house" may mean that the family won’t live their everyday life in the house, right? What are the implications of that? Will this affect your design, and influence on the size of the property? Or think about what areas of the property that can be larger or smaller? How does this may affect the choice of materials?

Here you will use your Goal/ Purpose/ Method, and write a little more about your design ideas. You will establish what concepts you are working with and imagine ways you could represent those:

Specifications - I AM DESIGNING A... holiday house in beach tropical place. House is for a family of 4 (two adults and two children under five). Family often enjoys having friends around.

(CONTINUED)

Prioritizing - THE MOST IMPORTANT ASPECT OF THE OBJECT I AM DESIGNING IS THAT there are plenty of open spaces rather than enclosed ones. Although the children are young, the family will need room to grow. Also, space to have friends as they enjoy visitors.

Representation - Open spaces WILL BE REPRESENTED IN MY DESIGN BY USING/CONSIDERING or incorporating a balcony and by emphasizing open common areas, like larger living spaces or dinning spaces, places where the family and visitors might enjoy sometime together, and outside areas (e.g. garden or barbecue area). I will also include an extra closed “activity room”, which could become extra bedroom in future.

DEVELOPING THE CONCEPT - HOW? (ALEX ALL)

How to do the “Developing the concept” task?

Strategies for "Developing the concept":

Ideas to ASK other people:

Make a list or use your list (if done in previous task) of the characteristics of the object you are designing and reasons why these characteristic are there (e.g. a barbecue area, because people on holidays often have barbecues; or a veranda, because beach houses often possess an outside covered area where people can relax and be protected from the sun). Show your list to others (e.g. your teachers, other students, or museum visitors) and ask what they think of the goals you are working with and why? Ask others how do they feel about the ideas you are working with? Ask whether they have suggestions for other ways you could represent an aspect of your OBJECT?

Ideas to RESEARCH the topic:

Reflect about your list of the characteristics of the object you are designing and your reasons why these characteristic are there. Check how other similar objects look like. Consider how you feel about the characteristics present in these similar objects. Do you like or dislike a particular feature of the object? In your list, tick on the characteristics that are often present in these similar objects. Check for different ways you could represent your ideas.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

DEVELOPING THE CONCEPT - WHY? (ALEX ALL)

Why to do the “Developing the concept” task?

"Developing the concept" is about formulating how your design could meet the objectives.

The design brief ensures that important characteristics are considered and questioned before designing.

The design brief states the characteristics that are going to be present on your design, and it specifies why they are there, and how you are going to represent them. The design brief is expressing the choices you have made and gives reasons why you are incorporating certain characteristics in your design. The design brief defines possible ways to represent certain characteristics in your design.

The brief is often written in consultation with a client and provides a point of reference for both parties.

DEVELOPING THE CONCEPT - REFLECT (ALEX ALL)

Reflect on the way you performed this task

Ask yourself:

Have you come up with the specifications of your design (your design brief)? How do you feel about these specifications?

Have you prioritized the objectives that you will be taking into account first and thought about why?

Have you analyzed different ways that you could represent them?

PRELIMINARY DESIGN (OR EMBODIMENT)(ALEX ALL)

Well, you are now ready to put your ideas in to practice! Here is a summary of the activities you went through, and your design briefing.

Your next step is to go to the 3-D software and try to represent your ideas.

Remember, however, that design is not a linear process. Designers may have to come back many times to further develop their conceptual ideas. You are welcome to comeback and re-do the activities.

Or just go on and give it a go!

UNDERSTANDING THE DESIGN PROBLEM (NICK NEUTRAL)

Great! Lets start the design of the OBJECT!

Think about the objectives you want your OBJECT to meet. What do you want your OBJECT to do? What it will look like? Who will it appeal to?

In this task you will need to list questions that you think are important and related to the design of the OBJECT. It may help to think about similar objects out there in the world.

