Conceptualising design knowledge and its recontextualisation in the studiowork component of a design foundation curriculum

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Declaration

This work has not been previously submitted in whole, or in part, for the reward of a degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

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Abstract

Universities of Technology have traditionally prepared students for the world of work and their close ties with industry directly impact on vocational curriculum, which has to impart subject knowledge and specialized knowledge valued by industry, whilst simultaneously encouraging the acquisition of vocational identity.

This study of a Design Foundation Course's curriculum is located at a University of Technology which is currently undergoing a process of re-curriculation, which has initiated a process of examining subject knowledge and its structuring in various course's curricula. In the light of these developments, an examination of the nature of design knowledge and the role of the foundation curriculum in the transfer of core disciplinary knowledge to underprepared students appeared both timely and necessary.

The bi-modal nature of design knowledge with its roots in science and the arts is well documented by empirical research; however the use of social theory to examine design curricula is less frequent. This study uses the theories of knowledge developed by the educational sociologists Basil Bernstein and Karl Maton to examine the structuring and progression of design knowledge in a foundation curriculum by means of two interrelated questions:

How has design knowledge been recontextualised into the project briefs of the studiowork component of the integrated, multidisciplinary Design Foundation Course's curriculum, and how does this curriculum enable the intended development of design knowledge and consciousness over the course of the year?

These theories of knowledge provide the analytic tools to position the design curriculum in pedagogy, and to analyse a theory of design cognition and its development. A language of description, used to analyse the data, emerges from bringing the theories of knowledge and the findings of empirical design research into relation.

The analysis demonstrated that recontextualised design knowledge bears a close resemblance to design knowledge in the field of production and that sequence matters in

design curriculum. Well sequenced curricula have the potential to better enable the transfer of conceptual and procedural design knowledge and, significantly, to enable the acquisition of more tacit forms of design knowledge such as aesthetic discrimination and gaze. The analysis furthermore found that a theory of knowledge helps to make visible the often tacit assumption and grounds for legitimation implicit in design curricula, which can privilege some students over others. The analysis also confirms the strong relation between situational context and knowledge progression in design pedagogy.

The ultimate purpose of this study is to show how a theory of knowledge can make curriculum practices more transparent and thus enable the conscious planning of theorized curricula which have the potential to better enable knowledge transfer and cumulative learning in design pedagogy.

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Chapter 1: Introduction

In the recent past rapid change in social, political, economic and technological spheres have impacted on universities, pressurizing them to adapt their curricula to be more responsive to the world of work and to the diverse needs of enlarged, non-traditional student populations. Consequently, institutes of higher education are debating how to best prepare students for active participation in a rapidly changing 'knowledge society' (Moore & Young, 2001, p. 445).

Moore and Young (2001) caution against over-ideologised views of knowledge, which have resulted in curricula in which the internal interests of knowledge acquisition is eclipsed by external social interests, be they political, ideological or economic. In South Africa, post apartheid educational policy reform has followed a worrying global 'economy-led trend', in the form of the National Qualifications Framework (NQF) and Outcomes Based Education (OBE) (Young & Gamble, 2006, p. 2). Both of these models differ conceptually from older syllabus-based models in their treatment of education 'as *an end product or commodity measurable in terms of standards or outcomes*' (p. 8).

According to Young and Gamble (2006, pp. 8-10), although these models were instituted to integrate a fractured and unequal education system, the transfer of mechanical, measurable outcomes and unit standards to education underestimated the fact that outcomes are the result of learning and teaching, which involve people whose behaviors, unlike that of machines, is not consistent or predictable. Young and Gamble describe how these educational models differ from others in two respects, both of which have far reaching implications: Firstly, their use of standard criteria and level descriptors fails to differentiate between different kinds of learning and forms of knowledge. Secondly, their performance based criteria conflate doing with knowing – rendering disciplinary knowledge implicit. This lack of differentiation enables the problematic claim that the NQF can pave the way to for the comparison and transfer '*of all qualifications at a given level*' (Young & Gamble, p. 9) regardless of their knowledge base and form of transmission. The concern with outcomes, the lack of knowledge differentiation and a

clear concept of knowledge itself, is seen by many as central to the problems facing educational reform in South Africa (p. 10). This is significant in the light of the current review of vocational curricula at recently merged Comprehensive Universities and Universities of Technology, including the Cape Peninsula University of Technology (CPUT), where this study is located.

Universities of Technology have traditionally prepared students for the world of work and their close ties with industry directly impact on vocational curriculum, which has to 'face both ways' by imparting subject knowledge and encouraging the acquisition of vocational identity and personal attributes valued by industry (Barnett, 2006, p. 152). Barnett describes the complexity of vocational pedagogy which is the result of situated, tacit knowledge or 'know how', as well as of codified disciplinary knowledge, or 'know that'. This disciplinary knowledge requires an additional process of reorganization of the curriculum to accommodate the technological and organizational demands of the context specific vocation or profession (pp. 145-148). Professional and vocational foundation courses are similarly tasked with providing curricula that 'face both ways', but their primary concern, according to Muller (2008, pp. 15-17), is providing students with core disciplinary knowledge whilst simultaneously initiating the process of inducting them into their future professional identities.

In South Africa universities have provided academic support for non-traditional students since the 1980's. During this time thinking amongst academic development practitioners has shifted from locating reasons for high failure rates on students alone, to using critical theory to examine the structure of the educational system itself (Boughey, 2010).

Such a critical orientation to knowledge refuses to take 'commonsense' or hegemonic ways of thinking about education for granted. It is concerned with the social character of knowledge production and transfer (Moore & Young, 2001), and with how to understand and transform internal teaching and curriculum practices which may '*disadvantage some and privilege others in ways which are not always overt*' (Boughey, 2010, p. 7). This shift from providing skills to underprepared students to '*making the ways in which subject knowledge is constructed and produced, or epistemology, more transparent*' (Garraway,

2010, p. 59) has significant implications: It requires critically evaluating the continued relevance of established ways of structuring foundation curriculum and pedagogy, and it encourages exploring alternative ways of structuring subject knowledge so as to provide *all* students with social and epistemological access. Vocational and professional foundation programes have the added responsibility of providing students with vocational access (pp. 60-61).

The Design Foundation Course is an example of such a programme. At the time of writing, its multi-disciplinary curriculum integrates the Extended Curriculum Programmes (ECP) of the following design disciplines based on the Cape Town campus of CPUT:

- Interior design
- Three-dimensional (Industrial) design
- Graphic design
- Fashion design
- Surface design
- Jewellery design
- Architectural technology

Its curriculum, with its official purpose of redress, is less directly affected by the dictates of industry and external professional bodies and more by socio-political imperatives to widen social and epistemological access. But its curriculum does 'look both ways', requiring the transfer of different kinds of disciplinary knowledge by means of lecture and studio based instruction. This study is concerned with the different forms of knowledge which constitute the practical, studiowork component of this curriculum. (In this dissertation, 'studiowork' is consciously favoured over 'practical work', since the latter can be mistaken for being purely procedural). It is also concerned with understanding how curriculum can contribute to providing epistemological access, by creating enabling conditions for the successful transfer of these knowledges.

1.1 Background

The Access Course was started in 1994 as a corrective measure to the skewed demographics of what was then the Cape Technikon's School of Design. It was a standalone, bridging course and its official purpose was redress. It was the precursor to the current Design Foundation Course.

Pedagogically, the Access Course's aim was to provide an opportunity to study design for students who, as a result of Apartheid legislation, were not able to study art at school. By providing both theoretical and practical foundational design knowledge to talented but underprpared students, it was reasoned that such students would stand a better chance of gaining access to, and successfully completing, one of the design courses on offer at the institution. It was furthermore understood that there was enough foundational design knowledge held in common between these courses to constitute a single but integrated, multi-disciplinary foundation course to serve them all simultaneously. Furthermore, multi-disciplinary foundation courses have a proven track record, having been the norm since the Bauhaus' Basic Course revolutionised design education at the beginning of the 20th century (Wick, 2000).

Acceptance into the course was dependent on meeting institutional academic criteria and evidence of visual aptitude, assessed by means of a visual portfolio, an essay and an interview. Since very few students who applied to do the Access Course were well informed about design in general and the different design courses in particular, the course came to serve, as it still does, an important diagnostic function: Doing this multi-disciplinary course enabled students to be directed into the course best suited to their abilities.

The practical, studiowork component of this curriculum had to, as it still does, accomplish two things simultaneously: to introduce students to foundational design knowledge *common* to the different design disciplines it serves, and to provide students with a clear understanding of disciplinary *difference.* To achieve this, discipline specific projects became carriers of generic foundational *and* discipline specific design knowledge, thereby

starting the process of inducting students into subject knowledge as well as defining their professional identity. The intention of the curriculum planners was, and still is, that the foundational design knowledge would be transferrable across and between projects, without getting submerged in the specialized contexts of these projects.

Design curricula are typically project driven (Lee, 2009) and the Access Course was no different. When the course started, there were no textbooks or curriculum documents to structure the pedagogic process other than an arbitrary collection of projects deemed suitable for entry level students. Many of these early projects proved to be inappropriate since they were based on assumptions of prior design knowledge which many of the non-traditional students did not possess. Based on these early lessons, the curriculum evolved through close collaboration between Access Course lecturers, the course's coordinator, and a small number of lecturers from different design departments who volunteered their expertise and assistance with assessment of student work and with the annual review of the curriculum. Since the course lecturers were also curriculum planners, feedback from these reviews, as well as from student's results and surveys, could be rapidly implemented into pedagogic strategies and into the curriculum. The course was overseen by the Dean, who supported this ideologically strategic, albeit marginal course during a time of fundamental political and social transformation in South Africa.

In 2004 the Access Course it was renamed the Design Foundation Course of the newly merged CPUT's Faculty of Informatics and Design. In 2007 it was officially incorporated into the diploma structure of this Faculty. This newly acquired status simultaneously paved the way for accessing Department of Education funding for Extended Curriculum Programmes (ECP's). These changes necessitated aligning the curriculum to comply with the official regulations of the funders, of the faculty and of the university, but the course retained its integrated, multi-disciplinary form of delivery.

1.2 Rationale

The Design Foundation Course, in its various guises, has for eighteen years prepared students for further study in design. Its curriculum has continued to evolve in the habitual

collaborative and responsive fashion, shaped by observation, insight and experiential feed-back, and by commonly understood, but frequently implicit, educational design theory. What is understood by design knowledge in this curriculum and how the intended curriculum has been structured to enable transfer of design knowledge and consciousness to underprepared students, has not yet been consciously scrutinized from any theoretical perspective.

I have been a lecturer on this course since its inception and have been actively involved with designing and improving the curriculum over the years. Being exposed to social theories of knowledge during the course component of my master's studies at UCT has fuelled my curiosity to scrutinize design knowledge, and its structuring in the foundation course's curriculum, in a less 'commonsense' way. This curiosity is motivated by a desire to understand how design curriculum can contribute to better enabling students doing the course to succeed in their quest to become productive, innovative design professionals.

The university is currently in the process of re-curriculation with the view to offering both diploma and degree courses. This has initiated a process of examining design knowledge and its structuring in our various course curricula, including identifying core, generic design knowledge. In the light of these developments, an examination of the nature of design knowledge and the role of the curriculum in its transfer to students appears both timely and necessary.

1.3 The Question

This dissertation provides an opportunity to investigate the integrated, studiowork component of the Design Foundation Course's curriculum by means of a less familiar 'gaze': that of the educational sociology of Basil Bernstein and Karl Maton. This theoretical framework will provide the language of description with which to define design knowledge and its recontextualised form in the curriculum and discuss the implications for knowledge transfer intended by this curriculum.

This dissertation therefore asks the questions*: How has Design knowledge been recontextualised into the project briefs of the studiowork component of the integrated, multidisciplinary Design Foundation Course's curriculum and how does this curriculum enable the intended development of design knowledge and consciousness over the course of the year?*

1.4 Outline of dissertation

In order to answer these two related questions, this dissertation will attempt the following:

I will first describe what is understood by design knowledge and its progression. This will involve clearing up some common misunderstandings about Design, by distinguishing between how it is currently understood, and its older relatives, Fine Art and Craft. I will position this study within recent research into design knowledge and education.

I will then describe design knowledge and its progression viewed through a different theoretical lens: that of the educational sociology of Basil Bernstein and Karl Maton. These theoretical languages will provide the analytic tools with which to position curriculum in pedagogy and to analyse a theory of design cognition and its development.

I will use this theoretical lens to develop a language of description for analyzing the projects briefs of the Design Foundation Course, which constitute the data sources of this study. The development of the language of description emerges out of the theory chapter, which leaves the methodology chapter to discuss its application to the data.

The data will be analysed to establish what forms of design knowledge are legitimated by inclusion in the project briefs, and how the sequencing of these projects enable or inhibit the intended transfer of design knowledge and consciousness in a multi-disciplinary design curriculum.

Chapter 2: Literature review

Design research, as opposed to Art historical research and theory, is a relatively new field. The Design Research Society was founded in the 1966, but design research was only established as a coherent discipline in the 1980's (Cross, 2007). Here Cross refers particularly to research into design methodology and process rather than to practice based design research.

In his overview of the past 40 years of design research, Cross (2007, pp. 1-3) highlights the emergence of two dominant theoretical positions in the field – Scientific Positivism and Constructivism. Simon's seminal work '*The Sciences of the Artificial'* (1968) described the scientific, analytical approach to solving design problems whilst Schön's, '*The Reflective Practitioner*' (1983) viewed design as a more artistic, intuitive process. What these two schools of thought held in common was an interest in understanding the design *process* (Dorst, 2008).

A related debate concerned defining Design as a discipline. Research into general design education conducted by Archer at the Royal College of Arts (RCA) in 1979, identified the domain of study peculiar to design as that of the '*artificial*' world, to distinguish it from that of science, concerned with the '*natural*' world, and the humanities with '*human experience*' (Archer cited in Cross, 2006, p. 2). According to this report, Design was the third culture missing from Snow's (1959) influential 'two cultures' debate, and a discipline in its own right. Archer concluded that Design should be understood as *'the collected experience of the material culture, and the collected body of experience, skill and understanding embodied in the arts of planning, inventing, making and doing'* (Archer cited in Cross, 2006, p. 1). Here material culture is understood as a carrier of generations of design knowledge which designers are able to decode and use to create new objects or environments. According to Cross (p. 9) designers are able to 'read' and 'write' material culture.

More recent research conducted by means of protocol studies of the design process illuminates its diverse modes of cognition, or what Cross refers to as 'designerly ways of

knowing' (Dorst & Cross, 2001) . This research confirmed the dialectic, 'bi-modal' (Schön, 1983) nature of design, which characteristically involves using both analytical reasoning *and* creative imagination to solve ill-defined problems.

In his influential paper on design research, Dorst (2008) claims that these investigations into design process and methods have dominated design research until recently, to the exclusion or 'bracketing' of other equally important elements of the field such as the '*designer,*' the '*design context'* and the '*design object'* (p. 7). He suggests that recent design research is showing signs of what Thomas Kuhn (1962) called a 'paradigm shift', and that this shift is being brought on by certain anomalies in process oriented research, which are challenging the way that design research, design practice and their respective purposes are understood.

According to Dorst (2008), one anomaly concerns the relevance of process methods research for design practice and education, when this research is disconnected from the design context, the design object and the designer. Another anomaly concerns the manner in which process oriented research has largely ignored fundamental changes in design practice being brought about by globalization, rapidly developing new technologies and increasing economic and environmental uncertainty (pp. 4-8).

To start to address these perceived anomalies in design research, the *designer* is fore-grounded in more recent design research (Lawson, 2004; Cross, 2004; Dorst, 2008) which examines differences between how novices and expert designers approach design problems. Based on interviews with expert designers and on the work of Herbert Dreyfus (2004) on expertise, their investigation of different levels of *design* cognition – Novice, Advanced Beginner, Competent, Expert, and Master – has significant implications for curriculum development. It has direct bearing on my enquiry, which is concerned with how design curricula facilitate knowledge transfer. Furthermore, Dorst and Reymen (2004, p. 1) observe that no theoretical basis exists yet with which to explain the empirically observed differences between these levels and their progression. A proposed theoretical basis will be addressed in the Theory chapter.

Current debates about design are less concerned with whether design is an art or a science and more with the inter-disciplinarily nature of design and its capacity to '*integrate knowledge and insight from many disciplines – the fine arts, the humanities, the social and behavioral sciences, and engineering and the natural science's* for productive purposes (Buchanan, 2001, p. 189). These debates touch on the other 'bracketed' elements of the design field identified by Dorst – those of design content and context. They warrant further discussion if the research question related to the nature of design knowledge is to be answered successfully.

Buchanan (2001), in his seminal paper '*Design and the New Rhetoric'*, argues persuasively that considering technology and design from a rhetorical perspective can provide us with fresh insights into the nature of the design cognition and its capacity to connect theory with practice. Design thinking, like rhetoric, '*has no fixed subject matter*' (p. 191). Viewed as a form of persuasive visual argument, it is domain independent and can be applied to any number of design contexts, regardless of disciplinary boundaries:

> *Design is an art of invention and disposition, whose scope is universal, in the sense that it can be applied to the creation of any human-made product (*Buchanan, 2001, p. 191).

Buchanan's understanding of design has major implications for this study about the nature of design knowledge and the education of future design professionals. To practice medicine requires different kinds of medical knowledge. Yet to practice design requires integrating knowledge from many different fields. What, other than requiring creative cognition, distinguishes design knowledge from those of other professions?

Design thinking may not have a fixed subject, but design practice is contextually situated and purpose driven. These contexts generate the design briefs which provide the subject, or problem, requiring the application of design thinking. According to Friedman '*Good design solutions are always based on and embedded in specific problems*' (Friedman, 2003, p. 511). This situated nature of design problems also determines specialised forms of design practice.

Heskett's (2005) investigation into Design history shifts the focus from the 'end result' of the design process to how this result is received by the user within a given context – from design outcome to the '*interplay between the designer's intention and the user's needs and perceptions*' (p. 36). For this reason his history is structured around what he refers to as 'generic *concepts'* rather than design disciplines. These overarching concepts incorporate a range of 'end results' which share certain features across disciplines. These concepts include 'objects' (three-dimensional artifacts), 'communications' (two dimensional materials and the media), 'environments' (interior and exterior spaces), 'systems'(collective entities constituted of interacting, interrelated, interdependent forms) and 'identities' (national, corporate or individual, constructed by objects and/or environments). However, these generic concepts reveal little about the knowledge or content required to construct socially meaningful and contextually relevant design solutions. At this point a few definitions may suffice.

2.1 Definitions

Understood in the broadest and most inclusive sense of the word, design can be defined as *'the human capacity to shape and make our environment in ways without precedent in nature, to serve our needs and give meaning to our lives'* (Heskett, 2005, p. 5). This human capacity has remained constant over millennia and defines, along with language, '*what it means to be human'* (p. 6). What has changed, over time, are the tools, materials, technologies and fabrication methods at our disposal, and the social, economic and organizational contexts within which the creative design process happens.

Viewed in this holistic way, design affects every aspect of our daily lives which involve interacting with the material environment. Heskett (2005) agrees that design generates a great deal of ephemeral, inconsequential material. But beneath this '*froth and bubble'* (p.2) lies its formidable capacity to shape and construct the human environment and to influence human behavior, for better or worse.

Heskett uses the Modernist dictum 'Form follows Function', to explain how the form of things communicates function in two ways: it either refers to utility − the way things work − or it refers to a form's significance – the way it communicates meaning (p. 25).

Understanding how objects or environments function − their fitness to purpose −requires knowledge about technology and ergonomics: for example the functional attributes of form, the properties of different materials and specialised techniques of fabrication and realization. These kinds of knowledge are rational, specifiable and quantifiable.

Understanding how objects and environments communicate meaning, or significance, requires knowledge about social behavior, cultural/gender/ generational values and preferences, fashion and aesthetics (target markets, specialized needs, values and practices). The outcome of design decisions involving people's responses to form would be less predictable. Beauty, status, fashion or humour is relative to the user's perception, unlike gravity, colour fastness or the melting point of silver, which is inherent in the materiality of the object.

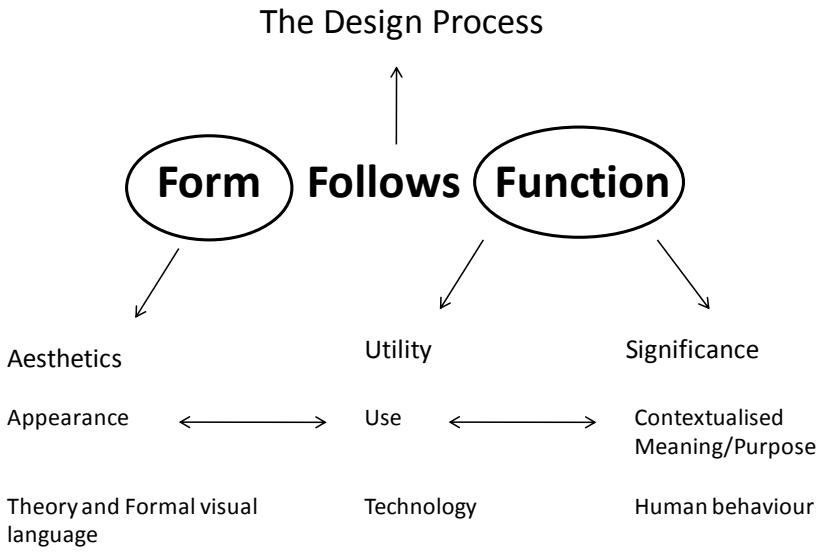


Figure 1 Aspects of design knowledge, inspired by Heskett (2005:25)

During the design process all these intertwined forms of knowledge, ranging from symbolic meaning to technological efficiency, economy and ergonomics are translated

into a functional or significant form. Figure 1 represents my understnding of aspects of design knowledge, inspired by Heskett's description of 'function' in design.

Buchanan's (2001) comparison of design with rhetoric includes a compelling description of the three distinguishing features of well structured and persuasive arguments, which he claims are equally relevant for design: *Logos, Pathos* and *Ethos* (pp. 195,196). These features augment Heskett's insights into the aspects of design knowledge involved in form making, by focusing on the kinds of *thinking* required to transform these knowledges into objects which communicate unambiguously how they should be used and understood. They also provide a more nuanced interpretation of 'significance '.

Logos refers to the *usefulness* of objects. It involves the logical, rational 'technological reasoning' required to ensure a product's utility. Different design contexts and design specializations would require the application of different forms of logos; for example a fashion designer would apply logos to the design of a measured, accurately specified coat pattern.

Pathos, in design, refers to a product's *usability* or degree of 'affordance' in relation to an intended user or group of users. These affordances could relate to the '*physical, cognitive, emotional or cultural features or adjustments*' of artifacts which make them '*suitable for human use*' (p. 195). Designing a usable winter coat would require selecting the materials and technology best suited for its use by particular people (gender, age, status) under specific environmental conditions and social circumstances; for example cold/wet/extreme/mild winter, formal/casual/or part of a uniform.

Ethos refers to the '*voice*' of a product, and its capacity to persuade people to identify with it and find it *desirable*. The *'voice'* of the product is ephemeral and may have more to do with perceptions of the object than with the object itself. This explains why a perfectly usable and useful winter coat is considered desirable one year and not the next because the cut, length or colour is no longer considered fashionable. Where '*voice*' is applied over a range of products it becomes a brand or a corporate identity. Aesthetics form a part of this appeal for identification with the product by helping to communicate the '*voice*' of the client, and of the designer, by means of a range of styles (p. 196).

For a designer to use stylistic features to enhance the aesthetic appeal of products to targeted groups requires possessing a developed 'gaze' : this capacity for aesthetic discrimination requires familiarity with design traditions, historic styles and with current trends, including being well versed in formal visual language without which 'reading' and 'writing' design, in context, is not possible. This language consists of the vocabulary, or elements, of design as well as to their ordering principles, or grammar.