Ask yourself:
Who is going to use the OBJECT?
When is the OBJECT going to be used?
What is the purpose of the OBJECT?
How is this OBJECT going to be used?
What sort of material can I use?

At the end of this task you will need to come up with a list of questions. Write your questions in the space provided. You will need them for the next phase of your design experience.

UNDERSTANDING THE DESIGN PROBLEM - WHAT? (NICK NEUTRAL)

What is the "Understanding the design problem" task?

In "Understanding the design problem" you need to write down a number of questions that you think would be relevant to the particular object you chose to design.

There are a number of factors designers need to take into account, like what might affect the product, objectives or characteristics of the OBJECT that you can change, and what could be affected by these changes.

As an example, let’s say you were designing a house. You might ask yourself:

1) How do similar houses look like?
2) What are the common features that are always there?
3) From the houses I have seen, what would I add or change?

Try to be specific. It might help to choose a location for the house (beach house, country side house etc).

Consider that different factors may affect the design of a house. In the same way, there are a number of factors that may affect the design of your OBJECT.

So think about factors that may affect the design of your OBJECT, and write down questions that would be relevant for the specific object you are designing.

UNDERSTANDING THE DESIGN PROBLEM - HOW? (NICK NEUTRAL)

How to do the "Understanding the design problem" task?

Different people have different ideas. By talking to others or having a look at similar objects you can be reminded of things you didn’t think of.

Strategies for finding objectives to consider:

Ideas to ASK other people:
Talk to your friends or museum visitors about their preferences in relation to similar objects. Explain about what sort of OBJECT you are thinking of designing and exchange ideas with them. Talk about features they like, or don’t, what would they change and how.

Ideas to RESEARCH the topic:
Think about similar objects you have seen before. Do a search on Google images of similar OBJECT plus the word "design" and see what comes up.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

UNDERSTANDING THE DESIGN PROBLEM - WHY? (NICK NEUTRAL)

Why to do the "Understanding the design problem" task?

By asking questions and thinking about how you would like the object to be, you are narrowing down your “design problem”. This will help you to define what exactly you are going to be working on, the characteristics that are going to be present in the object you are designing. In other words, you are starting to define your ideas of what your design is going to look like, how it will be made and how it works, by considering different aspects of the product, and by making choices.

UNDERSTANDING THE DESIGN TASK - REFLECT (NICK NEUTRAL)

Reflecting on the way you performed this task is an important part of "Understanding the design problem" task.

Ask yourself:
Are the ideas I came up in my list related to the objectives?
Does my list report on obvious characteristics related to the objectives?
Have I checked whether others think my ideas are relevant?

COMING UP WITH A PLAN (NICK NEUTRAL)

Here are important questions related to the design of your OBJECT. These questions express characteristics that you will work with in this "Coming up with a plan" task.

In this task you will need to think of which of the questions from your list really matter and why. You will select the questions you will be working with and think about the answers to these questions.

In this way you are "coming up with a plan" for the design of the OBJECT you are working on. You are formulating what it will be important to consider and why it is important. And also you are thinking of ways you could actually represent your ideas in your design of the OBJECT. This task will help you to think about:
(a) the goal (i.e. the "what" of your design problem)
(b) the purpose (i.e. the "why" of your design problem)
(c) the methods you will use or how you will represent your ideas (i.e. the "how" of your design problem)

At the end of this task you will need to sort your questions/answers under the "what", "why" and "how" headings.

COMING UP WITH A PLAN - WHAT? (NICK NEUTRAL)

What is the “coming up with a plan” task?

At the end of the "coming up with a plan" task you will have a list of what you decided you must consider in your design. These are important characteristics that you think might affect the design of the OBJECT, characteristics that you can change, and what could be affected by these changes.

For example:
You answered the question - What is this object for? -

(CONTINUED)

with: This is a holiday house.
You answered the question - Who uses this object? - with: A family.

So in this task you will choose to place your answers under the different headings. For example, in the "what" category you would have: "a family house".