However, the voice of a product relies on more than aesthetics to communicate its appeal to potential users. The ultimate test of a designer's ability to facilitate a meaningful connection between a design's intention and human need is to conceptualise products that balance that which is useful, useable and desirable. According to Buchanan this balance is determined by the designer's 'stance' or point of view (pp. 196-197). As a socially situated activity, design decisions are not ideologically neutral. They are taken within constraining social, environmental and economic contexts, and they frequently involve moral choice. The paradigm shift in design thinking referred to by Dorst (2008) requires that designers question whether the results of their design choices are sustainable, contextually relevant and necessary. '*In the final analysis, what we design is a reflection of what we value, not how we design*' (Righini, 2000, p.186).

In summary, the cognitive, creative design process is the definitive practice of design, regardless of disciplinary specialization. It bridges the *'intellectual gulf that exists between applied research and the development of successful products'* (Buchanan, 2001, p. 194) by synthesizing knowledge from a wide range of fields. And yet design practice is frequently oversimplified and misrepresented as 'applied science' or mistaken for being purely concerned with 'superficial styling' (pp. 193-194). There are many reasons for this confusion about what design is and what designers do since 'design' can refer to a process, a product and to a field of diverse design activities and professions.

The contemporary understanding of Design as a profession only became firmly established after WW2, when consumerism was actively encouraged to stimulate economic growth in America and in Europe, and governments and business increasingly saw the potential of design to add value to their products (Dormer, 1993). Heskett (2005)

distinguishes between these relatively new Design professions, like Industrial and Graphic design and the more established ones of Architecture and Engineering. Although these older professions are part of the overarching field of design their strong professional identity and officially regulated practice sets them slightly apart. Unlike them, Design has never been officially classified as a unified profession, with an established knowledge base and clear standards of membership and practice. This has resulted in an ever growing number of design disciplines, defined by their specialized forms of design practice as well as by shared '*generic patterns of activity*' (Heskett, 2005, p. 5).

The confusion surrounding design practice and the lack of a clear concept of design knowledge has direct bearing on this study, concerned as it is with bringing different forms of design knowledge into clearer focus. It has ramifications for current attempts to differentiate between the kinds of knowledge best suited for diplomas and degrees in a range of different design disciplines offered for study at CPUT.

This confusion is partly due to the lasting legacy of a much older split between the fine and useful arts during the Renaissance. Related to this is the frequent conflation of Design with its older relatives, Fine Art and Craft.

2.2 Origins

To understand the confusion around the contemporary understanding of what design knowledge is and what designers do requires a very brief and selective overview of its origins. This will distinguish design from fine art and craft and trace the roots of the contemporary design profession and its many specialized forms.

Firstly, the Concise Oxford dictionary (Allen (ed.), 1990, p. 315) definition usefully narrows down the contemporary meaning of the word 'design': Both noun and verb, it refers to the products, the plans, and to the planning process. It does not include *making* the product. It is generally agreed that this divide between designing, planning and making defines contemporary design practice and distinguishes it from both Craft and Fine Art (Buchanan, 2001; Dormer, 1993; Heskett, 2005; Sparke, 2009).

2.4.1 Craft and Fine Art

Lucie-Smith (1981) describes how the distinction between Craft and Fine Art emerged during the Italian Renaissance when the weakening of the once powerful medieval craft guilds enabled certain craftsmen to establish themselves as fine artists. These Renaissance artists, along with theorists, encouraged the perceived division between intellectual and *purely* manual work already present during the middle Ages. Together they promoted the belief that artists made things informed by unique ideas of '*inborn genius'* whilst craft persons merely duplicated traditional forms. In so doing they managed to divorce the fine arts from the useful arts, which came to be perceived as '*servile, materialistic, and lacking the degree of thought that belongs to mathematics and the liberal and fine arts*' (Buchanan, 2001, p. 186). Lucie-Smith (1981, p. 165) notes how during the 17th and 18th centuries this intellectual prejudice against hand work and technology took on a social dimension with the status of fine artists elevated above those of successful craftsman-entrepreneurs , such as Chippendale. The legacy of this '*taint of utility'* (Sudjic, 2009, p. 188) associated with craft production has been transferred to Design where it remains entrenched in contemporary distinctions between the value and status of Fine Art and Design.

What is significant for this study is that Fine Art and Design share a formal visual language, a theory of aesthetics and, to a lesser degree, a history. This formal visual language is relatively stable but in Design, as in Craft, its ordering principles are connected to a purpose and involve constraints.

> *A painting is an answer to a need that cannot be conceived apart from the painting that answers it. Design on the other hand, is an answer to a need that can be discussed independently, and that could be answered by a number of alternative solutions (Caplan, 2005, p. 135).*

2.4.2 Craft and Design

It is generally agreed that the distinction between 'designing' and 'making', which dates back to the Industrial Revolution in England, irrevocably transformed production and consumption patterns , and marks the beginning of a process which lead to the establishment of the design profession as we know it today (Dormer, 1993; Lucie-Smith, 1981; Sparke, 2009).

Newly invented products and cheap imitations of those previously crafted by hand, could now be mass produced by machines and sold in newly designed department stores or by means of mail order catalogues. These products – both useful and fashionable- had to be introduced and promoted, graphically, in a manner that enhanced their appeal to potential customers *after* they were produced (Sparke, 2009:30-31).

These new forms of mass production and communication paved the way for the establishments of the graphic design and industrial design professions, and for a raft of others which emerged during the closing years of the 19th and the early years of the 20th centuries, and continue to diversify to this day (Buchanan, 2001, p. 188). The process set in motion by the Industrial Revolution can be described as a massive paradigm shift, since a series of scientific and technological inventions stimulated the creation of a proliferation of new products unprecedented in human history, for which suitable shapes had to be found: just think electricity, telecommunication and automobiles to name a few.

Initially, the new manufacturers of mass produced goods relied on pattern books of historic ornament and form to generate shapes. Or, like Josiah Wedgewood, they employed fine artists to do so (Heskett, 2005, p. 18). Since these artists were unfamiliar with industrial production methods, their drawings required translation into workable designs *before* manufacturing could commence. This task of communicating design intentions and specifications to others by means of technical drawings and plans became the responsibility of a '*new generation of draughtsman*' (p. 18) who, by the mid 19th century became the precursors of contemporary industrial designers. This skill to specify

for production is what distinguishes the activity of designing from the more tacit craft process of making (Dormer, 1993, p. 9).

It is generally agreed (Heskett, 2005; Lucie-Smith, 1981; Sparke, 2009) that the search for appropriate form resulted in many designs inspired by and suited to the new methods of industrial production, for example Thonet's iconic bentwood furniture . But it also resulted in those which slavishly copied natural and historic forms and used cheap materials to imitate expensive ones. It was this 'dishonest' use of materials by the Victorians and the indiscriminate application of historic ornament on forms which bore little relation to their intended function, that provoked the backlash of Ruskin and Morris against what Lucie-Smith terms the '*misuse of the machine'* (1981, p. 214)*,* and which lead to the formation of the influential Arts and Crafts movement, some of whose principles of 'good design' were shared by likeminded designers in Europe and America. These principles included fine craftsmanship, simplicity, truth to materials, fitness to purpose and a preference for the use of stylized over copied natural forms (Heskett, 2005, pp. 20-21; Lucie-Smith, 1981, pp. 209-220; Sparke, 2009, pp. 34-41). Their influence can be traced through the designs of the late 19th to the unadorned, abstract forms favored by 20th century Modernism (Sparke, 2009, p. 41).

In Germany the Deutscher Werkbund and companies like AEG pioneered attempts to form a relationship between art, craft and industry in their search for new forms suited to and expressive of the standardised and competitive production methods of the machine age (Sparke, 2009, pp. 51-52). This ethos was supported, if not realised, by the philosophy and practices of the Bauhaus and in its influential workshop centered curriculum (Dormer, 1993, pp. 16-17).

2.4.3 Bauhaus Curriculum

The modernist curriculum of the Bauhaus included a Basic Course which, along with much else of the Bauhaus curriculum, became a template for design education in the 20th century (Whitford, 1984; Wick, 2000). Johannes Itten was responsible for the first version of the Basic Course, which explored composition, abstract form and colour by means of

his theory of contrasts, and introduced students to the organizing principles (grammar) and core elements (vocabulary) of formal visual language (Itten, 1975). Moholy-Nagy's version shifted the focus of the course from art and craft towards industry and the production of prototypes (Fiell, 1999, p. 85).

All design foundation curricula owe some debt to the Basic course of the Bauhaus (Whitford, 1984; Wick, 2000) and the curriculum under scrutiny is no exception, with its exploration of materials, fabrication methods and liberal reference to design elements, principles and theories of contrast, including those related to the grammar of colour.

It has been noted how the shared features of logos (useful), ethos (desirable) and pathos (usable) inform the design of objects, environments, systems and forms of visual and symbolic communication for productive purposes. But there has been no discussion in detail of the design process which integrates all these features.

There are many processes that make up what is understood by design, from initial definition or analysis of a brief to its implementation. Numerous models exist to explain these processes, usually in linear fashion, such as this one by Ambrose and Harris (2010):

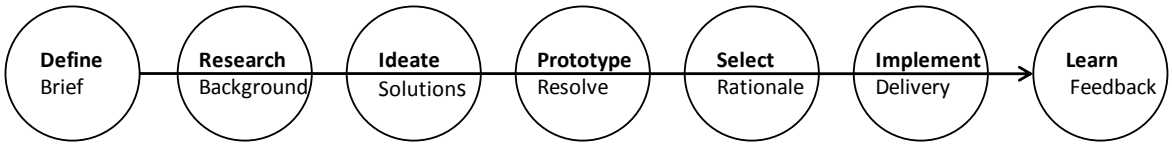


Figure 2 The seven stages of design (Ambrose & Harris, 2010, p. 12)

The integrative process of visual and spatial ideation is what is commonly understood as the definitive process of design practice (Buchanan, 2001; Cross & Dorst, 2001; Heskett, 2005). It is during this process that the designer has to structure innovative arguments which result in persuasive design proposals and prototypes. It is the practice of this largely intuitive process which students acquire during studio centered pedagogy, through tacit and discursive means of instruction. It is here where students, through a process of apprenticeship, are inducted in a secondary visual discourse (Gee, 1996). For this reason it requires closer scrutiny.

2.5 The Design Process

This visual design process involves applying design thinking to synthesize different kinds of knowledge to meet the requirements of a client's brief. Cross-disciplinary research points to the domain independence of this cognitive process and its capacity to use 'visual codes' to translate abstract concepts into material form, and to make connections between domains, just as language translates thoughts into words (Cross, 2006, p. 8).

Cross defines design ability, as being able to do the following (p. 12):

- Resolve ill-defined problems
- Adopt solution focused strategies
- Employ abductive/productive/appositional thinking
- Utilize non-verbal, graphic/spatial modeling media.

Ill-defined or 'wicked problems' are indeterminate in that they have more than one potential solution (Rittel, 1967, cited in Buchanan, 1992). For this reason designers, unlike scientists, tend to adopt solution rather than problem focused strategies for finding appropriate, as opposed to optimum, solutions. Solution focused problem solving is a form of abductive or conjectural reasoning, which involves testing potential solutions, and reframing the question by engaging with task constraints. In so doing, designers gain new insights into the design problem, which results in the re-framing of it and of the evolving solution. Schön (1987, p. 27) describes this process of learning-by-doing as '*reflection in action'*. Gee (1996) describes this process of immersion in a practice as *'learning* **inside** *the procedures rather than overtly* **about** *them'* (p. 136).

> *I don't think you can design anything just by absorbing the information and then hoping to synthesize it into a solution. What you need to know about the problem only becomes apparent as you're trying to solve it (McCormack cited in Cross, 2006, p. 32).*

Although analytic research of contextual design constraints and affordances are commonly thought to precede the constructive design process, recent design research

indicates that they progress simultaneously, as parallel or 'co-evolutionary' processes, rather than in a neat linear sequence, from problem to solution (Maher, Poon & Boulanger,1996, cited in Dorst & Cross, 2001). This co-evolution is variously described as a '*dialogue*' (Calatrava, cited in Cross, 2006: 91), an *'oscillation'* (p. 91) and a *'shift from verbal, analytical, logical skills to spatial, intuitive skills'* (Righini, 2000, p. 188). Cross (2006) describes how, like the famous duck-rabbit puzzle, designers shift focus from part-problem to part-solution until they recognise a satisfactory match (pp. 56-57). He concludes that this frequently emotional moment of recognition is less of a 'creative leap' than a process of conceptual bridging between problem and solution spaces (pp. 84-85). These descriptions all point to the integration of different forms of design knowledge in the process of creating new things.

They concur with Polanyi's distinction between tacit (*subsidiary*) and explicit (*focal*) forms of awareness of the world, which function simultaneously but '*which cannot be attended to at the same time', requiring 'an act of integration*' (Polanyi, 1996, pp. 138-158 cited in Arnal & Burwood, 2003, pp. 384-385).

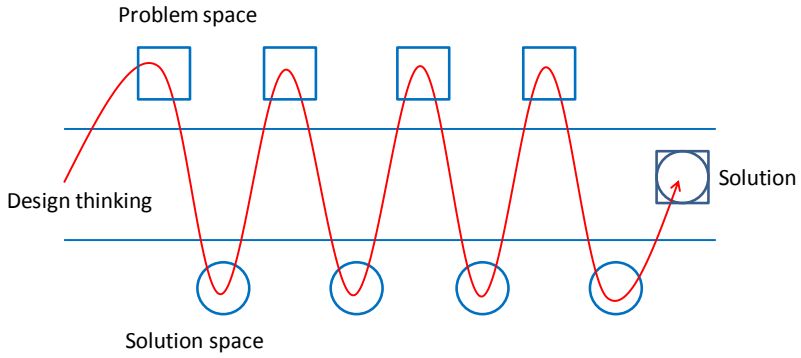


Figure 3 The design process represented as a co-evolution of problem and solution space (adapted by the author from Dorst & Cross (2001, p. 435)

Solving ill-defined design problems, which by their indeterminate nature have more than one potential solution, requires that the designer exercises agency and gaze. This process of reflective practice involves making design choices, which in turn creates opportunities to exercise judgment according to valued disciplinary criteria which are not always explicit. This cognitive capacity to make decisions and exercise judgment during the

design process has to be acquired, along with disciplinary knowledge, by students of design. This design judgment is not purely aesthetic, but involves working towards finding the right balance of *logos, pathos* and *ethos* in a design proposal.

Recent design research by Dorst (2009) and Lawson (2004) into the designer's role in the design process found distinct differences in the ways novices and experts think and engage in this cognitive process. This research has significant implications for designing curriculum that enables the transfer of design knowledge and consciousness. It has immediate relevance for this study and will be explored further in the theory chapter.

Design theory, as discussed above, has identified that design practice involves using creative cognition to integrate knowledge from different fields into coherent and persuasive design proposals for solving problems across a diverse range of contexts. Yet the exact nature of this knowledge remains elusive. Knowledge of the history and theory of art, of aesthetics and of formal visual language is part of this knowledge base, but is not unique to Design. Nor is the knowledge about specialized materials, procedures and fabrication techniques. What is the nature of the knowledge which distinguishes a dressmaker from a fashion designer or an architectural technologist from an architect?

In the following chapter the social theories of knowledge of the educational sociologists Basil Bernstein's and Karl Maton will be used to describe the structuring principles of knowledge, thereby providing me with a critical sociological 'lens' through which to view Design knowledge. Their work will furthermore be used to examine the role of curriculum in the specialization of knowledge and consciousness in general, and in the foundation curriculum under investigation in particular.

In order to bridge the gap between these highly abstract theoretical languages of description and my empirical data, I have selected two other theoretical sources from the field of Design to help develop an analytical instrument. The first of these is a typology of design project methods developed by Lee (2009). The second source consists of the results of empirical research into the development of design cognition, adapted from the Dreyfus's (2004) research into levels of expertise.

All of these sources will be synthesized into a language of description for analyzing the intended curriculum of the Design Foundation Course. This unusually long chapter therefore introduces theories of knowledge whilst simultaneously developing the research methodology.

Chapter 3: Theory

Bernstein's abiding interest was how education specializes consciousness differentially. Whereas many other theorists had noticed that education is a carrier of dominant social relations, he was one of the few to conceptualise the *relay* of these power and control relations *within* rather than *by means of* pedagogy, and he did so with the pedagogic device (Bernstein, 2000).

3.1 The Pedagogic Device

This pedagogic device consists of three hierarchically related fields, each with its own generative rules:

The *field of production* (universities, research units, design offices/studios) is the site of the creation of new or unthinkable knowledge. Here the distributive rules of power determine what counts as legitimate knowledge (pp. 28-31).

The *field of recontextualisation* (education departments, textbooks writers, curriculum designers) is where this legitimate knowledge is converted, according to the rules of recontextualisation, into educational knowledge (pp. 31-33). According to Bernstein, these '*imaginary subjects*' (p. 233) bear little relation to their parent knowledge forms but this is generally accepted as being overstated (Muller, 2008, p. 19).This is particularly so in Higher Education where academics frequently work in all three fields, as is often the case in the traditional design studio, with its roots in the master-apprenticeship model of knowledge transmission.

Finally, the *field of reproduction* is where recontextualised pedagogic knowledge, in the form of subjects, is transmitted, acquired and evaluated in schools and at undergraduate level at tertiary institutions. It is here where the evaluative rules control the differential acquisition of the recognition and realization rules of a knowledge discourse (Bernstein, 2000, pp. 35-38).

The relocation of knowledge from one field to another creates what Bernstein calls a discursive gap where '*ideology can play*' (p. 32). The recontextulalising agents – whether operating in the official or pedagogic recontextualising fields (p. 33), can 'set' the curriculum, by means of their recontextualising gaze, to suit their own interest. In this way dominant power relations are deliberately, or less consciously, relayed by curriculum and pedagogy into students' consciousness.

Changes to the design foundation curriculum enforced by the recent official alignment with those of the first year diploma courses are an example of the power of the official recontextualising agents on a curriculum. But this curriculum is also influenced by the recontextualisng rules, and gaze, of the pedagogic recontextualising agents (the lecturers) who are given considerable autonomy over selecting the content, sequence, pacing and evaluative rules of these projects. As one of these lecturers, the pedagogic device is a powerful reminder of the potential impact of my recontextualising gaze on the intended and enacted curriculum.

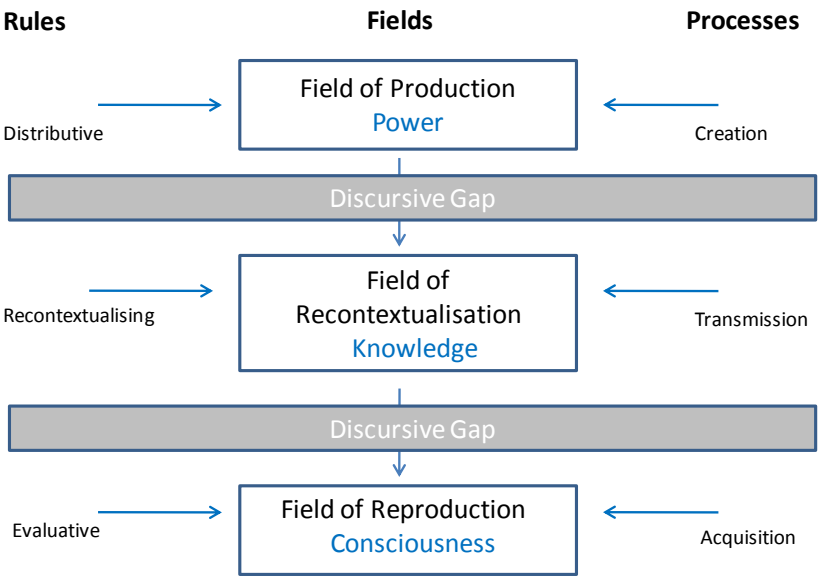


Figure 4 The pedagogic device, based on Bernstein (2000, p. 37)

With the hierarchical structure of the pedagogic device Bernstein described the relay of knowledge and consciousness within pedagogy. However, it is only in his late work that

Bernstein turned his attention from examining the *relay* of knowledge to the *structure* of knowledge – in the field of production.

3.2 Vertical and Horizontal Discourse

Bernstein (2000) first distinguished between what he called Horizontal and the Vertical Discourse: Horizontal Discourse refers to everyday or commonsense knowledge. This knowledge is '*oral, local, context dependent and specific, tacit, multi-layered and contradictory across but not within contexts*' (p. 157). For example, learning how to peel an apple bears no relation to learning how to ride a bicycle. Transmission of Horizontal Discourses is frequently tacit, by means of modeling.

Vertical Discourse refers to schooled or recontextualised knowledge and is either hierarchically or serially organised. This knowledge is specialized, explicit, abstract and hierarchically connected at the level of meaning. For example, doing times tables is dependent on first learning how to add. Its transmission is coherent, hierarchically and formally regulated and sequenced over time (pp. 156-160).

3.2.1 Hierarchical and Horizontal Knowledge Structures

Vertical Discourse consists of two knowledge forms: Hierarchical and Horizontal knowledge structures (Bernstein, 2000, pp. 161-169), and are relevant for understanding design knowledge.

Hierarchical knowledge structures are '*coherent, explicit and systematically principled*' (p. 157), generating increasingly abstract, general prepositions and integrative theories. Hierarchical knowledge structures are typically found in the natural sciences. Bernstein suggests that this knowledge is integrative and that knowledge progression happens vertically by means of either subsuming or incorporating existing theories into more general, abstract and integrative ones. Because of the strong grammar of the language, these theories can be used as a form of unambiguous communication, thus enabling disputes to be settled empirically (p. 165). Hierarchical knowledge structures are

distinguished by the strength of their verticality – the integrative capacity of a theory or the power of its conceptual reach − and reveal the '*uniformities across an expanding range of apparently different phenomena'* (p. 161). Hierarchical knowledge structures in Design would conform to those concerning utility and technology – with the *logos* of how things work.

Horizontal knowledge structures are prevalent in the Social Sciences and Humanities. They consist of discrete theoretical languages, each with its own criteria, 'gazes' and speakers. Knowledge develops serially, through a process of accumulation.

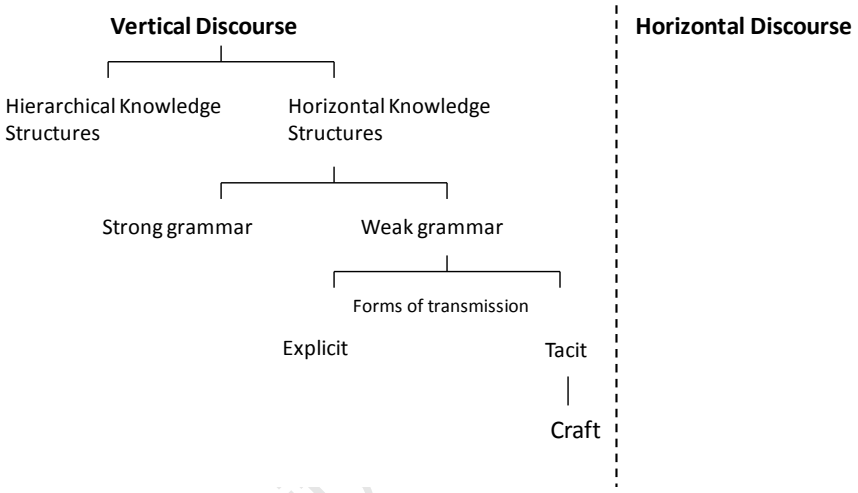


Figure 5 Vertical and Horizontal Discourse, based on Bernstein (2000, p. 168)

Because of the weak grammar of many horizontal knowledge forms, change is the result of struggles for hegemony and disputes are dealt with by means of critique (p. 172). These struggles may lead to the creation of a succession of new theories with new languages, new criteria, and new speakers with unique 'gazes' (pp. 164- 165). 'Gaze' here refers to the acquirer, and not the discourse to be acquired. Tacitly acquiring the 'gaze', or the recontextualising principles of a discourse, enables the recognition of its legitimate evaluative criteria and the ability to realise these in legitimate texts by the acquirer (p. 174). Failure to do so is educationally disastrous because '*to know is to gaze'* (p. 164).

Horizontal knowledge structures are further distinguished between those with 'strong' and 'weak' grammars. Those with strong grammars, for example Mathematics and

Economics, have '*an explicit conceptual syntax capable of generating relatively precise empirical descriptions*' or '*modeling of empirical relations'* (p. 163), whilst those with weak grammars do not. The latter rely on the weaker descriptive criteria of incommensurable theoretical languages, as are found in Sociology and Anthropology. In Design, horizontal knowledge structures would conform to those concerned with communicating meaning either explicitly, or by means of more ephemeral fashions. Bernstein finally distinguishes between tacit and explicit forms of transmission of horizontal knowledge structures with weak grammars. Explicit forms of transmission try to make the '*principles, procedures and texts to be acquired*' (p. 169) as explicit as possible. Craft is provided as an example of a form of pedagogy using a tacit form of transmission, '*where showing or modeling precedes doing*' (p.169), and is positioned closest of all to the everyday knowledge of Horizontal Discourse.

3.2.2 Knowledge Regions

Bernstein (2000) furthermore distinguishes singular discourses from regions, which consist of *parts* of the singulars which have been selectively recontextualised into larger regions (p. 9). By recontextualisation, Bernstein refers to the repositioning of knowledge from one context to another, during which it is transformed in some way. Bernstein's description of knowledge regions could be taken as an acknowledgement of the limitations of the explanatory reach of his knowledge structures – which consist of pure knowledge forms and do not take applied knowledge forms, prevalent in the professions, into account.

Singulars are usually referred to by name, and constitute fields of knowledge production which are completely self referential and strongly bounded. Regions face inward towards several singular knowledge forms which combine around the outward facing, '*supervening purpose'* of the region (p. 52). Regions, like Medicine, Architecture and Engineering '*are the interface between the field of production of knowledge and any field of practice*' (p. 9). Boundaries between singulars are weakened to privilege the supervening purpose of the region, which defines its identity in the world of practice.

3.2.3 Design as a region

Design can be described as a region, of which the supervening purpose is the integrative and creative design process. As was discussed previously, this is the definitive process of design practice. Design thinking is domain-independent but is usually applied to a design brief which is discipline and context specific, and which requires familiarity with specialized design knowledge and procedures. A distinguishing feature of the design profession is the designer's task to integrate and synthesize knowledge from '*many other disciplines – the fine arts, the humanities, the social and behavioral sciences, and engineering and the natural sciences, to solve contextualized design problems…'* (Buchanan, 2001, p. 189). Friedman similarly describes Design as a field which integrates different kinds of knowledge, in differing aspects and proportions (Friedman, 2003, p. 508). He identifies 6 knowledge domains, which bear a strong resemblance to those identified by Buchanan:

1. Creative and applied arts
2. Humanities and liberal arts
3. Social and behavioral sciences
4. Human professions and services
5. Natural sciences
6. Technology and engineering

Shared forms of design knowledge which have been recontextualised from singulars represented by the first four domains include:

- visual and spatial design (Fine Art), a horizontal knowledge structure with weaker grammar;
- design history and theory (History of Art), a horizontal knowledge structure with stronger grammar;
- design context and purpose (Sociology and Psychology), horizontal knowledge structures with weaker and stronger grammars respectively);
- professional design practice (Law, Economics), horizontal knowledge structures with stronger grammars.

Forms of Design knowledge recontextualised from singulars represented by the last two domains would be determined by the disciplinary specialization:

- Scientific knowledge, concerned with the properties and behaviors of materials (Physics /Biology/ Metallurgy): hierarchical knowledge structures with strong grammars;
- Technology and Quantitative literacy: specialized knowledge about the construction and fabrication of 3-D structures and environments, the reproduction of 2-D images and 3-D forms, the construction of patterns and prototypes and the assembly of components (Building Science, Computer Science, Applied Mathematics): Hierarchical knowledge structures with strong grammars.

Knowledge of these specialized technologies distinguishes design disciplines from one another, and the complexity and amount of this specialist knowledge will differ between disciplines. For example, the technical knowledge required to construct a dress would be considerably less complex than that required to construct a high rise building or a submarine, and the consequences of design failure incomparable in scale. Larger, more complex design projects commonly require the collaboration of teams of designers with specialized areas of expertise.

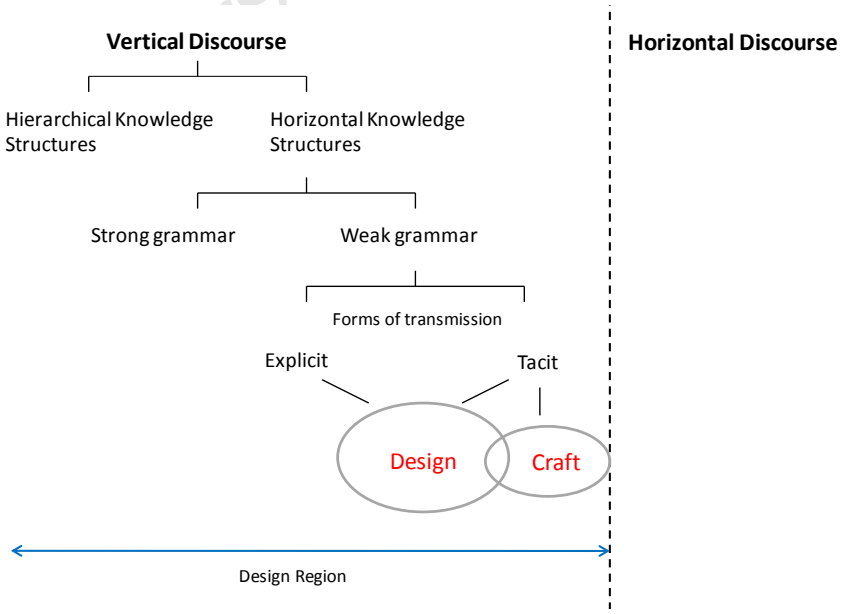


Figure 6 Design as a region, adapted by the author from Bernstein (2000, p. 168)

In summary, Figure 6 illustrates how the region of Design, like that of Architecture (Carter, 2007) extends right across the continuum of Bernstein's Vertical Discourse.

Singulars are moved from their original disciplinary contexts to serve the supervening purpose of the region, which is to design useful, usable and desirable objects, environments, systems and forms of symbolic communication. The resulting weakening of the boundary strengths between the different singulars enables their selective synthesis during design practice. In Figure 7 the productive purpose of the design process – the product – is shown to extend across Horizontal and Vertical Discourse to the interface with the user within the design context, which also generates the design problem or brief.

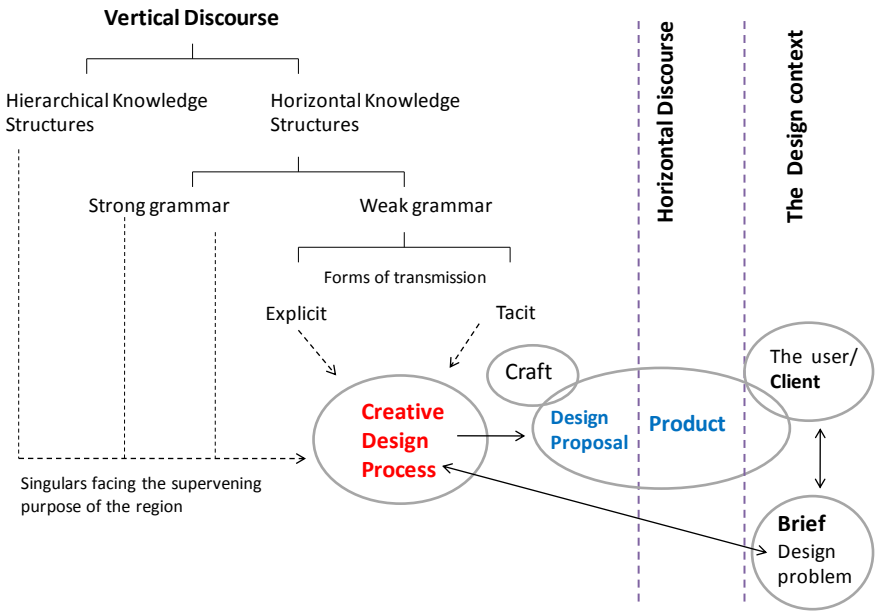


Figure 7 The relation between different forms of design knowledge involved during design practice in the field of production.

Figure 7 represents my understanding of the relation between different forms of design knowledge involved during design practice. It distinguishes between the kinds of knowledge used to *conceptualise and design* a product *(*in Vertical Discourse,*)* and to *manufacture* it (in Horizontal Discourse) to serve a particular *purpose* within a specific *context*. Design knowledge, like other forms of vocational or professional knowledge, has an added dimension of functionality. This is knowledge directed at a purpose, which results in a product or system useful to people whose changing needs continually

generate new design opportunities. Although designers frequently do not manufacture or sell what they design, they require knowledge of the manufacturing process and of the design context to generate successful design proposals.

The design process involves an oscillation between the different forms of knowledge required to resolve a design problem, but its creative, integrative function can be classified as a horizontal knowledge structure with weak grammar and a form of transmission which incorporates both tacit and explicit forms. Like Fine Art, Design '*is taught through modeling and talking*' (Bolton, 2006, p. 64). Conceptualizing Design as a region rather than as a singular enables explication of its definitive, integrative capacity.

Considering that the design region spans the continuum of Bernstein's Hierarchical and Horizontal knowledge structures, it would be expected that the singulars constituting the region may develop either by integration or by accumulation. In the following section the growth of the Design region will be explored. This is significant for this study, since the growth of knowledge in the field of production may share similarities with the progression of recontextualised knowledge in curriculum. To do so, I will refer to Heskett's (2005) view of design history as a process of layering rather than one of a succession of art historical movements and styles (2005, p. 6).

3.2.4 How design knowledge grows

Design History is conventionally presented as developing in a serial manner, with styles and movements succeeding each other. Heskett argues that this chronological art historical narrative, in which design is traditionally included, neglects to capture the ability of design knowledge to also develop hierarchically , as '*a process of layering in which new developments are added over time to what already exists*' (p. 6), without supplanting entirely that which has gone before. Considering that the History of Craft and Technology were essentially marginalized in the master narratives of Western Art History from the time of the Renaissance, Heskett's discomfort with this skewed representation of Design as a sub-text of this serial narrative is understandable. These narratives are not

the truth but *a* truth, determined by the perspective of the recontextualising gaze of the authors of art historical narratives and of curricula.

Heskett's interpretation of the history of Design is supported by Dormer (1993), who observes that '*the essential shape, form and structure of many artifacts, such as containers, tools, clothes and decoration, were fixed ten, twenty, or even one hundred generations ago*' (p. 9). Sudjic (2009) refers to these artifacts as design archetypes: Archetypal forms communicate their function and use so unambiguously that the designs endure and are emulated or adapted in accordance with available materials, technology and fashionable styles:

> *Some archetypes have millennia –long histories, with generation after generation producing their own particular interpretations of a given format. These are archetypes that have become so universal as to become invisible, each version building on its predecessor to continually refresh the basic parameters. Who would think of asking who first designed the chair with a leg at each corner?* (p. 60).

The style or aesthetic form of objects and forms of visual communication can change rapidly and serially under the influence of novelty driven fashions in a '*pecuniary culture'* (Dahl, 2007, pp. 6-7), without necessarily representing the growth of new knowledge in the field. *'As a practice, design generates vast quantities of material, much of it ephemeral, only a small proportion of which has enduring quality' (*Heskett, p. 2).

Significant developments of design knowledge are the result of changes in society and technology, as happened during the Industrial Revolution and are happening now with digital technology. Such changes present new options for designers to develop the knowledge domain by exploiting the opportunities provided by new technologies, materials and fabrication methods (Dorst, 2008; Heskett, 2005; Sudjic, 2009). This progressive layering is equally applicable to techniques of representation and to production and communication methods. Advances in digital technology are creating significant new forms of interactive design, of rapid prototyping and of representation, but these systems frequently augment rather than replace established ways of visualizing and shaping the environment (Heskett, p. 7).

Significant shifts in societal values equally contribute to the development of design knowledge across the continuum of Bernstein's knowledge structures. For example, current concerns with sustainable and socially responsible design are not only influencing designers' choice of materials, methods of fabrication and distribution but also how they communicate with stakeholders.

So the Design region exhibits examples of both horizontal (serial accumulation of styles and fashions), and hierarchical progression (subsumption and technological development of existing and new archetypes). Different kinds of disciplinary knowledge, for example Fashion or Industrial design, would develop according to where they are positioned along the continuum between these two extremes. Bernstein's knowledge structures make it possible to incorporate both these views of design since they refer to different kinds of design knowledge with different forms of progression.

However, design choices are socially influenced but not determined, and ultimately '*the human factor is present in decisions taken at all levels in design practice'* (Heskett, p. 5). The role of *the designer* requires further investigation and for this, I turn to the work of Karl Maton.

3.3 Knowledge Structures and Maton's Legitimation Code Theory (LCT)

Bernstein's knowledge structures, consisting of dichotomous, ideal types have attracted criticism. Maton and Muller, in his defense, remind us that Bernstein's conception of these knowledge structures are '*locked into a metaphorical phase where terms are more suggestive than explanatory*' (Maton & Muller, 2007: 27). Maton's (2000) work on Legitimation Code Theory (LCT) augments and develops Bernstein's work on knowledge structures by introducing the concept of the Knower.

By emphasizing the importance of the epistemic *and* social relations underpinning *both* Hierarchical and Horizontal knowledge structures, he manages to overcome the limiting dichotomy of these structures. He does so by incorporating aspects of Bourdieu's field theory to explore the bases of measures of achievement in social fields (Maton, 2000, pp.

148-149). These languages of legitimation are measured by means of various legitimation codes, which are determined by Maton's epistemic device. (2006, pp. 49-52). This device, like Bernstein's pedagogic device, can be 'set' to determine what practices and beliefs matter most in these fields. This study is restricted to using two of these codes: the specialization codes and the semantic codes.

3.3.1 The specialization codes

Maton (2006) uses Snow's 'two cultures' debate to demonstrate how scientific (Hierarchical) and humanist (Horizontal) knowledge forms are distinguished by what is considered the most valuable or legitimate knowledge in each of these fields. Hierarchical knowledge structures validate knowledge which emphasises '*explicit principles, skills and procedures'* – an epistemic relation (ER) of knowledge, or a Knowledge code (pp. 46-47). What matters most here is *what* you know not who you are (p. 51). In Design, this would refer to knowledge of theory, technology and utility. Horizontal knowledge structures, on the other hand, validate knowledge which emphasises 'gaze' and '*attitudes, aptitudes and dispositions*' _ a social relation (SR) of knowledge, or a Knower code (pp. 47-49). What matters most is *who* you are, not what you know (p. 51). In Design this would refer to knowledge concerned with aesthetics and values. So, according to Maton, Knowledge is always about something and by someone, and there is a Knower structure for every Knowledge structure (p. 58). Different knowledge forms specialize different kinds of knowledge *and* different kinds of knowers

All knowledge forms possess both Social and Epistemic relations of knowledge, but in differing combinations, depending on which kind of knowledge establishes '*the basis of status and achievement in the field*' (p. 50). These specialization codes determine this basis of achievement by identifying the frequently tacit '*rules of the game'* (Bourdieu & Wacquant, 1992) and the kind of social or epistemic knowledge valued in the field.

Referring to Bernstein's description of the significance of acquiring a specialized 'gaze' within Horizontal Knowledge Structures, Maton (2007) describes three different ways in which 'gaze' can be acquired: through birth ('genius'), through social position

(gender/class/race) or through education . In Design this 'gaze' is specialized as a form of domain specific expertise or connoisseurship which has to be cultivated and, like Bourdieu's *habitus,* positions the designer in the disciplinary field.

Maton's epistemic device (2006, pp. 52-54) describes four Knowledge-Knower codes, according their degree of strength or weakness of either their social (SR) or epistemic (ER) relations of knowledge. These Knowledge-Knower continua form the axes of a Cartesian plane, creating four quadrants:

1. The Knowledge code (ER+/SR-) specialized by stronger epistemic relations of knowledge- the basis of legitimation is your acquired coded knowledge;
2. The Knower code (SR+/ER-), specialized by stronger social relations of knowledge – the basis of legitimation is your cultivated insight;
3. An Elite code (ER+/SR+), which refers to a knowledge field which is specialized by equally strong ER and SR of knowledge;
4. A Relativist code (ER-/SR-), which refers to a knowledge field which is specialized by neither a strong SR nor ER of knowledge.

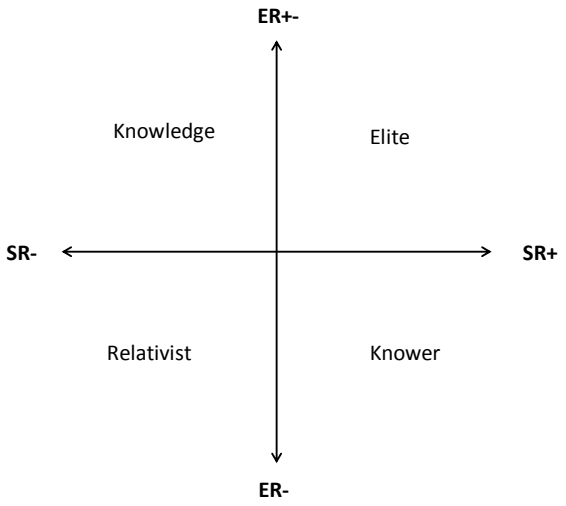


Figure 8 Legitimation codes of specialization (Maton, 2006, p. 53)

The specialization codes are well suited for examining design knowledge. For example, research by Carvalho , Dong & Maton(2009) found that not all design disciplines conform to the same specialization codes and that their relation to epistemic and social dimensions

of design knowledge will differ in the mix. Their research into the kinds of knowledge most valued in four different design professions found that Fashion Design had a Knower code, Engineering a Knowledge code, Architecture an Elite code and Digital Media Design a split between knower and knowledge codes . These findings indicate that specialized domain knowledge largely determines what counts most in a field (p. 486). It furthermore confirms design theorists' like Schön's (1983) and Dorst's (2008) understanding of the bi-modal, dialectic nature of reflective design practice, which requires applying '*knowledge and experience to each unique circumstance'* (Carvalho, Dong & Maton, p. 484). Designers need to recognise the '*rules of the game'* (Bourdieu & Wacquant, 1992) of their respective disciplines in order to realise those in design practice (p. 488). But, by their own admission, Carvallho, Dong & Maton's findings are very general (p. 500). Coding may equally be determined by contextual and other variable demands of project briefs, and the kinds of design thinking required to meet such specialized criteria and by individual agency. For example, designing a restaurant may require different specialization codes for designing the functional kitchen and the ambient restaurant interior.

3.3.2 Design knowledge and the epistemic device

In the following section I will use Maton's specialization codes to briefly describe which kinds of design knowledge are legitimated by the different specialization codes to clarify how the epistemic and social relations of design knowledge are to be recognised and understood within the context of this dissertation. These descriptions will enable us to identify to what extent professional design knowledge is transformed during recontextualisation into the project briefs the Design Foundation Course's curriculum. These descriptions will also be used to develop a language of description with which to analyse the project briefs which constitute the data set of this study.

Knowledge code (ER+/SR-)

This language of legitimation values specialized conceptual, procedural and contextual Design knowledges, which can be communicated reasonably explicitly. The decision to refer to conceptual and procedural knowledge, rather than to 'theoretical knowledge' and

'skills', is to align conceptualizing design knowledge with the work done on curriculum differentiation and progression as part of the South African Norway Tertiary Education Development (SANTED) programme run at the Nelson Mandela Metropolitan University (NMMU) (Shay, Oosthuizen, Paxton et al., 2011). This project in turn draws on work done by Muller (2008) and Gamble (2009) on curriculum planning, progression and differentiation. This is also the terminology used in Kratwohl's (2002) revised version of Bloom's well known taxonomy of educational objectives. These would include

- specialized knowledge related to the utility (logos) of designs : technology, efficiency, economy, ergonomics and methods of fabrication;
- specialized knowledge of the properties of different materials ;
- contextual knowledge gained through rational analysis of affordances and constraints of brief (objective situational , material, structural, environmental, economic and legal);
- skills and techniques of representation (conceptual, technical and orthographic and computer aided drawing, scamps, models, patterns and prototypes) and presentation (observational and presentation drawing, in a range of techniques, including CAD);
- knowledge of History of Art and Design, of the terminology and theory and formal visual language, of style and aesthetics, common to all design disciplines.

However, the ability to creatively *apply* visual language and theory to identify and compare the different canonic styles requires visual gaze. Gaze is also required to synthesize knowledge with stronger epistemic and social relations into useful, usable and desirable design solutions.

Knower code (SR+/ER-)

The language of legitimation of the Knower favours who you are and requires having or cultivating 'gaze'. In design gaze refers to the designer's 'voice' or personal insight, values and aesthetic sensibility. As a form of connoisseurship, gaze acts like a filter which guides design choices and judgments during the creative design process. This design knowledge specializes the following, less visible, tacit attributes:

- capacity to apply knowledge of history of art, design and aesthetics to 'read' and 'write' design;
- ability to use creative imagination and visualization to integrate different kinds of knowledge into innovative design solutions;
- ability to communicate abstract concepts graphically/spatially, or by means of analogy ;
- capacity for visual perception and aesthetic discrimination (having a good 'eye' and sense of part-whole relationships),
- visual-motor skills (having good 'hands' for graphic rendering and for constructing prototypes or fabricating smaller artifacts);
- contextual knowledge gained through cultivated insight (understanding of human behavior, social trends, sub-cultures, fashion, style which may be positioned in other knowledge fields for example Psychology, Anthropology, Sociology).

Gaze is necessary to both 'read' and 'write' design and for designers this also involves interpreting, clarifying and directing the needs of the client, by asking the right questions, within the specific context of the brief (Ambrose & Harris, 2010, pp. 14-16). The indeterminate nature of ill –defined design problems presents many opportunities to exercise gaze.

Elite code (ER+/SR+)

This quadrant is distinguished by knowledge which contains equally strong social and epistemic relations. According to Carvalho, Dong& Maton (2009), architectural knowledge qualifies as an Elite code since the field requires technical knowledge and aesthetic sensitivity in equal measure. Similarly music taken at a more advanced level equally requires more than just technical virtuosity from a performer (Maton, 2006).

Relativist code (ER-/SR-)

This specialization code requires neither a strong epistemic or social relation to knowledge. In Design this specialization would refer to generic skills like time and stress management, presentation techniques and basic visual, verbal and written

communication skills. Figure 9 represents my summary of the specialization codes of different kinds of design knowledge:

All design disciplines require a combination of technical, aesthetic and symbolic knowledge but in some disciplines one form of knowledge may be privileged over the other as a basis for achievement, and may take longer to acquire. Studying to become an architect (ER+/SR+) rather than an architectural technologist (ER+/SR-), requires meeting more stringent entrance requirements, takes three years longer, and the difference can be partly attributed to the latter's stronger grounding in Design. Unlike scientists who 'peak' young, architects and industrial designers are rarely known by name for their work before the age of 40 (Lawson, 2004, p. 443).

Coded Design Knowledge (ER/SR)			
Conceptual (ER)	**Procedural (ER/SR)**	**Contextual (ER/SR)**	**Gaze (SR)**
How things work (Logos): Utility, efficiency, economy and ergonomics. History of Art & Design. Terminology, theory and principles of formal visual language. Generic (domain independent) or specialized (discipline specific).	Material properties, technology, efficiency and methods of fabrication and representation (know-that: ER). Material properties, techniques, skills and methods of fabrication, graphic rendering and 3-D presentation (know-how: SR)	Degree of context dependence of constraints and affordances as determined by degree of disciplinary specialization (Pathos).	Cultivated insight and connoisseurship, 'voice' and capacity for aesthetic sensibility required for making design judgments and choices (Ethos). Capacity for creative integration of knowledges towards a productive purpose.

Figure 9 Specialization codes of different forms of design knowledge

Part of the difficulty with defining design knowledge could be due to a restricted view of knowledge which privileges epistemic over social relations. The significance of specialization codes for this study, particularly its conceptualization of the Knower, is that it enables bringing this more tacit but definitive form of Design knowledge into clearer focus. It is *this* knowledge which distinguishes the creative professions, including Design, from others. If the strong social relation of knowledge is a distinguishing feature of the design professions, how is it transmitted to students? How can curricula consciously facilitate the cultivation of gaze?