Goal (what) - a family house
Purpose (why) - used for holidays
Method (how) - include outdoor spaces, tiled floor, barbecue area

Here are some other examples:
Goal (what) - a summer dress
Purpose (why) - to be used in summer/spring in everyday activities
Method (how) - will include floral patterns, cotton material, and will have no sleeves

Goal (what) - an animation character
Purpose (why) - to be used in a cartoon TV series.
Method (how) - include funny features (e.g. big nose, flower hat), bright colors appealing to children.

Goal (what) - a bridge
Purpose (why) - to transport people and cars from one side of a river to the other
Method (how) - use materials, such as concrete and iron, to cope with high weight.

Here you are starting to be specific about what exactly is the "design problem" you are working on. You are narrowing down and making choices.

COMING UP WITH A PLAN - HOW (NICK NEUTRAL)

How to do the "Coming up with a plan" task?

This task is about figuring out the characteristics of the OBJECT. Strategies for "Coming up with a plan":

Ideas to ASK other people:
Think of activities you think people do when in contact with your OBJECT. For example, if you are designing a holiday house what activities would you do when in a holiday house? (e.g. barbecues, playing football in the garden, outdoor lunches). Then try to incorporate in your design the most common features for a holiday house.
Or think of characteristics of a holiday house (e.g. veranda, barbecue area, tiled floors, boat ramp, pool,

(CONTINUED)

air conditioning). Then choose the most common ones to incorporate in your design.

Ideas to RESEARCH the topic:
You may choose to have a look at what other similar houses look like. You may do a search on Google images of holiday houses and check which features they have.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

COMING UP WITH A PLAN - WHY? (NICK NEUTRAL)

Why to do the “Coming up with a plan” task?

In "coming up with a plan" you are defining the characteristics that are going to be present on the product and why they are there. In this task you are making choices and thinking about the reasons why you are incorporating these characteristics in your design. You are starting to develop your design concept.

COMING UP WITH A PLAN - REFLECT (NICK NEUTRAL)

Reflect on the way you performed this task

Ask yourself:
Do my ideas make sense?
Do the reasons I have stated for incorporating these ideas make sense and seem plausible?

Have you thought about your goal, the purpose and methods?

DEVELOPING THE CONCEPT (NICK NEUTRAL)

In the "developing the concept" task you will elaborate on your ideas and write the design brief.

The brief is a written summary which breaks down concepts and assign ways you could use to represent each aspect in your design. In your brief you will need to address:
(a) the specifications of your design (e.g. use your answers from the Goal, Purpose and/or Method headings, completed on the previous task)

(b) prioritize the objectives (select which objectives need to be worked on first)
(c) define ways you could represent them (state how you are applying your ideas to meet the objectives)

At the end of this task you will have written a short paragraph about your design concept.

Complete each sentence (Specification, Prioritizing and Representation) in the screen:

Specifications (use your objectives - a paragraph format of what was under the three headings - Goal/Purpose/Method),

Prioritizing (use the specifications above, and select one or two characteristics, features or factors in your design that you consider as essential in your object),

Representation (elaborate about what in your design is representing the important characteristics/features/factors you chose in Prioritizing. State how your design will express your objectives and its implications).

DEVELOPING THE CONCEPT - WHAT? (NICK NEUTRAL)

What is the "developing the concept" task?

The objective of this task is to break the concepts down and assign ways of representing each aspect into your design.

For example, if you were designing a house you may have chosen to design:

Goal (what) - a family house
Purpose (why) - used during holidays
Method (how) - include outdoor spaces, tiles, barbecue area

In this task you will work with these ideas, transforming these headings into a paragraph. For instance, think about what are the implications of your choices and how it affects your design.

Here you will use your Goal/ Purpose/ Method, and write a little more about your design ideas. You will think about the concepts you are working with and imagine ways you could represent those:

Specifications - I AM DESIGNING A... holiday house in beach tropical place. House is for a family of 4 (two adults and two children under five). Family often enjoys having friends around.