Fortunately Maton's LCT is not restricted, like Bernstein's knowledge codes, to the field of production but can be applied to analyzing curriculum and pedagogy (2006, 2010). This dissertation is concerned with the role of curriculum in the specialization of design knowledge and consciousness. The following section focuses on examining recontextualised Design knowledge in curriculum. Maton's specialization and semantic codes, which can be operationalised in all three fields of Bernstein's pedagogic device, will be used for this.

3.3.3 Educational specialization codes

The Pedagogic Device is the symbolic regulator of the specialization of consciousness and can be ideologically 'set' by those in positions of power to favour their own (Bernstein, 2000:37). So it is important that curriculum developers have a sound understanding of recontextualised disciplinary knowledge, and that they are conscious of the role of their own recontextualising gaze in the process of determining which forms of knowledge are legitimated by inclusion in curricula.

Legitimation Code Theory (LCT) can be used to examine how different educational knowledge-knower code modalities are able to shape consciousness differentially. It can be used to illuminate the frequently tacit criteria which signal what kinds of recontextualised knowledge are valued in a curriculum, a subject or a project. For example, it has been used to study the lack of uptake of music as a school subject. This study found that the Elite coding of music, requiring both specialist skill and musical aptitude, was responsible for fewer students choosing to study it at an advanced level (Maton, 2006). It can also help identify possible mismatches between the aims and the means of curricula. Such mismatches occur when the intended transfer of semantically dense (SD) knowledge relies largely on (uncultivated) Knower dispositions rather than on more explicitly taught principles with stronger epistemic relations (Maton, forthcoming, p. 44).

The semantic codes of LCT, on the other hand, are valuable for examining curriculum sequence. They enable us to drill down and understand not just which forms of

recontextualised knowledge are legitimated by curriculum but also how they are transferred and grown (Maton, 2010, p. 46). Most significantly, the semantic codes enable us to examine how gaze is cultivated over time. Maton's semantic codes, consisting of semantic gravity (SG) and of semantic density (SD), enable examining progression in the intended curriculum and its potential impact on enabling or inhibiting the transfer of different forms of design knowledge.

3.3.4 Maton's Semantic codes

Semantic gravity (SG) enables us to '*conceptualise the contextual transfer of knowledge'* over time and refers to '*the degree to which meaning is dependent on its context*' (p. 46). Where semantic gravity is very strong, meaning may be restricted to a specific context. Where it is weak, context independent meanings have the potential for transfer across contexts, increasing the chances of knowledge transfer or '*cumulative learning'* (Maton, forthcoming, pp. 1-2).

Semantic density (SD) of knowledge refers to '*the degree of condensation of meaning into symbols* (*terms, concepts, phrases, expressions, gestures*', which relate to the '*cosmology or semantic structure within which it is located*' (p. 5). In the context of this study, semantic density refers to the condensation of meaning into terminology, principles, concepts and images. It strengthens when general design principles and concepts are abstracted from more specific concrete examples, and weaken when abstract ideas are made more concrete and specific by means of example or practice. Practical application, or learning by doing, 'unpacks' abstract concepts (p. 6). So studio pedagogy would facilitate the process of weakening abstraction whilst theory lectures would strengthen it. In different ways both processes intend deepening students' understanding of abstract design concepts underpinning graphic and spatial design. These designs can differ in their degree of formal and symbolic abstraction; for example, a logo representing corporate identity would be characterized by stronger semantic density.

Maton (2010) argues that '*one condition for building knowledge or understanding over time may be weaker semantic gravity*' (p.46), where meaning is hierarchically related and

less context dependent. Curriculum could therefore be intentionally structured to encourage cumulative learning by using weakening semantic gravity to facilitate '*the transfer of meaning between contexts*' (p. 46). Considering the significance of context in Design in the field of production, where it provides the content of design problems, this study will test Maton's contention that weak semantic gravity is a necessary condition for enabling cumulative knowledge building in the intended curriculum and in the field of reproduction.

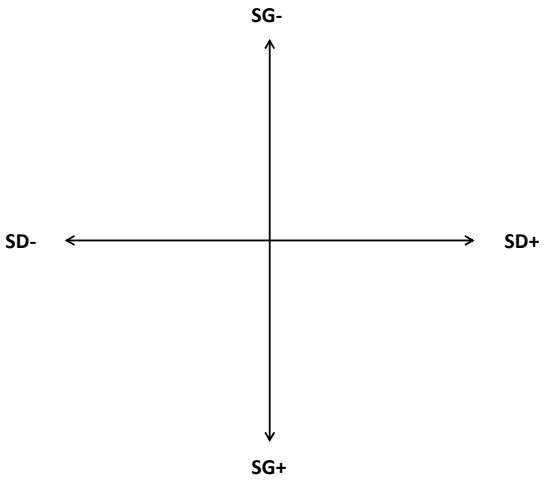


Figure 10 Semantic legitimation codes adapted from the codes of specialization

To conclude, the specialization codes are useful for recognizing the kind of knowledge which is valued in the project briefs which constitute the curricula, including the more tacit kind which privileges the designer's cultivated insight and aesthetic judgment over more technological forms of knowledge. Both these knowledges can be developed over time by sequencing projects to build on prior learning. More discipline specific contexts allow for incrementally increasing the complexity of subject content, privileging either of these different kinds of design knowledge, depending on the contextual nature of the ill-defined design problem. For example, designing a wheelchair or a mayoral chain of office would evoke the use of different kinds of complex design knowledge.

The Semantic codes have the capacity to reveal the intended progression of these different kinds of design knowledge in the curriculum. It also has the capacity to reveal

the potential effect of more specialized project contexts – which call for greater levels of abstraction and gaze – on knowledge building and transfer over time.

Semantic gravity, in this educational context, refers to the degree to which meaning is dependent on the disciplinary specialization evident in the recontextualised content of the project briefs. The purpose and potential affordances and constraints of content and process will all be influences by the degree of specialization of the context. Semantic density refers to the degree of abstraction of design terminology, concepts, content and the principles and theories of formal visual language. It also refers to the degree of abstraction of visual representation ranging from the purely descriptive (as in a medical illustration) to the highly symbolic (as in a corporate logo or a wedding ring) or abstract and multi-layered (as in an architectural plan).

Figure 11 summarizes of the specialization codes of different forms of recontextualised design knowledge:

Recontextualised Design Knowledge Content (ER/SR)				Creative Cognition (SR)
Conceptual (ER) History of Art & Design. Terminology, theory and principles of formal visual language.	**Procedural(ER)** Techniques, skills and methods of fabrication, Material properties, contraints and affordances.	**Abstraction (SD)** Degree of abstraction of terminology, concepts and principles.	**Contextual(SG)** Degree of disciplinary specialization, constraints and affordances.	**Gaze (SR)** Capacity for making self directed design choices based on aesthetic and moral judgments. Capacity for creative integration of knowledges towards a productive purpose.

Figure 11 Definitions of Maton's semantic and specialization codes as applicable to recontextualised Design knowledge

In the next section I will briefly discuss the distinguishing characteristics of design curricula. This will be followed by a discussion of an example of project methods research at an Australian university which resulted in a typology of hierarchically sequenced design project methods (Lee, 2009). This research provides empirical examples of different levels of design cognition, and forms of design knowledge present in design project briefs. This information will assist in developing a language of description with which to analyse the project briefs of the foundation curriculum.

3.4 Design curricula

The intuitive, integrative design process has previously been described as an example of a horizontal knowledge structure with a weak grammar and both tacit and explicit forms of transmission (Bolton, 2006). This transmission is by means of the established, but '*deviant*' (Schön, 1987, p. 15) form of studio pedagogy, with its apprenticeship model of knowledge transmission, where learning is largely by doing.

Both the physical space and the practice of learning by engaging in 'authentic' projects, create a simulated professional environment. In this way the pedagogy inducts students into a secondary discourse, and much of its nuanced practice is tacitly transmitted rather than explicitly taught (Gee, 1996). Gee describes this process of immersion in a practice as *'learning* **inside** *the procedures rather than overtly* **about** *them'* (p. 136). Sought after design criteria are transmitted by means of modeling, the use of examples, including precedent – which refers to good examples of past design solutions. However, criteria are also transmitted more explicitly through written texts, like project briefs, and through talking during one-on-one continuous evaluation (Bolton, 2006). Studio curricula are typically project driven (Lee, 2009; Schön, 1987). These projects, which frequently simulate those likely to be encountered in the world of work, provide subjects and contexts with varying degrees of specialization within which to engage in the design process, and to acquire the terminology and abstract codes of formal visual language.

Lee's (2009) analysis of 82 design projects has resulted in a project typology, consisting of six models arranged in a '*tentative hierarchy'* of complexity and levels of autonomy (p. 548). This typology enables identification of underlying '*project principles, structures and processes*' (p. 542), making it immediately relevant to this study of a project driven foundation curriculum.

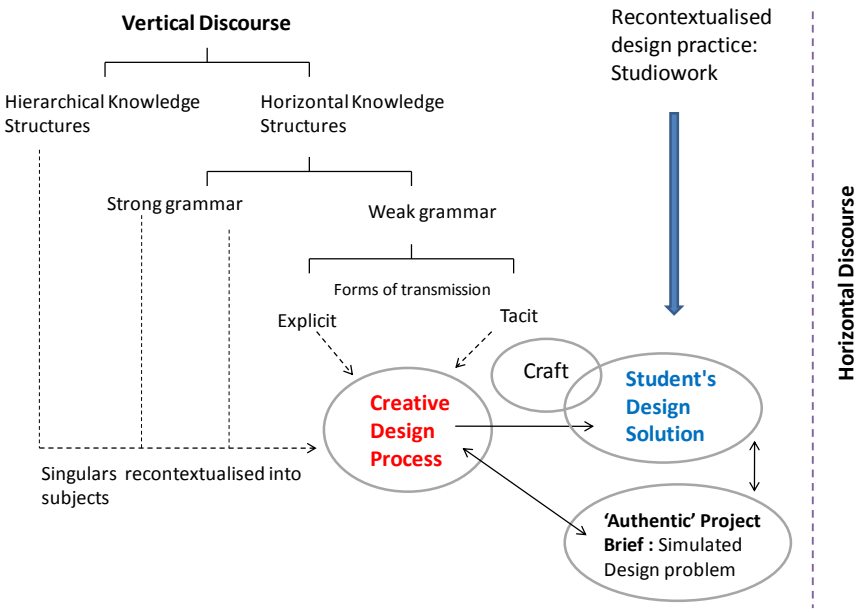


Figure 12 The relation between different kinds of recontextualised design knowledge involved during studiowork practice in the field of reproduction (studio pedagogy)

According to Lee (2009), the literature on project methods is '*relatively undeveloped* 'and bears little relation to the practical experience of design educators (p. 541). Project methods theory describes a sequential transmission of skills, followed by content and by engaging with authentic projects for external parties. Her findings on design projects contradict this sequence. According to her research findings, design skills and content are taught / acquired simultaneously and the complexity of content and skill will be largely determined by the scope and complexity of the contextualised problem posed in a project brief (p. 546). Just as music cannot be played without an instrument, design concepts (know-that) cannot be communicated without technical means and facility (know-how). In other words, the level of specialization of the contextualised content of a project brief will determine its level of conceptual complexity as well as the intended degree of control over the design process by the lecturer and student (p. 547). The weaker the control, or framing of the process, the more opportunities would be provided by the brief to evoke the exercise of gaze. Lee's typology is therefore a good example of a

sequence of project types which describe the progression and development of different kinds of design knowledge.

Lee's typology of six project types indicates '*concepts of alignment to specific learning outcomes, circumstances and capabilities*' rather than describing actual projects (p. 548). These concepts include project '*Intentions '(*knowledge and skills), modes of '*Delivery',* '*Assessment /Outcomes'* and student '*Roles*'. The latter provides the link between her and Dorst and Lawson's research into levels of design cognition.

Her typology consists of three broad categories and three sub-types.

1. **Activity Methods** (Directed and Project oriented) : Concerned with the development of design knowledge and skills;
2. **Project methods** (Directed and Guided) : Concerned with the application of these to solving 'authentic' , situated design problems;
3. **Inquiry methods** (Independent project and Independent inquiry): Concerned with advanced, investigation and development of design knowledge at post graduate level, and therefore not relevant to this study.

Project intentions are used to distinguish between what she calls projects *'goals'* (knowledge and skills) and the *'nature'* of the process by which these intended goals are achieved (p. 547).

I understand her descriptions of the 'nature' of the knowledge and processes to refer to the strength of framing, or control, over the content of the project briefs, and over the level of gaze evoked by the contextualised problem described in these briefs (Bernstein, 2000). This would partly be determined by the degree of determinacy (how well or ill-defined) of the 'authentic' design problem:

- **Open/closed structured** *indicating the level of control exerted over the path students would be expected to take* or
- **Open/closed ended** *'indicating the level of control exerted over the form and content of the final outcome* (Lee. p. 547)

Design knowledge, in this typology, is not specified other than referring to it as 'defined', 'broad' or 'deep' and its manner of use is described: application, analysis, synthesis, decision making, investigation. In other words, the knowledge is *implicit* in this description of project types. Maton's specialization codes could be fruitfully mapped onto Lee's typology to help make the design knowledge obliquely referred to in these descriptions more explicit. Figure 12 is my summary of Lee's project typology and the progressive weakening of framing over all the knowledge categories.

Projects		Description of the categories of Lee's topology					Framing
Lee's Typology		**Intention: Knowledge & Skills**	**Process**	**Delivery**	**Student Roles**	**Assessment/ Outcomes**	**F+**
Activity Method	Directed ER+/SR-	Introduce defined knowledge base and skills by means of single activity.	Follow set procedure	General. Strictly defined task.	Dependent	Completion of prescribed task	
	Project oriented	Develop defined knowledge base and skills by means of connected activities.	Apply prescribed steps and structures	General. Defined activity.	Obedient	Adherence to prescribed processes and use of provided knowledge base	
Project Method	Directed	Use knowledge, processes, decision-making and analysis/syntheses of content under supervision to solve 'authentic 'problems	Closed structured and mostly closed ended	Specialised, defined topic.	Reactive	Utilization of standard knowledge base	
	Guided	Investigative acquisition of defined area of knowledge by means of 'authentic' projects	Closed structured but open ended	Specialised, broad topic	Independent self-reflective and involved	Investigation of broad knowledge base	
Independent Meth	Project	Investigate broadly prescribed area	Open structured and ended	Broadly defined specialized area	As above but self-directed	Resolution : Problem solving using appropriate field knowledge	
	Inquiry	Investigate and develop self defined areaod		Self-defined area	Autonomous	Sophistication: deep, broad knowledge base and critical analysis.	**F-**

Figure 13 Author's summary of Lee's project typology (2009, 555-557)

Lee (2009, p. 551) notes that these projects types may be used in isolation or in combination, encouraging students to simultaneously reinforce known, and to employ novel problem solving behaviors. Whereas Dorst merely suggests the potential significance of the levels for designing curricula, Lee's hierarchically structured typology is the result of the study of projects situated within a pedagogic context, thereby enabling a comparison between levels of cognition, described by Dorst and Lawson in the abstract and empirically researched project models.

The hierarchical sequence of Lee's typology bears a strong resemblance to the findings of Dorst's (2008), Cross' (2004) and Lawson's (2004) research into the role of the designer in the design process. They found that this process differs according to the student's or designer's level of design cognition, which develops in distinct stages over time (Dreyfus, 2004). These levels chart a progressive strengthening of the designer's capacity to make self-directed and personally invested design choices. What they describe closely resembles the gradual cultivation of what Bernstein and Maton refer to as 'gaze'. These findings highlight the importance of designing curricula which are level appropriate, and projects that are within the epistemic and ontological reach of students.

3.4.1 Levels of expertise in design and their specialization codes.

Dorst's (2008) description of levels of expertise corresponds with five stages of '*perceiving, structuring and solving problems'*(p. 80) and has been adapted for design from Dreyfus' (2004) study into the development of adult skill acquisition, which highlighted the significance of intuition in complex problem solving. The difference between design cognition and other forms of complex problem solving is that designers typically solve ill-defined, weakly framed problems and are found to be '*more creative and more aesthetics-oriented'* (Visser, 2008, p. 209).

The educational value of understanding these levels of design cognition is that it enables a more nuanced understanding of the designer's role and level of creative engagement in the design process. The levels chart the development of the Knower in this process, making it possible to distinguish between the '*rule based'* design of the novice, the '*situation based'* design of the advanced beginner, the '*strategy based'* design of the competent designer and the '*pattern based'* design of the expert (Dorst, 2008, p.10).

Only the first two levels apply to foundation curricula, but the others warrant mention since they shed light on what is understood by new as opposed to routine design knowledge in the field of production, as well as the development of what Maton refers to as the '*cultivated gaze'* of the Knower (forthcoming, p. 2).

I will first briefly summarize features of these different levels of design expertise as described by Dorst (2008), Cross (2004) and Lawson (2004), and then map Maton's specialization and semantic codes onto these levels. These specialization codes enable the identification of combinations of different forms of recontextualised design knowledge likely to be valued at each of these levels. The semantic codes establish the degree of semantic gravity and density of knowledge deemed appropriate at each respective level.

In this educational context, semantic gravity refers to the degree to which meaning is dependent on the disciplinary specialization evident in the contexts provided by project briefs. Semantic density refers to the extent that meaning is condensed in design content, terminology, concepts, and principles of formal visual language. Students' developing conceptual understanding of formal visual language and their tacit understanding of design practice are cultivated simultaneously, as they are '*apprenticed into the semantic structure of the (design) field'* (Maton, forthcoming, p. 6). In other words, they learn by doing, but what they are capable of doing differs according to their level of design cognition.

I will match the levels of design cognition with those projects in Lee's topology which indicate similar levels of cognition, in order to generate general descriptions of the kinds of projects that would be considered appropriate for each level. This will enable developing a language of description with which to identify and code the recontextualised knowledge in the projects briefs and to analyse the possible implications of their sequence in the intended curriculum on enabling cumulative learning.

I will illustrate these levels using graphics (Figures 14-19) which I have very loosely based on Maher, Poon & Boulanger's (1996) representation of the co-evolutionary design process used by Dorst and Cross (2001, p.434) in their discussion of the design process (see Figure 3). However, in the context of using Maton's Legitimation Code Theory, I recast the conception of problem and solution space with those forms of knowledge most likely to dominate those spaces: The design process is therefore represented as a form of cognition which oscillates between rational analysis, informed by design theory and technology, and intuitive, creative imagination, guided by aesthetic insight and

discrimination. How designers synthesize these knowledges towards a productive purpose will differ according to their level of design cognition or expertise.

In the Figures illustrating the different levels of design cognition, solid shapes refer to choices made, and dotted shapes to the potential alternatives not taken, as is always the case with ill defined problems with their many possible solutions.

3.4.2 Coding the levels

0. Naïve

This level, introduced by Dorst (2008,) and not part of Dreyfus' original, recognises that design is not the preserve of professionals but is also employed by ordinary people as part of horizontal discourse. Many first year design students initially display naïve design behavior, which involves mimicry of existing design solutions rather than engaging in a design process (Dorst, 2008, p. 8). This level falls outside the scope of this study since it is part of horizontal discourse. However, it is relevant since this level of cognition marks the start of the process of 'cultivating gaze' intended by the Design Foundation Course's curriculum, and is one to which students return when they fail to grasp the recognition rules of projects.

1. Novice

At this level, students encounter the formal design process for the first time. Design thinking involves following rules and learning 'a *whole series of techniques and methods of representation*' (Dorst,2008, p. 8) which do not require prior knowledge or skills to perform.

Dreyfus (2004) uses the example of a how a novice chess player is first introduced to the role and value of chess pieces and to the basic rules of the board, but can only grasp the relative value of these pieces by engaging in a game. Similarly, for Novice designers to realise the relational nature of parts to the whole requires getting involved in the design process. Problem solving involves *how* to use methods and reflection deals with the rules themselves (Dorst, pp. 8-9). The subjects of such activities deal primarily with the

acquisition of formal visual language and basic techniques of representation rather than solving situated design problems, and are consequently positioned in general rather than 'authentic' disciplinary contexts. Lawson (2004) similarly describes the primary concern of the Novice as the '*acquisition of the design domain schemata*' (p. 456). Design schemata refer to conceptual and procedural knowledge held in common within the domain, which would include formal visual language with which to' read' and 'write' design – what Cross (2006) refers to a 'designerly ways of knowing'.

Lee (2009) describes such projects as 'Activities 'rather than 'Projects', since projects, in the literature on project methods, assume the presence of an 'authentic 'context (p. 54). She distinguishes between two types:

Directed activity methods refer to project types concerned with *'achieving a defined knowledge base and/or developing skills in a single topic'*, which can be completed according to clear instructions, without prior knowledge, by a *'dependent learner'*. (These activities are usually not part of a larger project, and can be quite complex.) They are strongly framed, allowing for little opportunity to exercise gaze, and would result in near identical outcomes (p. 550). They are specialized by a Knowledge code.

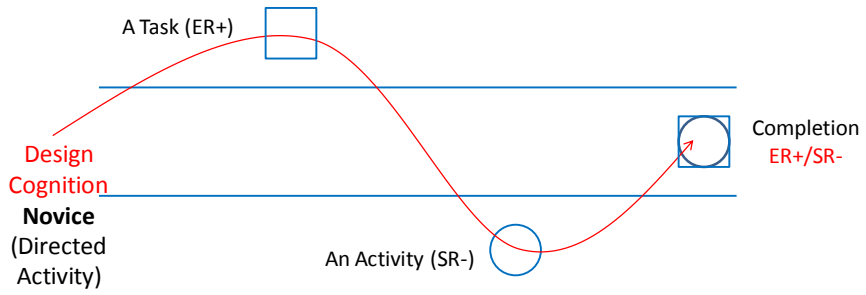


Figure 14 The design process: Novice level, Directed Activity (ER+/SR-)

Project oriented Activities are similarly concerned with acquisition and application of design knowledge and skills but by means of related activities which *'(connect) prescribed processes into a larger outcome'* (p. 556). Adherence to closed structured, strongly framed procedures by the 'obedient learner' is valued, but students are given more opportunities for exercising gaze potentially enabling more divergent outcomes (p. 551).

Projects suitable for the latter form of Novice cognition would guide the application of aspects of formal visual language to projects with general disciplinary contexts. The content of these projects would concern the acquisition of formal visual language rather than the solving of 'authentic' design problems. These more specialised contexts would provide opportunities for students to engage in the design process by applying abstract concepts to concrete situations, with the intention of making these concepts more concrete and easier to grasp. Ultimately the intention is that this 'unpacking' of abstract concepts will strengthen students' grasp of conceptual design knowledge.

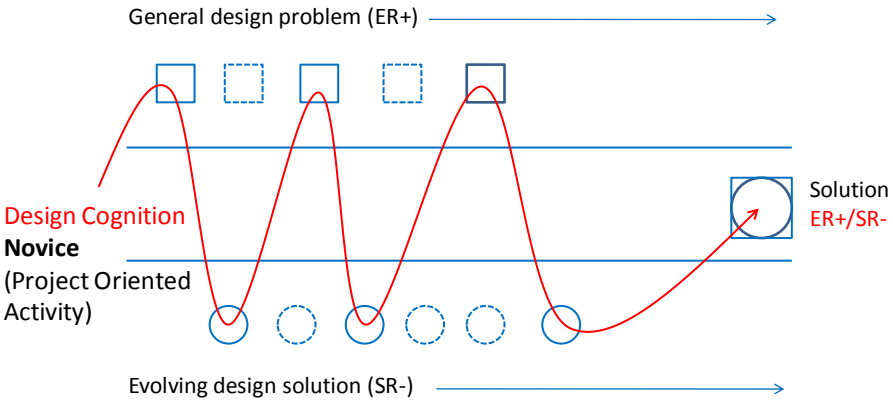


Figure 15 The design process: Novice level, Project Oriented activity (ER+/SR-).

Learning to understand the abstract concepts and principles of formal visual language and theory indicates a stronger epistemic relation of knowledge. Considering that Novice level projects initiate the process of cultivating gaze, opportunities to evoke gaze in these projects would gradually increase along a continuum towards Advanced Beginner cognition as design problems become more ill defined and weakly framed. Design tasks considered level appropriate for Novice cognition would conform to a Knowledge code. The weaker disciplinary contexts generating the design activities involving generic foundational design principles would render them easily transferable to subsequent projects, regardless of their disciplinary specialization.

2. Advanced beginner

Advanced Beginner (AB) design thinking is situational. It is distinguished by the capacity to recognise the contextual significance of design problems (Dorst, 2004). This enables

grasping how parts relate to a whole and how these parts both structure and are structured by the whole, just as the value of chess pieces is not absolute but relative to their position on the board (Dreyfus, 2004). Advanced Beginners develop '*a new sensitivity to exceptions to the 'hard' rules of the novice*' and they increasingly use maxims to guide their design process and, with experience, acquire '*schemata and design prototypes*' (Dorst, p. 9). Maxims are general truths: for example, light colours advance, dark colours recede. Maxims, unlike strict rules, require some prior knowledge of the domain and can be applied to increasingly complex and discipline specific, 'authentic' design problems (Dorst, 2008). The design process is iterative and design prototypes refer to the acquisition, with practice and experience, of habitual ways of approaching design situations.

More specialized 'authentic' contexts with their additional external constraints require *analysis* as well as *application* of formal visual language and its significance. Here the concern in not just with *how* to apply rules and maxims but with *when* to do so, depending on the design situation (Dorts, p. 9). This level has much in common with Lee's (2009) Project Method, which is similarly concerned with the competent application of '*knowledge, processes, decision making and analysis/synthesis of content, under supervision, by the 'reactive learner'* (p. 556).

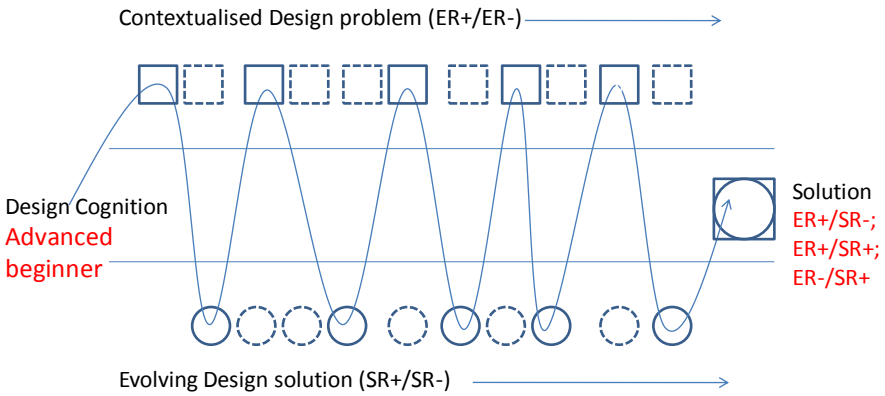


Figure 16 The design process: Advanced Beginner level (ER+/SR-; ER+/SR+; ER-/SR+)

This level is primarily concerned with application of design knowledge to solve contextualized design problems, providing opportunities for further expanding

understanding of abstract design concepts, with the intention of strengthening epistemic relations of knowledge. The increasingly complex and discipline specific contexts of Advanced Beginner projects simultaneously open up opportunities to evoke gaze , enabling a wide range of project outcomes.

Advanced Beginner cognition is less straightforward to code than that of the Novice. Suitable projects would specialize different kinds of knowledge and consciousness, along a continuum towards competence in a particular discipline. This study indicates that Advanced Beginner cognition may initially conform to a Knowledge code, but that this specialization may start diverging as cognition becomes more developed, specializing either an Elite or a Knower code. The balance between the *logos, pathos*, and *ethos* would differ according to what is required by the contextualized content of the design problem. This is confirmed by Carvallho, Dong's & Maton's (2009) study which found that competence in different design disciplines mean different things.

Although Advanced Beginners, over time, develop both their conceptual and intuitive understanding of design problems, their thinking is still primarily reactive (Dorst, 2004; Lee, 2009). With experience, they are increasingly able to recognize but not discern between additional aspects of contextual significance in design situations (Dorst, 2008). This can lead to feelings of being overwhelmed by this information, and potential responses to it (Dreyfus, 2004, p. 178).

According to Lawson (2004), developing a '*growing pool of precedent'* (p.456) is one of the primary requirements of this level of cognition, without which design students will not be able to achieve competence. Precedent (particularly as used in Architecture) refers to good examples of design solutions. In studio pedagogy it would refer to examples from the canon used as *'a point of departure'* (p. 449) for creating original work involving similar design problems.

This pool of precedent, along with students' own experience (prior knowledge) of solving design problems, is stored in chunks in their episodic (experiential) memory, and represents the *e*xperience which will increasingly inform design thinking, and without

which students will not be able to progress to Competent cognition and beyond (pp. 453-454).

3. Competent

At this level, design cognition shifts dramatically from being reactive to being increasingly strategic, reflective and involved (Dorst, 2008, p. 9). Competent designers are able to select and order information and plan by matching new design situations to past experience (p. 9). Competent design problems are increasingly ill defined and 'wicked'.

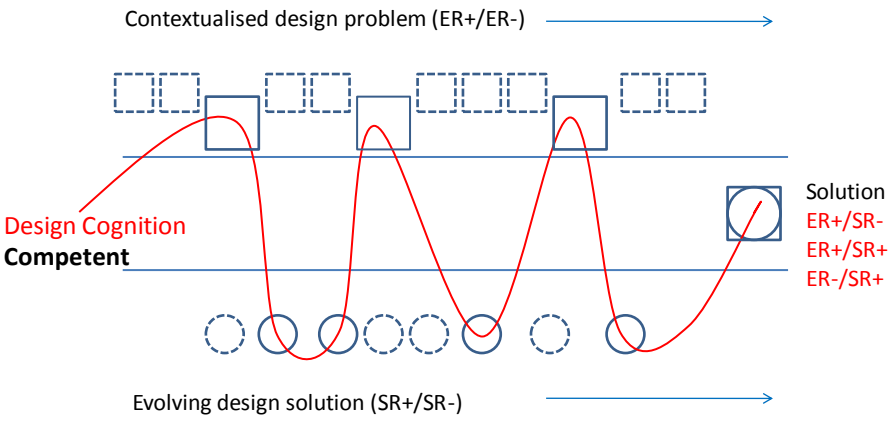


Figure 17 The design process: Competent level (ER+/SR+; ER+/SR-; ER-/SR+)

Lee's (2009) Guided Project Method, which involves '*investigative acquisition of knowledge'* (p.555) by the involved, independent and self-reflective learner, by means of 'authentic' tasks indicates Competent cognition. She and Dorst/Lawson note a distinct shift between this level and what has gone before and the key attribute here appears to be experienced based self-directed *involvement* in the design process.

The significance of emotional involvement in attaining competence is generally recognized (Dreyfus, 2004; Dorst & Reymen, 2004). This makes sense for a discipline like design, which demands significant personal investment. The self-directed cognition of this level indicates considerable strengthening of gaze, and the capacity to discern a hierarchy of importance in design situations, which is indicated by the larger squares in the Figure 16.

Competent designers are better equipped to cope with the uncertainty which comes with basing design decisions on experience rather than on maxims and rules (Dorst, 2008; Dreyfus, 2004). Competence could be specialized by either a Knower or an Elite code, depending on the requirements of the project and/or what is most valued in a particular disciplinary specialization.

Projects requiring this level of cognition would not be suitable for foundational curricula, although it would not exclude students with sufficient capital and skill from responding at this level to aspects of projects. However they would, like Lee's Guided Project Method, be the norm in third year design curricula where achieving competence is a prerequisite for graduating with a diploma, and entering the world of work.

4. Expert

Expertise is based on experience. This enables high-level pattern recognition in design situations, and results in intuitive rather than analytical responses. Experts don't solve problems: they simultaneously recognise familiar patterns and formulate suitable, frequently routine, responses (Dorst, 2008, p. 9).

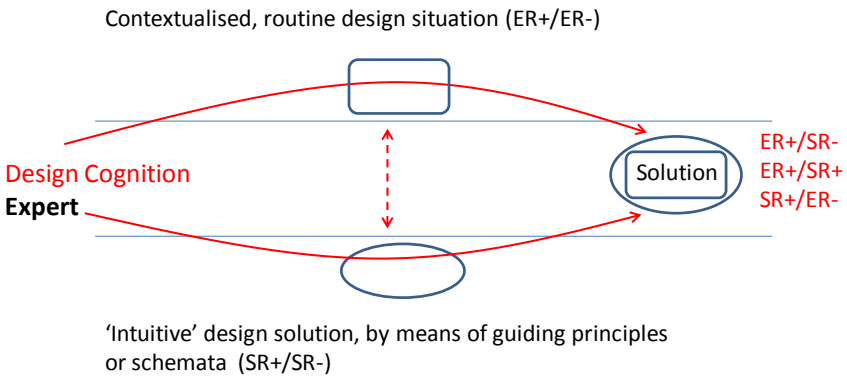


Figure 18 The design process: Expert level (ER+/SR+; ER+/SR; ER-/SR+).

By this stage designers have acquired '*guiding principles which develop over time and further structure and filter the continued acquisition of precedent*' (Lawson, 2004, p. 448). Expert designers are often sought out for *who* they are and for the guiding principles which inform their work (p.448). This indicates a Knower code (SR+/ER-) specialization,

but the *considerable* subject knowledge, episodic memory and accumulated experience informing 'intuitive' decisions could equally be indicative of an Elite specialization code (ER+/SR+). So which is it?

As with Competent cognition, it appears that it could be either. Coding may be determined by disciplinary specializations, as described by Carvalho, Dong & Maton (2009), or by the contextual demands of specific project briefs.

5. Master

The master is an expert who creates innovative as opposed to routine responses to ill defined design problems. Experts use their guiding principles to initiate and oversee the creation of work which enriches the domain by '*producing designs ideas that are innovative responses to situations that may have been previously well understood*' (Dorst, 2008, p. 9). Their work, or the work of their practice, represents new knowledge in the field, it gets published and establishes new precedents for other designers to learn from – a form of '*practice based research*' (p. 9).

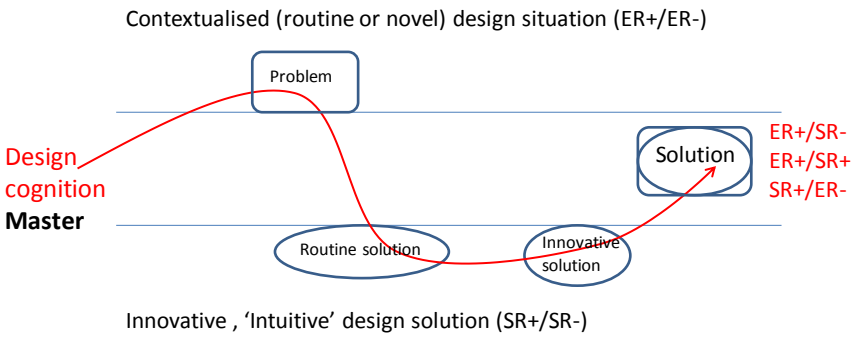


Figure 19 The design process: Master level (ER+/SR-; ER+/SR+; ER-/SR+)

The potential implications of these levels for curriculum planning are significant:

- Project content could be designed to evoke degrees of gaze and conceptual complexity within the reach of students' level of cognition.
- This could be done by incrementally weakening framing over content by gradually replacing well defined by ill defined design questions.

- Level appropriate project sequence in curriculum could guide the increase of conceptual complexity as well as the cultivation of gaze.
- Design thinking may be domain-independent (SG-), but level appropriate content of contextualized design problems could be planned and sequenced in intended curricula to better enable knowledge transfer.

What also becomes apparent from this description of levels is the incremental increase of the discipline specificity (SG) of project content at each level, and the demand for greater levels of abstraction (SD) of this content.

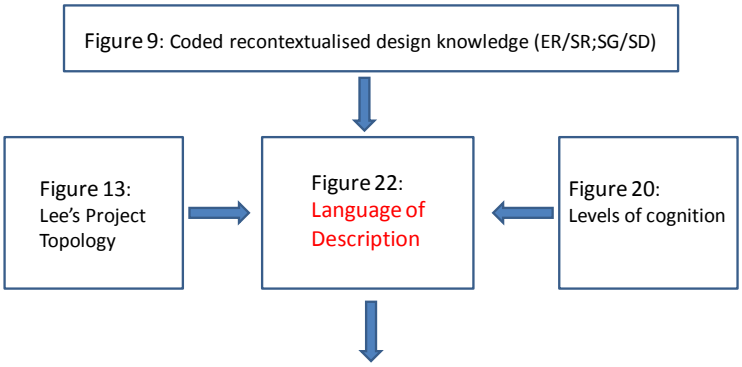
Figure 20 represents my summary of the coded levels of design cognition, which bear a strong resemblance to those described in Lee's project typology.

Levels of Design Cognition			
Design knowledge(ER/SR)	**Design situation (SG)**	**Design process (SR)**	**Level**
Acquire design domain schemata	General	Rule following How to use rules.	**Novice**
Develop a pool of precedent	Situated	Maxim following/ Reactive When to use maxims?	**Advanced Beginner**
Develop episodic/experiential memory of design knowledge and precedent	Situated	Self directed and reflective Involved. What experience is relevant?	**Competent**
Use guiding principles routinely or to create new knowledge	Situated	Intuitive Which guiding principles to use?	**Expert**
Consciously create new knowledge	Situated	Intuitive How to innovate and create new knowledge?	**Master**

Figure 20 Author's summary of the levels of design cognition/expertise

Since design knowledge is implicit in Lee's project typology (Figure 13) and in the levels of design cognition (Figure 20), the summary of coded recontextualised design knowledge developed earlier (Figure 11) will be merged with them to create an analytical language of description (Figure 22), which will be explained in detail in the following chapter. This analytical instrument will be used to do the following:

- Describe design Knowledge and its recontextualised form in the curriculum;
- Discuss the implications for knowledge transfer intended by this curriculum.



Projects			Levels	Recontextualised Design Knowledge				
Lee's Topology			Dorst/ Lawson	Process (Gaze) SR	Conceptual ER	Procedural ER/SR	Contextual SG	Abstraction SD
F+	Activity method	Directed	Novice	Rule following — SR-	Generic/ basic — ER+	General — ER+/SR-	Context independent — SG-	Descriptive — SD-
		Project oriented						
	Project method	Directed	Advanced Beginner	Reactive			'authentic'	
		Guided	Competent	Self-Directed/Involved — SR+	Specialized/ Complex — ER+/SR- ER+/SR+ ER-/SR+	Highly Specialized — ER+/SR- ER+/SR+ ER-/SR+	Highly context dependent — SG+	Highly abstract — SD+
F-	Independent method(PG)	Project						
		Inquiry						

Figure 21 Methodology used to create the analytical instrument

Chapter 4: Methodology

4.1. Data Selection

The limited scope of this dissertation does not allow a full investigation of the intended and enacted curriculum. Instead, in the absence of a formally theorized curriculum or textbook, these studiowork project briefs (referred to in Chapter 1:3), and their sequence, will provide the data for analysis. These documents make up the material form, or 'public face' (Barnett & Coate, 2005, p. 33) of what is understood as curriculum by the lecturers involved with its design and implementation.

Since these briefs (see 9. 3) routinely state assessment criteria, and describe intended procedures in a detailed manner, I reasoned that they would provide a concise description of the course's intentions and indicate, through inclusion and omission, which kinds of design knowledge are valued. Most of the briefs do not contain weighted assessment criteria. Since mark sheets, as part of the field of reproduction, are not included in the data set, it will not be possible to accurately establish which knowledge is *most* valued in the enacted curriculum. The project briefs are positioned in a time table, which enables examining the intended knowledge *progression* over the course of the year.

These briefs are part of filed records and are in the public domain. I decided to use those from one year, 2010, for the analysis. Similarly, the timetable used is from 2010. Very few have been designed by a single person but are the result of collaboration between lecturers. As a lecturer on the course, I have participated in designing many of these projects. In this chapter these projects will be described and analyzed using an analytical instrument developed for this purpose. The analysis will attempt to answer the two interrelated research questions:

How has design knowledge been recontextualised into the project briefs of the studiowork component of the integrated, multidisciplinary DFC curriculum?

How does this curriculum enable the intended development of design knowledge and consciousness over the course of the year?

4.2 The Design Foundation Course's curriculum

The current curriculum has five broad subject areas that are aligned with those offered in each of the regular first year design courses. Two of these are theoretical and lecture based whilst the other three are practical and studio based. These studio based subjects, including drawing, take up approximately 60% of class time. Collectively, they are referred to as studiowork.

Studio based

- 2-D design (Graphic; Fashion; Surface design)
- 3-D design (Jewellery; Industrial; Interior design; Architectural Technology)
- Drawing (Object & Figure)

Lecture based

- Communication Studies (History of Art and Design; Design and Visual Literacy)
- Professional Business Practice (Study and Language skills; Language support; Life, Computer and Numeracy skills)

This curriculum is divided into two parts: the first multi-disciplinary part has to be completed by all students. The second, discipline specific part consists of an Extra project and an Exam Project. This study is confined to the first part of the curriculum and focuses on the studio based subjects called 2-D and 3-D design. These two subjects act as overarching categories to accommodate the seven discipline specific modules, which in turn consist of 17 projects, of varying lengths. Space constraints necessitated excluding the observational drawing projects from this analysis other than where they provide scaffolding for other studiowork projects, but I have included different kinds of drawing which are embedded in these projects.

4.2.1 Project briefs

Project briefs serve the same purpose as instructions for a written academic assignment. They describe the instructional discourse through assessment criteria and suggested

procedures. They also refer to the regulative discourse in the form of presentation requirements, time management, communication with lecturers and project deadlines. The written brief contributes to clarifying the recognition rules to students.

The format of the project briefs is the result of compliance with NQF funding requirements in the recent past. This accounts for the emphasis on doing, which renders some forms of design knowledge implicit in many of these briefs, particularly those with stronger social relation of knowledge. The briefs share a standard template which includes seven assessment criteria, four of which relate to instructional discourse. It is not the intention of this study to perform a discourse analysis of these briefs. They will be analysed for the different kinds of design knowledge (ER/SR) they contain, how explicitly they communicate these knowledges, and how their intended transmission is sequenced over time. The logic of the project sequence will be examined to see whether it enables or inhibits potential knowledge transfer.

These briefs describe the project requirements in a condensed, summary fashion. They are given to students at the beginning of projects and are customarily supported by verbal and visual presentations which explain the brief in more detail, provide and discuss visual examples, explain new terminology, demonstrate procedures and field questions from students. Since this research is restricted to the intended as opposed to the enacted curriculum, such additional data from the field of reproduction falls outside the scope of this dissertation.

A graphic representation of the sequencing of the 17 projects can be found in the (Appendix 9.1). It names and numbers each project and identifies the disciplinary specialization and the length of each project. It demonstrates how the three week modules allocated to each of the disciplines are either divided into smaller projects of incremental complexity or extend continuously over the module. Each band represents a quarter. The part of the curriculum relevant for this study concludes at the beginning of the fourth quarter. A descriptive summary of the 17 projects can be found in the Appendix (Appendix 9.2).

4.2.2 Selecting a sample

It soon became apparent that not all 17 projects could be analysed in detail within the limited scope of this study. In preparation for selecting a sample, I first described all the briefs sequentially and in great detail. This process revealed several sequences of schematic development. Some were familiar to me but reflection and scrutiny of the descriptions also brought into focus dimensions I was not aware of before. These intertwined sequences included those describing the development of formal visual language – for example, knowledge about colour, design principles, three dimensional and spatial design, and fabrication methods.

I decided to narrow my sample to a sequence tracing the development of knowledge about colour, since these projects are located in several different design disciplines, enabling testing whether the transfer of powerful, domain independent design knowledge is impaired by the stronger discipline specific contexts of the project briefs. However, I realized that this narrower focus would fail to capture a comprehensive *overview* of recontextualised design knowledge in the curriculum. I then decided to analyse all the projects briefly to establish their specialization code and their required level of design cognition, but to analyse those projects which introduce rather than reiterate some aspect of colour theory in more detail. This would allow for a fuller description of the development of condensation of meaning in design terminology, principles and concepts of one aspect of design knowledge, in the contextualized project briefs.

Analysis of recontextualised knowledge and its intended progression in this foundation curriculum, calls for a language of description (Bernstein, 2000) which can bring Maton's theory and the empirical data into relation. The design of this analytical instrument has been informed by recontextualised knowledge coded with Maton's epistemic device (Figure 11) and Lee's project typology (Figure 12) and the levels of design cognition (Figure 19). It will be used to identify and code recontextualised design knowledge in the curriculum. It will be used to understand how curriculum sequence impacts on the potential transfer of recontextualised design knowledge and the cultivation of 'gaze'. The ultimate intention of this research is to inform the planning of future design curricula with

the potential to better encourage students on their way towards becoming visually literate, aware and fluent in their ability to '*read and write material culture*' (Cross, 2001, p. 12).

4.2.3 Developing a language of description

The analytical instrument (Figure 22) can be read horizontally and vertically. Horizontal rows describe different features of each level and project type. Vertical columns track the cultivation of gaze, the increase of theoretical and symbolic density of concepts and images described in the findings of Lee's project typology (Figure 13) and implied by the levels of design expertise (Figure 20). The information in this table is therefore a much abbreviated, short-hand version of what is found in earlier summaries, including that of coded recontextualised design knowledge (Figure 9).

This instrument provides a lens through which to observe, and analyse, the data and includes the following information:

- Conceptual (ER) and Procedural (ER/SR) knowledge: These two categories are divided by a broken line to show how, in design projects, these forms of knowledge are combined in the content of the project briefs. The framing over this content can vary in strength, depending on the level of design cognition of the students, and will depend on how indeterminate (ill-defined or wicked) the design problem is.

- Conceptual (ER) knowledge refers to design theory and principles, which can be made reasonably explicit. This knowledge can be generic (domain independent) or highly specialized (discipline specific), as indicated in Figures 9 and 11.

- Procedural knowledge can be specialized by SR or ER. Those with stronger epistemic relations relate to how things work or are made – to utility, technology and material properties. Those with stronger social relations relate to gaze and disposition – to what is referred to in the discipline as having a good 'eye' and

good 'hands' respectively . More detailed descriptions can also be found in Figures 9 and 11.

- Contextual knowledge (SG) refers to the degree of disciplinary specialization of the content of design problems described in project briefs. These would range from general, domain independent to 'authentic', discipline specific design problems. Contexts are closely related to the project content they generate, which include constraints and affordances which vary in their degree of context dependency.

- Gaze (SR) refers to the cognitive capacity of the student to exercise aesthetic judgment and make insightful design choices during the design process – what Lee refers to as the student's 'role' (Figure 13). This capacity is enabled by the degree of autonomy allowed by the brief and can range from dependent, rule-following to self-directed, involved cognition, depending on the strength of framing over project content and context. Weaker framing creates greater opportunities for exercising gaze.

- Abstraction (SD) refers to the degree of abstraction (condensation of meaning) of terminology, concepts and principles, and means of representation referred to in the briefs. It refers to the level of abstraction required from students' responses to these briefs, which could range from the purely descriptive to the abstract and symbolic.