(CONTINUED)

Prioritizing - THE MOST IMPORTANT ASPECT OF THE OBJECT i AM DESIGNING IS THAT there are plenty of open spaces rather than enclosed ones. Although the children are young, the family will need room to grow. Also, space to have friends as they enjoy visitors.

Representation - Open spaces WILL BE REPRESENTED IN MY DESIGN BY USING/CONSIDERING or incorporating a balcony and by emphasizing open common areas, like larger living spaces or dinning spaces, places where the family and visitors might enjoy sometime together, and outside areas (e.g. garden or barbecue area). I will also include an extra closed “activity room”, which could become extra bedroom in future.

DEVELOPING THE CONCEPT - HOW? (NICK NEUTRAL)

How to do the “Developing the concept” task?

Strategies for "Developing the concept":

Ideas to ASK other people:
Think about the characteristics of the object you are designing and check with others they would also use similar features (e.g. a barbecue area; or a veranda). Think about the goals you are working with and why they are there. Ask whether others have suggestions for other ways you could represent an aspect of your object?

Ideas to RESEARCH the topic:
Using your list of the characteristics of the object you are designing and reasons why these characteristic are there, check how other similar objects look like. Check for different ways you could represent your ideas.

Ideas to look within the MUSEUM:

You can visit EXHIBITION (OBJECT dependent). Check whether you could participate in GUIDED VISIT (OBJECT dependent).

DEVELOPING THE CONCEPT - WHY? (NICK NEUTRAL)

Why to do the “Developing the concept” task?

"Developing the concept" is about formulating how your design could meet the objectives.

The design brief ensures that important characteristics are considered and questioned before designing.

(CONTINUED)

The design brief states the characteristics that are going to be present on your design, and it specifies why they are there, and how you are going to represent them. The design brief is expressing the choices you have made and gives reasons why you are incorporating certain characteristics in your design. The design brief defines possible ways to represent certain characteristics in your design.

The brief is often written in consultation with a client and provides a point of reference for both parties.

DEVELOPING THE CONCEPT - REFLECT (NICK NEUTRAL)

Reflect on the way you performed this task

Ask yourself:

Have you come up with a design brief that contains specifications about your design?

Have you prioritized the objectives that you will be taking into account first and thought about why?

Have you analyzed different ways that you could represent them?

PRELIMINARY DESIGN (OR EMBODIMENT)(NICK NEUTRAL)

Well, you are now ready to put your ideas in to practice! Here is a summary of the activities you went through, and your design briefing.

Your next step is to go to the 3-D software and try to represent your ideas.

Remember, however, that design is not a linear process. Designers may have to come back many times to further develop their conceptual ideas. You are welcome to comeback and re-do the activities.

Or just go on and give it a go!

Sociology of Learning in Design - Powerhouse Museum -

1. Background Information

Please place a tick on the appropriate answer

1. How old are you?

2. Gender

- ◯ Female
- ◯ Male

3. Where were you born?

- ◯ Australia
- ◯ Overseas

If you were born overseas, how long have you been in Australia?

2. Design disciplines and 3D modelling

3D modeling is a knowledge that is learned by various professionals such as engineers, architects, digital media, fashion designers and others. However, the way that designers learn about 3D modeling and how they use 3D models may differ. Think about what you know about these professions either from your family, teachers, the media, or friends. Then please choose three words that you could use to describe these professions (you can choose your own words, or pick one from the drop down menu)

1. Engineering design is...

	Pick one word...	Pick one word...	Pick one word...
Choose 3 words from list or write your own words			

Other (please specify)

2. Architecture design is...

	Pick one word...	Pick one word...	Pick one word...
Choose 3 words from list or write your own words			

Other (please specify)

Sociology of Learning in Design - Powerhouse Museum -

3. Digital media design is...

	Pick one word...	Pick one word...	Pick one word...
Choose 3 words from list or write your own words			