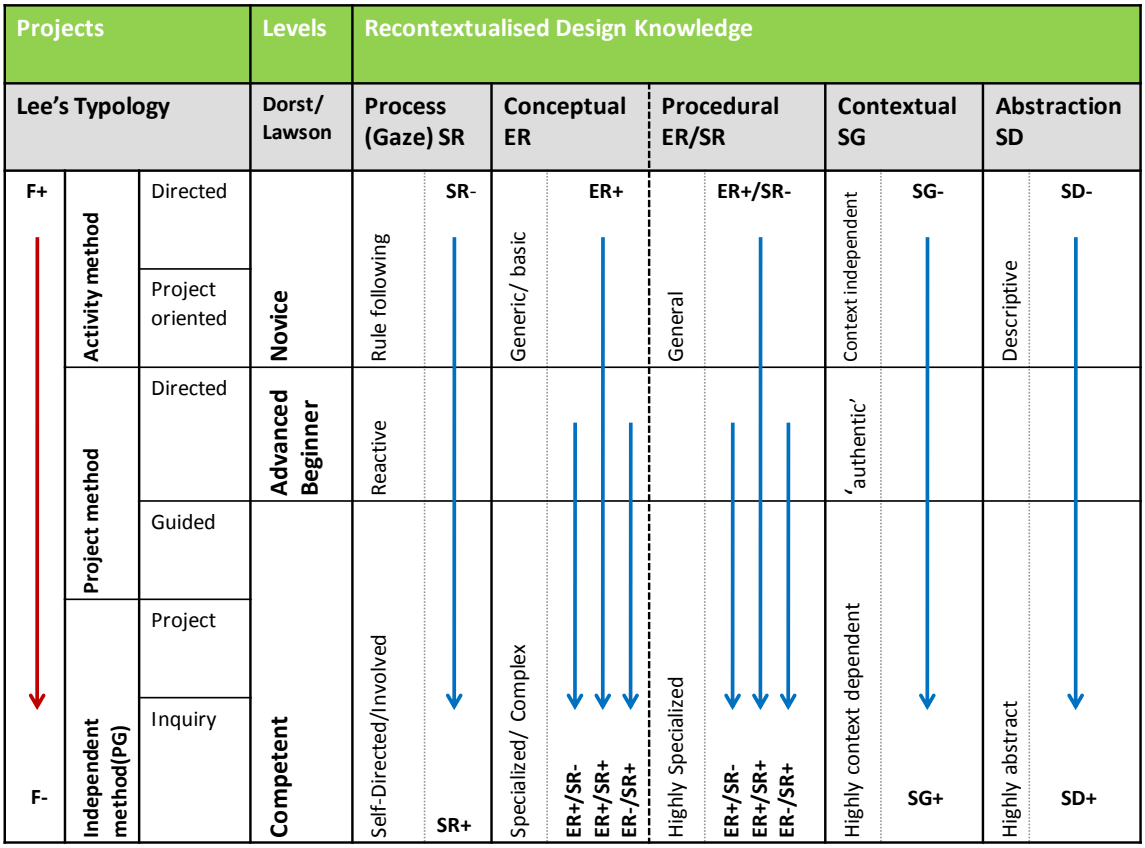


Figure 22 The Analytical instrument

Chapter 5: Analysis of selected projects

Project briefs are designed to facilitate the acquisition of different kinds of design knowledge, as categorized in the Language of description. It has been established in the theory chapter that the manner in which designers and students engage with design problems is determined by their level of design cognition. This implies that curriculum content which is level appropriate, and correctly sequenced, could potentially facilitate improved knowledge transfer to a greater number of students. The analysis will address these interrelated questions:

- What kinds of recontextualised design knowledge are legitimated by inclusion in the DFC's project briefs?
- How does the curriculum sequence the intended acquisition and development of these different kinds of recontextualised design knowledge and consciousness?

Maton's specialization codes (ER/SR) will be used for identifying the different forms and combinations of recontextualised design knowledge referred to in the assessment criteria and prescribed procedures of the project briefs (see Appendix 9.3). Coding is along a continuum, to identify the *degree* of legitimation of different forms of knowledge. The semantic codes (SG/SD) will be used to code the specialized contexts and degree of abstraction of the design knowledge contained in these briefs. Extracts from these briefs will be italicized in the analysis.

The analysis will cover the categories of the analytical instrument: Conceptual and Procedural content knowledge, Contextual dependency of content, its required level of abstraction and the potential strength of gaze enabled by the intended design process.

5.1. The project sequence

P1. 'Less is More'

The conceptual content of this project concerns the principle of abstraction: in this instance abstraction by means of visual condensation of meaning. The content involves

translating 'a *naturalistic drawing of an insect'*, rendered in pencil into three '*graphic images*' by means of three processes of visual abstraction: Simplification and stylization, positive and negative shape (figure/ground), and the selection of a part, through cropping, to stand for the whole by '*[retaining] the essence of the insect'*. These graphic processes are all a form of visual précis which strengthens the semantic density of the image, transforming it from a description to a symbol of an insect.

Figure 23 'Less is More' (P1)

This is a Graphic design project, but the context is general and the content is generic and context independent. The weak semantic gravity of the context allows for the formal design principles taught here to be transferred to other disciplinary contexts. Procedures are equally general and involve using pencil, khoki pen and gouache, and colour is restricted to black and white.

This project conforms to Lee's project oriented Activity method – a Novice level project. Its content is strongly framed and requires strictly prescribed rule following behavior. Gaze is required but is limited by the strongly framed content, indicating that completed projects would be similar but not identical. The project introduces generic conceptual design knowledge within a general context: a Knowledge code.

P2. The Colour Wheel

The conceptual content of this project concerns colour theory. Colour is an element of design and is part of the vocabulary of formal visual language. How colours can be combined to different effect is taught by means of colour contrasts: a grammar of colour relationships. The theory of contrasts used in this curriculum refer to those seven

described by Johannes Itten (1974) in his book *'The Art of Colour'*: hue; light/dark; warm/cold; complementary; saturation; extension and simultaneous contrast.

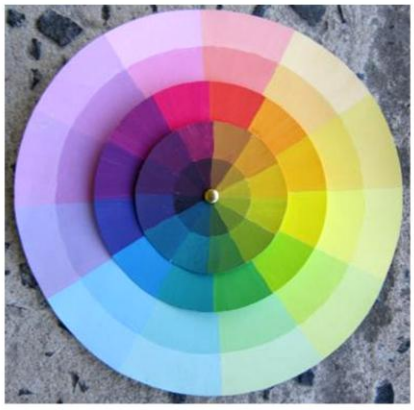


Figure 24 The Colour wheel (P2), consisting of two outer rings of tints, two inner ring of tones and a band of hues in the middle

The content of this project is a twelve stage colour wheel which requires that students *'show an understanding of primary, secondary and tertiary colours and their tints and tones*' and that they '*show an understanding of colour effects through the use of contrasts: Contrast of hue, light and dark and warm and cold*'. This calls for using the three process primary colours (magenta, cyan and process yellow), to create the six secondary and six (of many) tertiary colours, which are referred to as hues. When hues are mixed with white and black, they are referred to as tints and tones respectively.

Contrast of hue refers simply to the difference in colour between adjacent hues on the wheel whilst contrast of dark and light refers to the contrast of tonal value between these adjacent hues. Warm/cold contrast refers, metaphorically, to the 'warmth' or 'temperature' of colors, which have the potential to communicate meaning visually and emotively. Students are required to paint the wheel in gouache (a water-based paint frequently used by designers) and to position colours according to fixed rules. The strong framing allow for minimal opportunities for exercising gaze, other than exercising visual discrimination to distinguish between hues , tints and tones and their tonal values.

This is a Fashion design project, but colour is important for all design disciplines. This content knowledge is context independent, which makes it easily transferable to other

disciplinary contexts. However, the absence of a context within which to apply this knowledge inhibits the semantic density and expressive potential of these concepts.

The colour wheel conforms to all the criteria of a Novice level Directed Activity: It requires rule following behavior, is context independent and allows little opportunity to exercise gaze. The primary concern of this project is introducing an aspect of formal visual language and applying this knowledge in a single, prescribed activity with identical outcomes: a Knowledge code (ER+/SR-)

P3. The Gouache Repeat Pattern

The conceptual content of this project relates to the principle of repeat (order) and to colour theory. The content of the project is similarly twofold, but both are concerned with the acquisition of formal visual language rather than solving a situated 'authentic' design problem.

The first part requires '[*creating] a continuous, geometric repeat pattern informed by design principles'* such as contrast, harmony, balance, gestalt and rhythm. These basic principles of design are part of the grammar of formal visual language without which students can neither 'read' nor 'write' design. The project requires that students use their initials '*as a point of departure to design a geometric repeat pattern*'. This requires transforming their initials into abstract geometric shapes, and using these shapes to create one of four types of repeat pattern: a full drop, half drop, radial or mirror repeats. Each of these repeats is governed by fixed rules specifying the manner in which identical units have to be consistently repeated to create patterns much larger than themselves.

To visually grasp and control the emerging pattern, or gestalt, the brief rules that students '*work only in line and always in repeat'*. The requirement to create several alternative solutions from which' *to select the best pattern and colour way'* to render in gouache potentially encourages evaluation of alternative design choices and the cultivation of gaze.

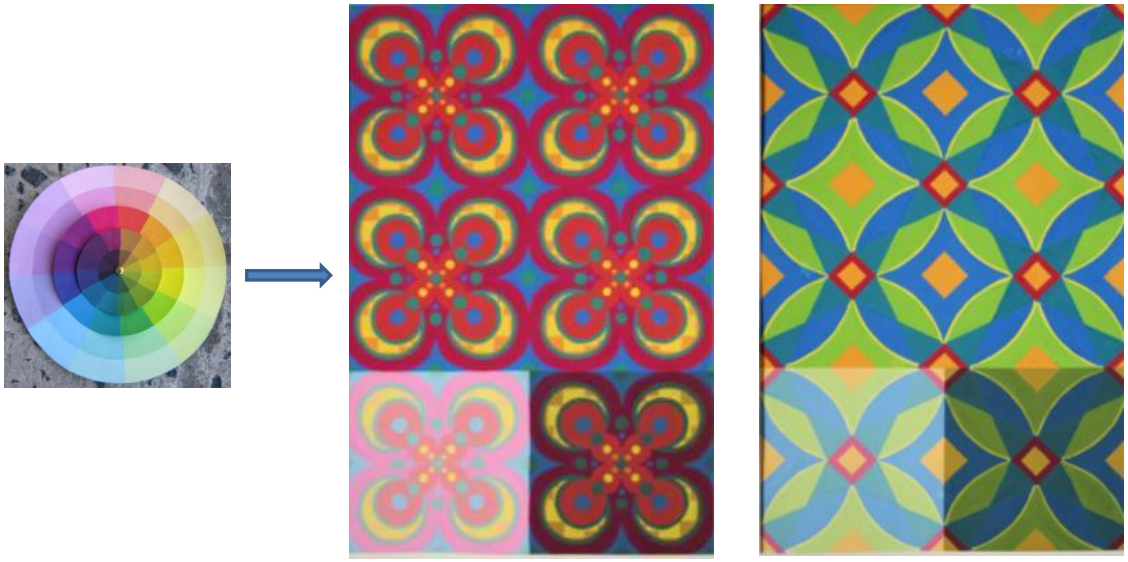


Figure 25 Examples of two Gouache Repeat patterns (P3) showing three warm and three cold colour ways. The larger square consists of hues, and the two smaller squares of tints and tones respectively

The second part of the brief requires application of prior knowledge of colour theory to render the repeat pattern in three different colour ways: those of hues, tints and tones. A colour way refers to the predominance of similar colours in a pattern or composition, which create distinct moods. (The purpose of colour ways in the Field of Production is to provide consumers with choice). Students are instructed to '*use hues, tints and tones to create three different colour ways*' consisting of six predominantly warm or cold colours which have to be selected and then distributed over the repeat pattern to create a '*varied, balanced and coherent*' design. The purpose of the application of prior knowledge about colour and design principles to a general context is to increase the semantic density of these generic principles, and the conceptual complexity of colour theory.

This is a Surface design project and the content is specialized by the general context of repeat pattern rather than by an 'authentic' purpose. This general context intends to provide an opportunity to operationalise the grammar of colour theory, and to explore their expressive potential independently of external contextual constraints.

This project with its two related components conforms to what Lee calls a Project Oriented Activity. It requires more complex Novice level cognition, increased

opportunities for choice and for exercising gaze. However, the required level of cognition is strongly framed by *how* to apply maxims and rules of design and colour theory. Although this Novice level project provides increased opportunities for evoking gaze, its primary intention is introducing generic conceptual design knowledge by means of the principles of formal visual language, and providing a general context for exploring their application: a Knowledge code (ER+/SR-).

P4. The Block Print (P4)

The conceptual content of this project, like the one before, is concerned with the principle of repeat, but it is explored by means of a specialized procedure: relief printing

The content has three interrelated intentions: to reinforce prior knowledge of repeat pattern and the application of design principles, to extend understanding of colour theory through the introduction of transparent colour, and to introduce the specialized relief printing technique.

This project explores the potential of a single unit to produce three different repeat patterns by means of relief printing. This requires designing, making and using an *actual* block (unit) to print these patterns. Students are required to use design principles (Contrast/ Harmony/ Balance/ Rhythm) to '*create repeat patterns which are both varied and coherent*'. The intended purpose of this reiteration is to strengthen conceptualization of the complexity and degree of abstraction of repeat, and of other design principles introduced during the preceding project.

The context is Surface design and content is specialized by a relief printing process called a progressive overprint. This technique involves the sequential overprinting of several transparent colours using a single block from which more of the printing surface is removed with each successive print. This project requires conceptualizing the designs in layers of transparent colour, with sufficient tonal contrast between each, and taking into account that overprinted colours will be altered by those underneath; for example, printing blue over yellow will yield green. The intention is to extend students'

understanding of the complexity and abstraction of colour theory and its application by means of a strongly framed technical process.

Acquisition of this complex new technique of colour application will require rule following Novice cognition. This project, with its interrelated parts, conforms to a Project Oriented Activity. Its lack of an 'authentic' purpose weakens semantic gravity, enabling the transfer of this knowledge to other projects. It simultaneously provides students with further opportunities to exercise gaze by exploring and evaluating potential design solutions in a highly structured way. However, its primary concerns are the reiteration of prior design knowledge by means of a specialized technique: a Knowledge code (ER+/SR-).

Figure 26 Examples of three Block Prints (P4)

The second part of the brief requires application of prior knowledge of colour theory to render the repeat pattern in three different colour ways: those of hues, tints and tones. A colour way refers to the predominance of similar colours in a pattern or composition, which create distinct moods. (The purpose of colour ways in the Field of Production is to provide consumers with choice). Students are instructed to '*use hues, tints and tones to create three different colour ways*' consisting of six predominantly warm or cold colours which have to be selected and then distributed over the repeat pattern to create a '*varied, balanced and coherent*' design. The purpose of the application of prior knowledge about colour and design principles to a general context is to increase the semantic density of these generic principles, and the conceptual complexity of colour theory.

This is a Surface design project and the content is specialized by the general context of repeat pattern rather than by an 'authentic' purpose. This general context intends to

provide an opportunity to operationalise the grammar of colour theory, and to explore their expressive potential independently of external contextual constraints.

P5. The Tile

The conceptual content of this project involves exploring form (an element of design) by means of a low relief pattern.

The project content involves the design of a '*directional repeat pattern, based on one of your surface designs and suitable for use as a low relief ceramic tile*', creating an opportunity for the application of prior knowledge of design principles to solve an 'authentic', situated design problem. The purpose of the directional low relief repeat pattern is a decorative, tile border that repeats on two sides; creating flow and visual continuity between units. The design of a positive for producing monochromatic tiles requires more specialized conceptual and procedural knowledge, with stronger epistemic relations: In the absence of multiple colours, the interplay between light and shade has to '[*provide] contrast in the design [which] will rely entirely on the skillful use of different levels and the transition between these levels*'.

Figure 27 Example of the Tile (P5).

This is the first 'authentic' project of the curriculum and as such distinguishes it as a Directed Project Method, requiring Advanced Beginner cognition. It is also the first project to move from two into three dimensions. The specialized content of this project is determined by the context which includes the context dependent constraints and affordances of specialized procedural knowledge with strong epistemic relations.

This procedural knowledge involves understanding the concept of a positive. A positive is used for making a 'negative' or hollow mould, allowing for the mass production of identical forms – in this case, of low relief ceramic tiles. The presence of undercuts, however small, will prevent the release of a tile from the mould. The brief calls for the construction of three identical, 'virtual' prototypes out of white card. It cautions students to '*beware of undercuts and glue spills*', advises working in layers '*from large to small'* and using a Marquette to resolve technical and design problems.

This Advanced Beginner project requires two levels of design cognition, confirming Lee, Lawson and Dorst's assertion that levels can co-exist or overlap. Constructing the positive out of card requires Novice cognition since this is knowledge of which students have no prior experience. The technical criteria regarding undercuts, accuracy and working from large to small are consequently explicit. However, the 'authentic' design calls for Advanced Beginner cognition and the application of maxims related to conceptual knowledge acquired in two preceding projects dealing with the principle of repeat. This reiteration of design principles by means of application to a repeat pattern with a specialized purpose, strengthen both their epistemic and social relations.

The requirement of the brief to translate multi-coloured 2-D design into a 5-layered, low relief border pattern calls for the application of more conceptually abstract and context dependent knowledge. Although the brief allows for opportunities to exercise gaze, the specialized conceptual and procedural knowledge, relevant for multiple other applications involving positives and mould making, specializes this project by a Knowledge code (ER+/SR-).

P6. The Bag

This project introduces texture as a design element, and reiterates the principle of composition. Procedural knowledge involves understanding fabric construction and embellishing techniques.

The project content involves making a bag and designing a personalized cover for it. This cover has to be hand sewn using '*different forms of applied decoration'* and fabric

embellishment techniques. Colour in this project is a matter of personal choice and, considering the technique of applied surface decoration, it would be 'found'– in the form of fabric swatches, sew-on labels, coloured embroidery cottons or beads. The cover design provides an opportunity to apply prior knowledge of design theory, calling for students to '*apply the element and principles you have already worked with in previous projects*'. However *how* students apply this knowledge is not specified and is left for them to decide. The weakly framed topic, '*inspired by (their) own interests',* therefore requires considerable, self-directed choice and a developed gaze.

The bag project is the first requiring the fabrication of an artifact from start to finish. It has to be machine sewn together according to step-by-step procedures, using a provided pattern. This part of this project is strongly framed and requires Novice cognition, but the design and making of the cover calls for Advanced Beginner cognition bordering on the Competent, considering the degree of self-directed choice required for its realization: a Knower code (SR+/ER-).

Figure 28 Example of the Bag Project (P6)

It is a relatively early project which, because of its open ended, ill-structured nature, requires a 'cultivated' gaze to complete successfully long before this gaze has had much opportunity to be evoked and developed. In other words, students would have to rely on disposition and past experience to successfully complete what is their first complex

composition project, without any maxims about composition to guide them. Students with a more developed gaze would enjoy the choice of potential solutions offered by this weakly framed project, but those lacking experience, prior knowledge or the requisite capital may have difficulty grasping its recognition and realization rules. This poorly sequenced project is not level appropriate and is an example of what Maton refers to as a mismatch between curriculum aims and means, where the intended transfer of knowledge relies largely on Knower dispositions, rather than on design principles with stronger epistemic relations (forthcoming, p. 44).

P7. Type and Meaning

The conceptual content of this project concerns the use of shape (an element of design), in the form of type, to communicate abstract concepts.

The content requires exploring the capacity of typefaces to communicate information as well as symbolic meaning. This project introduces type as a formal element of design, governed by strongly framed typographic rules.

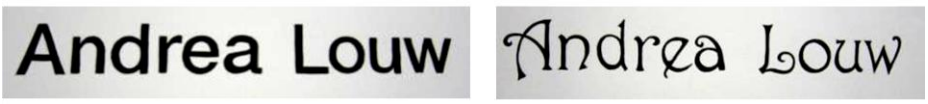


Figure 29 Examples of Helvetica and of typeface expressing a professional identity (Florist)

The projects consist of three related but separate activities which have to be completed without any prior knowledge. The first involves rendering the utilitarian Helvetica typeface. Here the primary intention is to introduce explicit, codified typographic knowledge about character formation, spacing and centering. This Novice level part of the project conforms to a Knowledge code.

The second and third parts of this project are the first which involve 'reading' the meaning of designs – in this case the 'personalities' of typefaces. Rather than creating something new, students are required to select and render examples of existing typefaces which act as visual equivalents of abstract concepts related to personal and professional identity. The visual discrimination required to match a font with the abstract concept related to

identity calls for the stronger gaze of Advanced Beginner cognition. Type is an element of design language, but comes into its own as a specialized form of knowledge in the context of Graphic design. In this project acquiring the rules of this formal visual language is as significant as learning how to apply this language to communicate symbolic meaning: an Elite code (ER+/SR+).

P8. The Puzzle

The conceptual content of this project concerns the principle of abstraction, which enables translating a two-dimensional shape into a free-standing, three-dimensional form. Procedural knowledge concerns understanding the specialized technique required to fabricate it.

Project content is generated by an 'authentic' brief which calls for the design and fabrication of a prototype of a children's puzzle, which consists of interlocking pieces of flat card with applied decoration synchronous with the thematic content. The topic is based on a weakly framed theme (carnival or festival), for a target age group. It is an Industrial design project and the first free-standing 3-D object of the curriculum, calling for the consideration of context dependent constraints and affordances during the design process. Unlike the topic, the design process is strongly framed and involves several stages and levels of abstraction, requiring considerable powers of imagination, 3-D visualization, technical skill and aesthetic judgment: an Elite code (ER+/SR+). It requires:

- Selecting a leitmotif representative of a specific carnival/festival from available photographic references and translating it into a descriptive drawing (SR+);
- Generalizing and abstracting form: '*Stylize and simplify these drawings by translating them into flat shapes*' (ER+ / SR+);
- Making use of prior knowledge: '*Remember the Less is More project'* (ER+) ;
- Visualizing these planes as interlocking puzzle pieces, using a '*slotting system'* and resolving design problems by making '*thumbnail prototypes'* (SR+/ER+);
- Using white construction card to cut out the puzzle pieces, '*to scale'*, which '*must be slotted together to make a 3-D constructed toy*' (ER+/SR+).

Figure 30 An example of a Puzzle (P8) along with its labeled box (P9 & P10)

The puzzle furthermore requires the application of prior knowledge of '*colour theory to surface detail*', in a limited colour range of hues and black, requiring conceptualizing the puzzle in abstract and decorative, rather than in realistic colour. The purpose of the application of '*surface detail through the use of colour (contrast of hue) texture, pattern and line'* is to enhance the design / leitmotif selected to represent a specific carnival or festival. This Advanced Beginner project introduces a new procedure to apply colour – that of the use of adhesive colour film, which has to be cut and then applied to the surface of the interlocking white puzzle pieces. The epistemic relation of colour theory, technique and application is consequently strengthened in this part of the project. Furthermore, to select *which* colour combinations to use to best communicate the theme of festival to 8 year old children requires increased levels of visual discrimination and gaze.

P9. The Box

This is a Directed Novice Activity rather than a project. The procedure is simple: to translate flat, technically drawn and measured pattern/plan into a three dimensional object. Skill concerns accurate measurement and construction according to strongly

framed procedures: A Knowledge code. This Novice level activity is part of a larger project involving packaging (P10).

P10. The Label

The conceptual content informing this project is the principle of composition, with a specialized purpose: Packaging. This involves the combined use of type and image in a given format.

Project content requires creating a label for the box (P9) intended for packaging the Puzzle (P8). It encourages the use of prior knowledge about colour, type, stylization and composition to create '*labels that include type and image to go onto packaging for a specified product*'. These labels have to communicate factual and visually appealing information about the puzzle to 4-8 year old children. Designing for a target audience involves considerations of significance. This requires a degree of contextual insight into context dependent constraints and affordances, which simultaneously create opportunities for exercising stronger gaze. Colour usage in this project again calls for applying '*hues black and white*' but poses the new challenge of creating a thematically coherent composition which incorporates a heading in a suitable typeface, and a stylized image representing the puzzle within the box. This process of visual abstraction and synthesis requires that the 3-D puzzle be translated back into a stylized 2-D image before being incorporated in the design. To do this will require advanced conceptual understanding of design principles and contextual insight, as well as a developed capacity for visual discrimination.

The context is Graphic Design and the content requires the application of prior knowledge of generic design principles towards a specialized, 'authentic' purpose. The reiteration of this conceptual knowledge strengthens epistemic relations. The required use of gouache also provides an opportunity to improve fluency (eye-hand co-ordination and colour discrimination) in this medium, strengthening social relations.

Solving the ill-defined problem posed in this brief requires developed Advanced Beginner cognition to solve. It potentially enables considerable choice of potential solutions but

provides few maxims to scaffold the more intuitive design process. Visualizing and creatively synthesizing the stylized image of the puzzle, a thematically suitable typeface, and a restricted colour range into a stylistically coherent composition aimed at a specific target market, calls for considerable aesthetic discrimination and gaze: a Knower code (ER-/SR+).

It could be argued that, as for the Bag project, without the provision of compositional maxims to guide the design process, the level of gaze required by this project in its current position in the project sequence may be too developed for students lacking in the requisite Knower attributes. This exposes the project to the risk of a mismatch between curriculum aims and means, which could potentially privilege some students over others.

P11. The hand painted Cushion Cover

The conceptual content of this project requires formal stylistic analysis and synthesis, and the introduction of additional colour theory. The content involves the design and fabrication of a hand painted cushion cover intended for a restaurant serving traditional cuisine. The intention of this project is twofold: to introduce stylistic and formal analysis as a point of departure for the design process, and to strengthen the epistemic relation of colour theory by introducing the use of '*complementary colours to create browns, chromatic grays and muted colours*'.

Stylistic analysis involves using formal design language and 'gaze' to 'read' distinguishing stylistic markers embedded in objects, and to use these as a point of departure for creating original work. These markers, or schemata, are shared stylistic features of works of art, design or craft produced during particular historic periods, and/or by people with shared values and technology. In this project students are required to *'Research and analyse the use of colour and ornament as found in the traditional, hand crafted artifact of a particular country, region or culture*'. Although it is an example of an 'authentic' project, its primary concerns are formal and stylistic. It is an example of a project where some of the 'wickedness' has been removed from the design problem by providing explicit

thematic referents. The stronger framing over content intends to guide, or scaffold the exercise of gaze.

Figure 31 Example of a Concept board and hand-painted Colour Cushion (P11)

Complementary colours stand opposite each other on the colour wheel and used alongside each other, result in strong contrast of hue. (An example would be of red flowers offset by a green background). When mixed together, these complementary pairs (red-green; blue-orange; purple-yellow) neutralize each other – enabling the creation of a range of different browns, chromatic grays and neutral or muted colours. This is powerful knowledge that allows for a more nuanced understanding of the other colour contrast; for example, a cold hue like green can be 'warmed' by adding red, resulting in olive green. This project therefore strengthens the semantic density of colour theory and in doing so simultaneously strengthens its epistemic relation.

To help assess how successfully students have recognized and realized the analysis and re-interpretation of stylistic information, this project calls for a Concept Board – a form of declarative discourse which involves referencing the design sources informing design decisions. These information rich concept boards 'reference' design sources, making design choices explicit, thereby strengthening epistemic and social relations.

The context is Surface Design and the procedural knowledge is specialized – requiring the use of textile inks. Students are encouraged to become familiar with its inherent

properties by '*shading, blending and texturing colours'*. Exploring this new medium strengthens both epistemic and social relation of this procedural knowledge.

In summary, this project calls for Advanced Beginner cognition to enable situational recognition and to evoke prior design knowledge about colour, composition, stylization and pattern. It also calls for stronger gaze to creatively synthesize these forms of conceptual knowledge into an original design, with the guidance of explicit formal referents: an Elite code (ER+/SR+).

P12. The Silkscreen Print

This project explores the design principle of figure-ground relationship (positive and negative shape) as well as introducing a new procedure for transferring a graphic image onto another surface in multiples: Silkscreen printing.

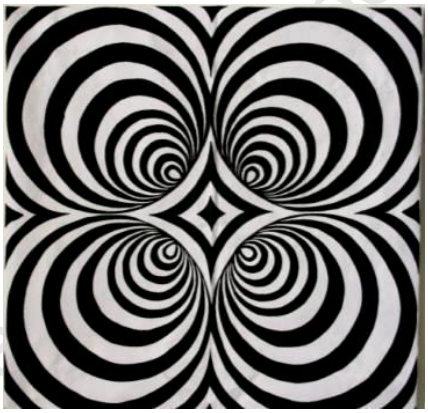


Figure 32 Example of a Silkscreen Print (P12)

This brief calls for the creation of a black and white cushion cover intended for use in a boutique hotel. The 'authentic' content of this project requires the application of the semantically dense concept of the figure ground gestalt by means of 'the *use of positive and negative space*' and the equal distribution of black and white – a distinguishing feature of 60's Op art. Examples of 'Op' art from the 1960's consequently serve as precedent, or a point of departure, for the design. This use of historic precedent strengthens the epistemic relation, but the very distinctive stylistic referents of the 'authentic' topic weakens gaze slightly by scaffolding its use.

This contextualized Surface Design project (P12) introduces the Silkscreen printing method, which enables the transfer of multiple identical images onto, in this case, fabric. This procedural knowledge, with its stronger epistemic relation, coupled with the evocation of gaze to 'read' and 'write' in the manner of 'Op' art, imparts this project with an Elite code (ER+/SR+).

P13. The Workstation

The concept informing this project is spatial design, especially that pertaining to interior space. The content calls for the design of an ergonomically sound and stylistically coherent workstation, for a student of design, in a specified (small) space.

This project has three distinct but intertwined foci: Conceptualizing spatial design and working to scale, stylistic analysis and its application, and communicating design intentions by means of technical and orthographic drawings.

Spatial design extends the vocabulary of formal visual language and the brief provides explicit guidelines about specialized contextual affordances and constraints to direct the initial research and planning process.

The specialized context of this project is Interior Design. Its purpose is to transmit codified, context dependent knowledge and procedures such as drawing accurate plans, sections, and isometric projections, to scale, according to the requisite architectural drawing conventions. Further requirements include building a scale model and rendering an isometric projection of the workstation in colour crayon.

The cognitive focus of this 'authentic' project is situational and formal. Spatial design also requires considering the ergonomic, aesthetic, emotional and human affordances of the space. Students are required to select the coherent style called for by the brief. This weakly framed aspect of the brief relies heavily on students' self-directed choice, and on evoking their intuitive aesthetic discrimination and developing gaze. Integrating all the different kinds of knowledge called for by the ill-structured, 'wicked' design problem posed by this 'authentic' brief requires developed Advanced Beginner cognition. A

concept board is required to support design choices and a verbal presentation provides further opportunity to explain these: An Elite code (ER+/SR+).

Figure 33 Example of a scale model of a Workstation (P13)

P14. The Fashion Illustration

The concept informing this project is of stylistic analysis, and synthesis using formal referents particular to Fashion design. The content involves designing and illustrating a range of clothing in the manner of a current collection of an established fashion designer. A formal and stylistic analysis of such a designer's work would include considering '*trademark silhouette, fabrics, colours, trims and accessories*' and their 'preferred *style, target market and sources of inspiration*'.

This fashion illustration project is an example of a Presentation drawing. Such drawings represent what finished products might look like and are usually part of design proposals. The technique and medium is colour crayon – first introduced during the 'Sweets' (OD.2) observational drawing project (Appendix 9.1). The fashion illustration requires applying prior knowledge about '*complementary contrast and chromatic grays'*, to draw in layers, and to '*develop form and space by blending colours (intense colours come forward, duller*

colours and chromatic grays recede). The latter implies contrast of saturation without explicitly naming it.

Figure 34 Example of a concept board and a fashion illustration (P14)

Colour frequently contributes to the mood and signature of designer's work; for example, Valentino's distinctive red and the prevalence of black and white in Chanel. In this project, prior knowledge of complementary contrasts is used to suggest three dimensional forms, the texture of fabrics and how they drape over the body. These illustrations also require including rudimentary knowledge about garment construction – procedural knowledge with stronger epistemic relations.

This Advanced Beginner project further strengthens the semantic density of colour theory by the requirement for its application towards descriptive and expressive purposes. The specialized content of the brief intends to encourage reiteration of the process of stylistic and formal analysis – evoking gaze with which to 'read' and then' write' design, by means of the stylistic markers of a chosen designer's work. These explicit maxims guide the design process, including the lay-out of the concept board and the manner of rendering it in colour. Although this project requires some technical understanding about garment construction, it is primarily legitimized by knowing what makes clothing desirable and fashionable: a Knower code (ER-/SR+).

P15. The Jewellery Design module

The conceptual content of the three projects which constitute this module is stylistic and genre analysis: genre as in specific types of jewellery which have particular uses, requirements and affordances; for example, rings, earrings, necklaces, bracelets and brooches.

The content of the Jewellery module includes two 'authentic' projects calling for the design and illustration of a *'pair of [chandelier] earrings and a pendant'* with a chain, and a cast silver ring.

Students are required to design and make the chandelier earrings and pendant for a 'client' who '*loves pattern and stained glass windows'* and whose '*only requirement is that it has some movement and some beads (colour) in it*'. The requirement to research examples from the canon (stained glass and pattern) and the discipline (chandelier earrings and pendant necklaces) as a point of departure for original work strengthens the epistemic relation of this specialized design knowledge. It also evokes further opportunities for exercising gaze, by requiring students to '*evolve elements from inspiration to form new, personalized designs*'. The required affordances of wearable and comfortable jewellery entail considering size and weight in addition to aesthetic and stylistic considerations: an Elite code(ER+/SR+).

Design for the ring requires incorporating a stylized letter, in low relief, into the design for a positive, to be carved out of wax for casting in silver, using the lost wax method. The epistemic relation is strengthened by the required use of prior procedural knowledge about positives and low relief, as well as design principles such as simplification, stylization and the element of type. These knowledges can be transferred to the discipline specific context of this brief due to their strong semantic density.

These two projects introduce students to a range of specialized materials and techniques of fabrication. These include cutting and piercing sheet metal, bending wire to make components of chains, earring sections and jump rings, and carving a wax positive for a ring. Both projects require presentation drawings rendered to scale, according to explicit

specifications. Close observation and prior knowledge of colour theory and rendering techniques are evoked to '*obtain an accurate idea of what metal/beads/glass look like'.*

Figure 35 Examples of Jewellery projects (P15)

The technical side of these projects required Novice cognition, unlike their design which calls for Advanced Beginner cognition. The project reiterates many kinds of conceptual and procedural knowledge introduced in previous projects, which strengthens epistemic relations considerably. However, the aesthetic discrimination required to design these pieces according to the weakly framed precedent and criteria provided by the 'client' calls for equally strong gaze: an Elite code (ER+/SR+).

P16. The Adventure route

Conceptually, this Architectural Technology project is concerned with spatial design. It introduces and reiterates several principles and elements of design related to three-dimensional form and space; for example scale, proportion, order, mass, light, movement. The content of the project involves the design of an Adventure Route for young adults or small children, and is informed by the dictum 'Form follows Function'.

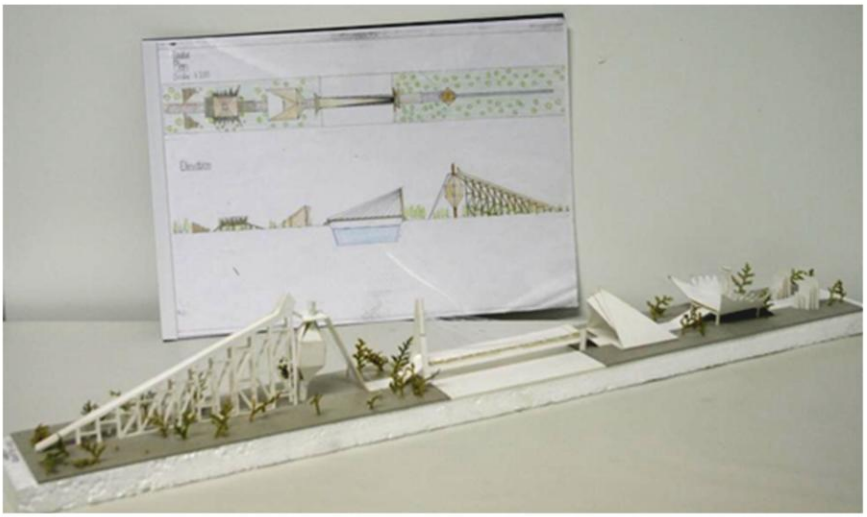


Figure 36 An example of a scale model, with a plan and section, of the Adventure Route (P16)

This route consists of distinct zones of activity, arranged in a linear fashion, and incorporates within it three generic structures: a gateway, a bridge and a tower. The brief requires the building of a scale model and drawn plans, elevations and sections of two of these structures. A precedent study of the work of a published architect (their choice), and that of Santiago Calatrava, is required to inform the design, which has to be conceptually and formally coherent. The brief specifies that students research the technology of basic timber construction and explore '*properties of specified building materials and their application*'. All of these criteria strengthen the epistemic relation of design knowledge.

Although the sequence of the zones of activity and their sizes are specified, the concept 'Adventure' is weakly framed and is left to students to define, along with choosing where to situate the route. So they are required to specify the concept driving the creative process, and to 'integrate *the concept throughout the route by considering the purpose, and the consequent arrangement of forms in space, of each of these zones*'. This weakly framed, ill structured and conceptually complex design requires the use of many different forms of specialized procedural and conceptual design knowledge, with strong epistemic relations. It also requires the exercise of considerable contextual insight and aesthetic and spatial discrimination to integrate them all into a conceptually coherent whole. This Advanced Beginner project is the only one in the curriculum to provide weighted criteria

prior to assessment. It requires knowledge about the utility and significance of spatial design in equal measure: an Elite code (ER+/SR+).

Even though this is a later project, the weakly framed, ill defined nature of the brief risks requiring a degree of self-directed design cognition and level of cultivated gaze which many foundation students may not yet possess. This project could be made more level appropriate by strengthening framing over the context and content of the design question – narrowing choice, weakening the requisite level of gaze and so enabling all students to grasp its recognition and realization rules.

P17. The Self Portrait

The Portrait is the final project of the general, multi-disciplinary part of curriculum. It involves applying *all* the colour theory acquired in previous projects to explore '*form and space, as well as emotional and psychological effects of colour*'. This requires the selection and a stylistic and formal analysis of an Expressionist portrait into which students are instructed to insert a self portrait.

This Graphic design project coincides with subject matter covered in theory lectures. This Advanced beginner project provides a suitable introduction to Graphic illustration techniques, intentionally increasing the level of conceptual and symbolic complexity of colour theory, and the procedural knowledge of gouache technique.

Gaze is intentionally guided by explicit criteria of what '*to look for when interpreting the painting',* making this an example of learning *inside* as well as *about* a canonic style (Gee, 1996). This is a strongly framed, self actualization project intended to enable students to select a portrait with which they most identify, and to apply prior knowledge of design history, drawing, colour, pattern and composition to realise it. The conscious reference to coded knowledge of the canon plus the extension of the range of gouache technique to express emotion and to modulate form specializes this project as an Elite code: (ER+/SR+).

Figure 37 An example of a Self Portrait (P17)

This project concludes the first multi-disciplinary part of the foundation curriculum. The curriculum intention is that students will be sufficiently equipped with design knowledge to embark on the second part of the curriculum involving projects in the design discipline considered best suited to their abilities.

Having analyzed the project briefs, I will proceed to discuss the following findings:

- I will first list the forms of recontextualised design knowledge identified and coded during the analysis using Maton's specialization codes, and distinguish these from knowledge in the field of production.
- I will then group the projects according to their required levels of design cognition specialization codes, and graphically illustrate their positions on Maton's epistemic device.
- I will then graphically represent their respective positions in the curriculum sequence according to their specialization codes and levels of cognition. This ought to reveal any potential mismatches between curriculum aims and means, and identify projects which are ill sequenced.
- I will conclude the analysis by discussing the significance of context possible implications of the current project sequence for potential knowledge transfer.

5.2 Recontextualised design knowledge

The forms of recontextualised design knowledge identified and coded during the analysis of the projects briefs can now be summarized using Maton's specialization codes. They will be compared with the kinds of knowledge identified previously in the field of production (Figures 9 and 11).

5.2.1 Knowledge specialized by a Knowledge code (ER+/SR-)

These kinds of knowledge and procedures can be communicated reasonably explicitly in project briefs:

- Design terminology, theory and formal visual language, common to all design disciplines: the vocabulary, or elements, of design as well as their ordering principles, or grammar; for example principles of composition, stylization, simplification, contrasts, repeat, coherence, gestalt, balance, harmony, proportion, movement, space, format and scale. Elements such as colour, value, line, shape, form, proportion and texture.
- Skills and techniques of representation; for example conceptual, technical and orthographic drawing, models, patterns and prototypes and presentation drawing, in a range of media and techniques.
- Material properties and methods of fabrication (discipline specific); for example, ways of fashioning metal, printing techniques, use of positives, fabric and timber construction.
- Contextual analysis and understanding of technological and formal constraints and affordances.
- Use of precedent to understand good, technical, design solutions.

5.2.2 Knowledge specialized by a Knower code (ER-/SR+)

The intuitive synthesis of different kinds of knowledge into creative design solutions, and the use of gaze to evaluate and discern between the merits of potential solutions, is

specialized by a Knower code. This knowledge, because of its tacit nature, is more difficult to describe explicitly, which is why its transmission, in pedagogy, is supported by means of modeling and doing. In the briefs which constitute the intended curriculum, Knower attributes are largely implicit, and their presence alluded to in words such as 'create', 'make', 'apply', 'synthesize', 'choose' or 'select'. There is very little explicit mention of desired dispositions such as creativity, curiosity, intuition, imagination or originality, making it difficult to establish what distinguishes excellent, innovative work from that which merely meets the required criteria set out in the brief. So the presence of implicit knower knowledge in the briefs has had to be teased out for this analysis, by reading between the lines of the more detailed descriptions of procedural and conceptual knowledges with stronger epistemic relations. This social relation of design knowledge specializes gaze and is identified in projects calling for the following:

- Ability to integrate different kinds of knowledge towards a productive or meaningful purpose by means of the design process.
- Ability to communicate abstract concepts/meaning visually; for example, conceptual drawings, sketches, scamps, Marquettes, and small prototypes are variously used during this more intuitive part of the design process, to give form to, develop, and record emerging ideas.
- Creativity, imagination, originality, intuition (largely implicit in the project briefs).
- Visual and Spatial perception and discrimination (having a good 'eye' for detail and part-whole relationships).
- Visual-motor control (having 'good hands' for fabricating and rendering in a range of materials).
- Contextual insight and understanding of human and social behavior of 'clients' targeted in some project briefs.
- Use of precedent to 'read' beautiful and meaningful design solutions.

Considering that this is a foundation curriculum, the primary intention of all the projects is the transmission of different forms of specialized and generic, recontextualised design knowledge by means of the design process. These knowledges bear a close resemblance to those identified in the field of production. However, the semantic density of

recontextualised forms of conceptual and procedural knowledge would be weaker and less complex, as would the anticipated fluency of their application in practice. The findings do confirm that, even at foundation level, the curriculum 'looks both ways' by starting the transfer of different forms of design knowledge as well as the cultivation of gaze by means of project briefs. In this way the curriculum enables the initiation of a long process of induction into a secondary, professional discourse.

5.2.3 Specialization codes and levels of design cognition

This analysis reveals that projects cater for many shades of Novice and Advanced Beginner cognition. There are fewer Novice level projects than would be expected at this level. Instead students are frequently required to apply quite complex principles and procedures without any prior knowledge or experience provided by preceding projects.

Those projects requiring Advanced Beginner cognition are spread between the Knowledge, Elite and Knower quadrants of Maton's epistemic device. As can be seen in Figure 38: the Puzzle (P8), Colour cushion (P11), Silkscreen print (P12), Workstation (P13), Jewellery projects (P15), Adventure Route (P16) and the Portrait (P17) are all specialized by an Elite code. The Fashion illustration (P14), the Bag (P6) and the Label (P10) are legitimated by a Knower code and the Tile (P5) by a Knowledge code.

The specialization of projects, even at this level, confirms what was indicated in the earlier discussion about expertise and the divergence of specialization codes contained within them. What was not anticipated was how early this specialization starts.

Many projects intend to transmit different kinds of design knowledge simultaneously. Often these kinds of knowledge require different levels of cognition to understand or to apply. That those levels and project types can co-exist and overlap was identified by Lee (2009), Dorst (2008) and Lawson (2004), and is confirmed by this research, as is the related matter of the simultaneous development of conceptual and procedural knowledge in design projects identified by Lee (2009).

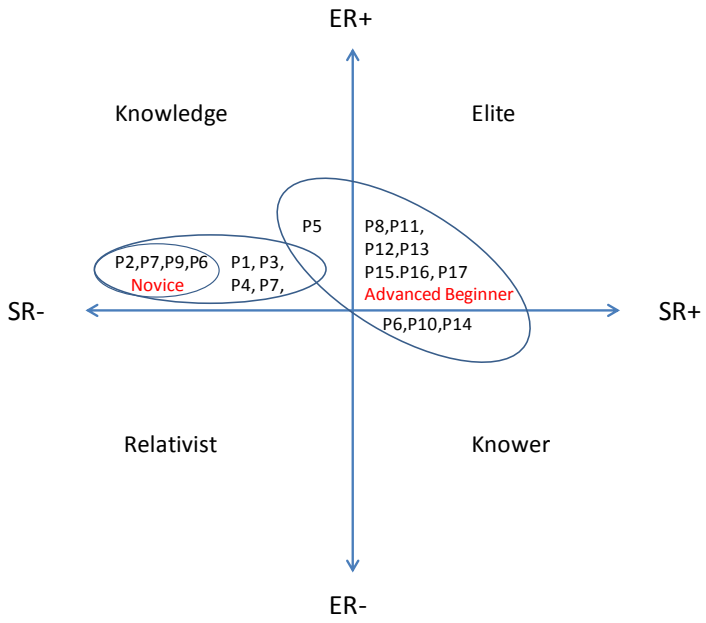


Figure 38 Coded projects positioned according to their required level of design cognition. The two overlapping Novice groupings refer to Lee's distinction between Directed Activities' (smaller circle) and Project Oriented Activities'.

The following section analyses the sequence of the projects of this curriculum and examines the potential impact of their required levels of cognition and specialization codes on enabling or inhibiting the transfer of different forms of design knowledge.

5.3 Project sequence and the transfer of knowledge and consciousness

Figure 39 illustrates the projects sequence of the multi-disciplinary part of the Foundation course's curriculum: Projects are positioned according to their sequence in time (columns) and their required level of design cognition (rows). Knowledge specialised by epistemic (red) and social (blue) relations have been separated to indicate possible mismatches between curriculum aims and means. The box project (P9) which is in effect a one day Novice exercise which forms part of the Label project (P10) has deliberately not been included, since its disproportionate dip adds little to the overall understanding of how the project sequence unfolds.

The horizontal arrow indicates how the semantic density (SD) of recontextualised knowledge was found to increase over time, and the vertical arrow indicates the gradual strengthening of context dependent knowledge in the briefs, from the general, context independent to the specialized and discipline specific (SG). The analysis found a distinct connection between the strengthening epistemic and social relations of knowledge and the increased levels of abstraction and context dependence of that knowledge.

It can be seen that epistemic relations are stronger in the early context independent Novice level projects (P1-P4 and P7), which are primarily concerned with acquisition of formal visual language and are just beginning to cultivate gaze. The semantic density of conceptual knowledge gradually increases over time.

What is also immediately apparent is that the intended development of knowledge and gaze is not incremental but is marked by some dramatic dips and spikes, indicating a curriculum sequence which contains some projects that are not level appropriate and fall foul of a mismatch between curriculum aims and means. The Bag (P6) is the most obvious example discussed in the analysis, which accounts for the dramatic blue spike in the chart.

The equally dramatic dip and spike of required strength of gaze in P7 is due to the introduction of the Typography project by means of the strongly framed Novice level Helvetica exercise, followed by the incremental strengthening of the symbolic density of the exercises concerned with the capacity of type to communicate information *and* meaning. The strong epistemic relation of the context dependent typographic knowledge remains constant.

Figure 39 indicates considerable variation amongst many projects identified as requiring Advanced Beginner cognition. This variation indicates criteria of differing conceptual or procedural complexity, degrees of context dependency and required strengths of gaze. The primary purpose of some 'authentic' projects is the transfer of conceptual and procedural knowledge, rather than finding solutions to contextualised problems. For others solving ill-defined problems is the primary focus of the project. This analysis has distinguished between these two types of Advanced Beginner level projects in this curriculum, and the distinction is related to the strength of gaze evoked by the situated

project briefs.