Other (please specify)

4. Fashion design is...

	Pick one word...	Pick one word...	Pick one word...
Choose 3 words from list or write your own words			

Other (please specify)

3. The design experience

1. What type of object did you design?

2. Consider your overall experience during the workshop. Then tick the option that best describes what was like for you:

	Strongly agree	Agree	Don't know	Disagree	Strongly disagree
As a result of the workshop, I have a better idea of how designers evaluate their design thinking					
I found the content of the workshop useful					
I learned how to organize my design ideas					
I was able to develop my design ideas					
I was happy with the guidance provided					
I was happy with the activities proposed					
I was able to define design ideas to work with at the lab					
I learned about points and perspectives I can consider when designing an object					
I felt supported in the design experience					

3. What was the best aspect of your design experience?

4. What was the worst aspect of the design experience? What do we need to improve?

Workshop2_Survey

1. Background information

Please place a tick on the appropriate answer

1. Age

- ◯ 14
- ◯ 15
- ◯ 16
- ◯ 17

2. Gender

- ◯ Female
- ◯ Male

3. Where were you born?

- ◯ Australia
- ◯ Overseas

If you were born overseas, how long have you been in Australia?

2. The settings of your design experience: guidance

Please place a tick on the appropriate answer

1. What design advisor did you have on your design experience?

- ◯ Nicole (first female from left of screen)
- ◯ Rachel (second female from left of screen)
- ◯ Christine (third female from left of screen)
- ◯ Alexandra (last female from left of screen)
- ◯ Nicholas (first male from left of screen)
- ◯ Roger (second male from left of screen)
- ◯ Christopher (third male from left of screen)
- ◯ Alexander (last male from left of screen)
- ◯ I didn't have an advisor
- ◯ I don't remember. Please describe your advisor.

Workshop2_Survey

2. Why did you choose this advisor?
(You may tick more than one answer, if appropriate)

- [ ] No special reason, just chose one by chance
- [ ] Because it was the best suited advisor considering my choice of object
- [ ] Because of his/her looks
- [ ] Because of his/her 'personality', likes and dislikes
- [ ] I had the advisor assigned to me according to object
- [ ] Because of his/her general ideas about how to design an object
- [ ] Other (please specify)

3. How often did you choose to be guided?

- ◯ All the time
- ◯ Just on request
- ◯ Never

3. The settings of your design experience: object

1. What type of object did you design?

- ◯ 3D character/creature
- ◯ car
- ◯ chair
- ◯ dress
- ◯ house
- ◯ logo/icon symbol
- ◯ footwear/shoes
- ◯ train

2. How important are the following for being good at designing in the field that produces your choice of object:

	Not at all	Not very	Quite	Very
Skills, techniques and specialist knowledge	☐	☐	☐	☐
Natural born talent	☐	☐	☐	☐
Taste, judgment or a developed 'feel' for it	☐	☐	☐	☐

4. Your design experience

Please read the statements and tick how much do you agree with each statement.

Workshop2_Survey

1. Regarding the design experience...

	Strongly agree	Agree	Don't know	Disagree	Strongly disagree
I was happy with the guidance provided	☐	☐	☐	☐	☐
I felt supported in the design experience	☐	☐	☐	☐	☐
I feel I have a better idea of how designers evaluate their design practices	☐	☐	☐	☐	☐
I was happy with having a choice of advisor	☐	☐	☐	☐	☐
I found the content of the environment useful	☐	☐	☐	☐	☐
I was happy with the activities proposed	☐	☐	☐	☐	☐
I learned how to organize my design ideas	☐	☐	☐	☐	☐
I was happy with my choice of object	☐	☐	☐	☐	☐
I was able to define design ideas to work with at the lab	☐	☐	☐	☐	☐
I learned about points and perspectives I can consider when designing an object	☐	☐	☐	☐	☐

2. What was the best aspect of your design experience?

3. What was the worst aspect of the design experience? What do we need to improve?