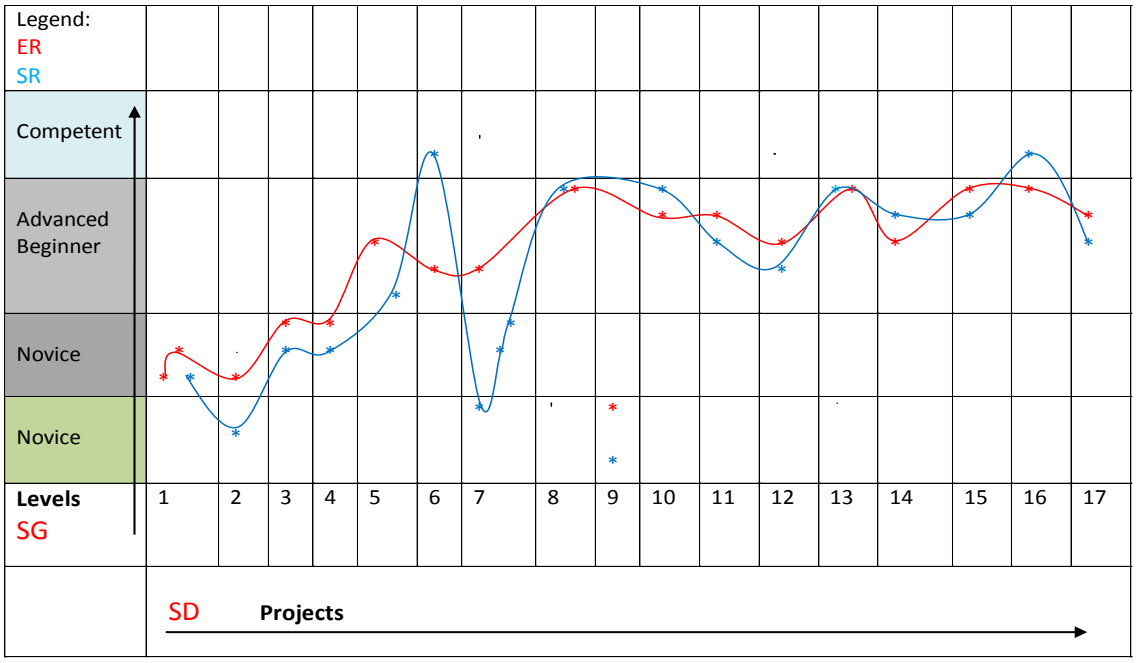


Figure 39 Coded projects placed in the curriculum sequence

The first type of Advanced Beginner level project involves those 'authentic' projects which use stylistic analysis as a form of 'trying on' of a style. These projects scaffold or guide gaze during the design process, by providing support in the form of unambiguous visual referents. According to Angelil- Carter (2000) this form of 'plagiarism' is both developmental and constructive within academic contexts where students are acquiring a new discourse – in her case academic writing, in ours designing. '*Gaining authority in academic writing means learning how to use the voices of others to develop one's own' (*p. 168). For example, the design of the silkscreen print (P12) is based on the strongly framed, distinctive precedent of 1960's 'Op' Art (P12) and the Colour Cushion (P11) similarly provides explicit colour and stylistic referents for students to re-interpret. The Fashion Illustration (P14) refers to a specific range of clothing with very clear guidelines about what to look for and which questions to ask, as do the Portrait (P17) and Jewellery (P15) projects.

The considerable difference in complexity and autonomy indicated between P7 (Typography) and P8 (Puzzle) in Figure 39 visibly illustrates the difference between the two types of Advanced Beginner projects identified by the analysis. The second type, of

which P8 is an example, calls for a developed gaze to evaluate the utility, form and significance of design choices posed by ill-defined, weakly framed contextualised design problems.

These projects allow for more potential design solutions and require stronger social and epistemic relations to grasp their recognition and realization rules. They include the Bag (P6), the Puzzle (P8), the Label (P10), the Workstation (P13) and the Adventure Route (P16). For example, project criteria related to the spatial design of the Workstation (P13) are reasonably explicit, but the choice of Style is weakly framed and dependent on a Knower disposition to interpret and integrate into an aesthetically coherent design.

The potential mismatch between aims and means of the Bag (P6) and The Label (P10) projects were identified during the analysis, as was the level of cognitive complexity evoked by the Puzzle (P8) and the Adventure Route (P16). All these projects require a reasonably well cultivated gaze for successful completion. Where they involve the use of precedent, for example the Adventure Route (P16), they call for conceptually advanced analysis, which require indentifying underlying unifying principles rather than surface similarities. According to Angelil-Carter this process entails reshaping the original into an authentic response (p. 172). The level of design cognition required to integrate these knowledges threaten to exceed those considered appropriate for foundation curricula, and may inadvertently set some students up for failure. This is also true for the projects positioned early, and poorly, in the otherwise carefully structured curriculum sequence: P6, P8 and P10.

Students with more cultivated Knower attributes may well respond to such ill-structured design problems with creativity and originality. However, for those whose gaze is still relatively uncultivated these weakly framed projects may be problematic and may inadvertently privilege students with more design experience, social capital and better developed Knower dispositions. This is why sequence matters in design curricula.

5.3.1 Project sequence and the significance of context

Lee's (2009) research found that the increasing complexity of knowledge contained in project briefs is directly related to the degree of complexity of the contexts of those briefs. This analysis confirms her findings but can be recast using Maton's specialization and semantic codes, as applied in the analytical instrument (Figure 22).

The analysis confirms that the project content of Novice projects is general and context independent. The primary purpose of these projects is to introduce generic design knowledge and to begin the process of cultivating gaze by means of strongly framed design activities specialized by a Knowledge code. Conditions promoting knowledge transfer at this level of cognition is thus found to be project content which combines weaker semantic density and gravity. This potentially enables generic design knowledge to be transferred between projects.

The analysis also confirms that Advanced Beginner projects with their 'authentic' briefs provide content of varying levels of specialization and context dependency. The more specialized contexts of these briefs have the capacity to generate 'authentic' design problems with more complex and context dependent affordances and constraints. This in turn calls forth more specialized disciplinary knowledge and stronger gaze to solve these situated design problems. These more complex design problems provide opportunities for abstract design concepts and principles to be unpacked. The potential for cumulative learning, at this level of cognition, is thus found in project content which combines stronger semantic gravity and density. Intended curricula have to create these conditions, characterized by context dependent project briefs, to best enable the transfer of increasingly complex and semantically dense design knowledge.

These findings challenge Maton's (2010) contention that a combination of stronger semantic density and weaker semantic gravity creates the ideal condition for knowledge transfer and cumulative learning. It may well be so for theoretical subjects and disciplines, but appears not to be entirely true for Design. As a vocational discipline, its curriculum has to 'face both ways' (Barnett, 2006). The project driven curriculum has to enable the

transfer of theoretical subject knowledge (know that) and situated, tacit knowledge (know how). This analysis found that although the weaker semantic gravity of generic design concepts allows for their potential transfer between projects, the transfer of more complex and context dependent design knowledge required the increasingly specialized contexts provided by 'authentic' project briefs. A combination of weak semantic gravity and strong semantic density is therefore not the only condition for enabling cumulative learning in Design. As discussed in Chapter 2, context is crucial in Design since it provides the subject, or design problem, to which domain independent design cognition can be applied to find a solution.

Although this analysis excluded projects suitable for Competent cognition, Lee's findings about how design knowledge grows suggest that the conditions suitable for Advanced Beginner level will equally apply for all subsequent levels of design cognition. It could be predicted that the strength of semantic density and gravity of design knowledge will progressively increase according to the level of cognition required to solve complex design problems, irrespective of their specialization code.

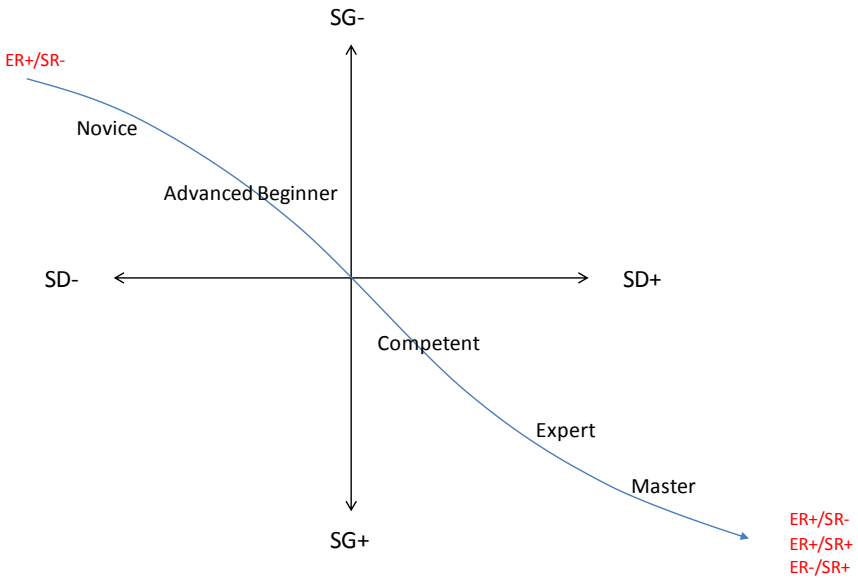


Figure 40 The progression of design knowledge and levels of cognition: a suggested trajectory

Undergraduate students are unlikely to progress beyond competence, since considerable time and experience is required to acquire the expert's capacity for intuitive problem

solving. This relation between stronger semantic density and gravity is illustrated in Figure 40. The progression of levels along the axis of the semantic codes indicates a trajectory which predicts the further joint strengthening of these codes as design cognition moves towards competence and beyond.

Chapter 6: Conclusion

In South Africa, universities have provided academic support for non-traditional students since the 1980's, during which time the focus of academic development has shifted from social to epistemological access. Instead of locating reasons for high failure rates among students within the students themselves, many academics have used critical theory to reveal the social character of knowledge production and transfer, in order to find ways of improving access to powerful disciplinary knowledge (Boughey, 2010; Garraway, 2010).

Vocational foundation courses are tasked with providing curricula that 'face both ways', (Barnet, 2006) but their primary concern is providing underprepared students with core disciplinary knowledge rather than preparing them for the world of work. This study of an existing design foundation curriculum uses a social theory of knowledge to render the structuring of its knowledge content more transparent.

The bi-modal nature of design knowledge with its roots in science and the arts is well documented by empirical design research; however the use of a social theory of knowledge to examine design knowledge and curricula are less common (Carter, 2007; Bolton, 2006; Carvalho, Dong &Maton, 2009). This study has used the theories developed by the educational sociologists Basil Bernstein and Karl Maton to examine the structuring and progression of design knowledge in a foundation curriculum by means of two interrelated questions:

How has design knowledge been recontextualised into the project briefs of the studiowork component of the integrated, multidisciplinary Design Foundation Curriculum and how does this curriculum enable the intended development of design knowledge and consciousness over the course of the year?

Their theories of knowledge provided a lens through which to examine a design curriculum and to analyse a theory of design cognition and its development. An analytical instrument was developed by bringing these theories of knowledge, the findings of empirical design research into levels of design cognition, and a typology of design projects into relation.

6.1 Summary of the findings

The analysis of the design foundation course's project briefs revealed the following:

Recontextualised design knowledge bears a close resemblance to design knowledge in the field of production.

Sequence matters in design curriculum. It influences the potential transfer of conceptual and procedural design knowledge and, significantly, enables the acquisition of more tacit forms of design knowledge such as aesthetic discrimination and gaze.

A theory of knowledge helps to make visible the often tacit assumption and grounds for legitimation implicit in design curricula, which can be 'set' to potentially privilege some students over others.

A strong relation exists between situational context and knowledge progression in design pedagogy, which along with the other findings has significant implications for designing curricula which better enable the transfer of design knowledge and consciousness.

6.2 Implications of the findings

The use of a social theory of knowledge helps to make explicit the different kinds of design knowledge synthesized during the design process. It recasts the science/humanities debate by drilling down to reveal the underlying structures and bases of legitimation of these analytical and intuitive forms of knowledge. Particularly significant is its bringing to light of more tacit forms of design knowledge, like gaze, which can easily be overlooked, or remain implicit, in curriculum design, but which constitute the creative glue that integrates different kinds of design knowledge during the design process. Maton's specialization codes bring the Knower into clearer focus and highlight the importance of scaffolding the cultivation of gaze as well as the more explicit, codified forms of design knowledge in design curricula entrusted with providing both social and epistemic access to underprepared students.

Using Maton's specialization and semantic codes to generate more fine grained descriptions of the levels of design cognition contributes to design scholarship by providing a theoretical basis from which to examine design knowledge and its transmission by means of studio pedagogy and a project driven curriculum. These codes reveal how and why projects that are not level appropriate and that are poorly sequenced, can result in curriculum that are 'set', frequently unintentionally, to privilege some students over others.

The poorly sequenced Bag (P6), Puzzle (P8) and Label (P10) projects, the weakly framed Workstation project (13) and the too cognitively advanced Adventure Route project (P16) are all examples of mismatches between aims and means in this foundation curriculum. They highlight the importance of ensuring that the logic of the curriculum sequence is informed by an understanding of how design cognition develops over time, and of which conditions best enable the transfer of different kinds of level appropriate design knowledge.

Bernstein and Maton's theories of knowledge thus provide a way of making the distinction between knowledge structures underpinning the different levels of design cognition more explicit. They provide answers to some of Dorst and Reymen's (2004) questions about conditions which could enable progression between levels of design expertise. In this way this study contributes to theory building in design pedagogy, in a field where '*theory development is just now beginning to blossom'* (Friedman, 2003, p. 516).

In the field of educational sociology, this study uses a theory of knowledge to demonstrate that design curricula are characterized by a combination of what Muller (2008) refers to as contextual and conceptual coherence, and to explain why sequence matters in such vocational curricula. It supports Barnett's (2006) claim that vocational curricula are tasked with providing students with epistemic as well as vocational access.

6.3 Suggested improvements

The analysis revealed that many projects in this curriculum build on prior learning and are well sequenced to enable knowledge transfer; for example, the carefully planned colour sequence from the Colour Wheel project (P2) through to the Tile project (P5). However the curriculum could be improved by implementing some changes:

Projects identified as poorly sequenced could be made more level appropriate by changing their position in the curriculum sequence or by strengthening framing over project content and context. Projects which scaffold the acquisition of gaze should ideally precede ill-defined ones that potentially evoke stronger gaze. For example, P11 (Colour Cushion) and P12 (Silkscreen Print), may be better placed before the more complex P8 (Puzzle) and P10 (Label) projects. The Colour Cushion (P11) introduces significant generic colour knowledge and its earlier introduction could benefit subsequent projects which involve colour work. The scaffolded Fashion Illustration (P14) and the Jewellery (P15) projects, on the other hand, are well placed to benefit from experience gained from preceding stylistic analyses (P7, P8, P11, P12, and P13). Although the technical side of the Jewellery project (P15) is both new and demanding, it is assumed that students' hand skills will be sufficiently developed by the time they do this later project. The Portrait (P17) draws all the colour theory together and deepens semantic density through its exploration of the expressive potential of colour. As a self-actualization project, it is a meaningful way of ending the multi-disciplinary part of the curriculum.

The analysis found that the curriculum contained very few Novice level projects. Although some Advanced Beginner projects contained parts which conformed to this level of cognition, many more could benefit by the inclusion of short Novice level Directed Activities by means of introduction; for example, a guided exercise in relief printing, or an exercise which introduces well known maxims like the Golden Section or the Rule of Thirds to guide composition. Technical benchmarks may similarly be more effectively communicated by short, strongly framed activities than purely by the display of examples. Arnal and Burwood (2003) significantly found that criteria which are too explicit can inhibit creativity by limiting potential solutions. However, for students being inducted into

a new discourse, I agree with Angelil-Carter (2000) that projects which guide the cultivation of gaze by having some of their 'wickedness' removed have a place in design curricula, provided that they are correctly sequenced.

In design curricula projects with 'authentic' contexts provide ideal opportunities for increasing the conceptual density and abstraction of design principles. Students with more experience, cultural capital or with stronger Knower dispositions may well respond at more advanced levels of cognition than required by such projects briefs. This is the advantage of ill-defined design problems, which allow for more than one potential solution. What is important is that projects are consciously planned to be within the cognitive grasp of *all* students, especially those whose gaze is still relatively uncultivated.

Transmitting design knowledge with stronger epistemic relations can be done reasonably explicitly and sequence, although important, may not always be crucial for cumulative learning: for example, design principles and elements do not have to be taught in any fixed order to be understood. But the *application* of these principles during the design process, which requires gaze, needs to be sequenced carefully to ensure that *all* students grasp the recognition and realization rules of these projects. It is for this reason that sequence is crucial in design curricula.

The analysis found that Semantic codes are able to describe the enabling conditions for knowledge transfer over time. It was found that the developing the degree of complexity and abstraction of different kinds of design knowledge are dependent on contexts dependent project briefs with stronger semantic gravity. All of these findings demonstrates the significance of sequence in design curriculum and illuminate how potential mismatches between curriculum aims and means can be prevented, and the potential for cumulative learning increased, through the careful sequencing of level appropriate project briefs.

The standardised categories of the assessment criteria of the current NQF formatted project briefs make little mention of desired Knower dispositions such as imagination, curiosity, originality and intuition. These could be included to make more explicit the frequently tacit criteria which distinguish excellent from average design solutions. Re-

designing the project briefs to inspire creativity should ideally include visual forms of communication to support and augment written texts.

The absence of weighted assessment criteria in the majority of current project briefs has been mentioned before. This omission should be addresses for two reasons: To clarify to students what kinds of knowledge matter most in particular design contexts, and to bring to light the often implicit values which inform the recontextualising gaze of curriculum planners, including myself. Evaluation in the field of reproduction could greatly benefit from such increased levels of transparency by making the kinds of knowledge that matters most in each project more explicit to lecturers and moderators involved with assessment.

Clearer, more explicit criteria of which kinds of recontextualised design knowledge are valued in the intended curriculum will better enable lecturers to communicate, and students grasp, the recognition and realization rules of design discourse in the enacted curriculum , empowering students on their way to becoming part of a new generation of visually literate, productive design innovators.

6.4 Further research

The scope of this study was restricted to describing design knowledge and the structuring of its recontextualised form in the intended curriculum of an existing design foundation course. Its purpose was to reveal how a theory of knowledge can make curriculum practices more transparent and thus facilitate the conscious planning of theorized curricula which have the potential to improve epistemological access to this vocational field of study.

Insights gained from using a social theory of knowledge to examine the role of this curriculum in the transfer of recontextualised design knowledge to underprepared students should ideally be implemented to improve this curriculum. Suggestions of how this can be done, by improving curriculum sequence and ensuring that projects are level appropriate, have been discussed previously.

A benefit of being conversant in a theory of design knowledge is that it provides a reasonably explicit language with which to facilitate communication between lecturers involved with planning and improving design curriculum and pedagogy at all levels of study. It is therefore hoped that the findings of this study regarding the significance of curriculum sequence in a design curriculum, and the analytical instrument developed to identify and describe different kinds of design knowledge, will have implications beyond the immediate context of the Design Foundation Course. This is particularly pertinent in the light of the current re-curriculation process taking place at CPUT, with the view to offering both diploma and degree courses. This study has demonstrated how a social theory of knowledge can help to distinguish between different kinds of recontextualised design knowledge, including their more generic and specialized forms. It could potentially also be used, as it was by the SANTED project based at NMMU (Shay, Oosthuizen, Paxton & van de Merwe, 2011), to assist with curriculum differentiation; for example, to identify which combinations of design knowledge are legitimated by the current curriculum of respective design disciplines, and how these knowledge combinations could be altered proportionate to different qualification pathways envisioned by the university. Shay (under review) reminds us of the challenge posed by differentiating between the kinds of knowledge required to gain access to and progress between these pathways, and the advantage of having a theory of disciplinary knowledge to negotiate this contested terrain.

Further research involving this particular foundation curriculum could involve examining the impact of the suggested improvements to project briefs and their sequencing in the intended curriculum. This would entail the use of quantitative and qualitative data, including project marks and interviews with students and staff.

An obvious next step would be to use this social theory of design knowledge to analyse and evaluate the pedagogic practices which constitute the enacted curriculum. Whereas the data set of this study allowed establishing the legitimating criteria of project briefs in broad terms, the inclusion of data such as project marks and weighted mark breakdowns would enable a more accurate description of the forms of design knowledge valued most in respective projects. A comparative analysis between such data and the findings of the

study could yield significant insights into alignment, or lack thereof, between the focus of assessment criteria in the intended curriculum and the basis of legitimation used during the assessment of students' work. Such comparative research could shed light on the frequently implicit legitimating criteria which inform the assessment of practical work in studio pedagogy.

This study's contribution to design theory has been noted. A theory of design knowledge enables a more detailed and accurate description of the different levels of design cognition. It is able to explain why curriculum sequence matters in design, and in other vocational curricula. However, further research needs to be done into factors which enable the transition between levels of design cognition. Previous studies note that this transition is frequently quite sudden (Dorst, 2008; Cross, 2005), indicating a profound cognitive shift. Work done on threshold concepts and levels of expertise (Kinchin, Cabot & Hay, 2008) and on threshold concepts and different forms of knowledge (Kinchin, 2010,) may help to explain this sudden transition between levels. Kinchin (2010) uses Bernstein's and Maton's theories of knowledge to interpret threshold concepts in biology education. Using a theory of design knowledge to research threshold concepts in design pedagogy could potentially increase the explanatory reach of this theory, and its capacity to inform the future planning and teaching of enabling curriculum.

The findings of this dissertation and the potential implications of their implementation, as well as the potential for further research into design pedagogy and curriculum, thus contribute in a small way to addressing the pressing problem of improving epistemological access to higher education in South Africa.

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9.0 Appendices

9.1 Table of the project sequence

The bar chart (Appendix 9.1) visually illustrates the sequencing of projects over the year. It identifies the disciplinary specialization and the length of each project. It demonstrates how the three week modules allocated to each of the seven disciplines are either divided into smaller projects of incremental complexity or extend continuously over the three week long module. In addition to these 17 projects, there are four figure drawing and four object drawing projects, spread over four semesters, which reinforce observational drawing skills iteratively.

P1 Graphic	**P2 Fashion**	**P3 Surface Design**	**P4 Block**	**P5 Industrial**	**P6 Fashion**	**P7 Graphic**	**P8 Industrial &**	**D1 Figure Drawing**
Less = More	Colour wheel	Gouache Repeat pattern	Print	Positve for tile	Bag with applied decoration	Type & meaning	3-D Puzzles	Introduction to Figure draw
5 days	4days	6days	2days	4days	7days	5days	9days	
First Quarter								
P9 Indust	**P10 Graphic**	**P11 Surface & D2 Figure draw**	**P12 Surf. & D1 Object**			**P13 Interior design**		**D2 Object draw**
Box	Labels	Painted cushion cover	Silkscreen print		Workstation: Design, Model, Technical & Presentation drawing			Sweets
1day	6days	5days x 2	3days x 2		15days			3days
Second Quarter								
D3 Object draw	**P14 Fashion & D3 Figure Draw**		**P15 Jewellery design**				**P16 Architectural technology**	
	Fashion Illustration	Cutting, Casting, Shaping, Linking metal & Presentation drawing			Adventure Route: Design, model, conceptual & technical drawing			
4days	5days x 2	14days			15days			
Third Quarter								
P17 Graphic & D4 Figure draw	**Extra Project**			**Exam Project**		**Moderation**		
Portraits	Discipline of choice					Exhibition/ Verbal presentation		
5days x 2	10days			10days				
Fourth Quarter								

		# Days			*# Days*
Two Dimesional Design	Graphic Design	21	**Three Dimensional Design**	Industrial Design	14
	Fashion Design	16		Interior Design	15
	Surface Design & Printing	16		Architectural Techno	15
				Jewellery Design	14
Drawing	Figure Drawing	20			
	Object Drawing	10			

Split cells indicate that the class has been divided into two groups.
This allows for two activities to be conducted simultaneously but in diffe udios

Studiowork occupies approximately two thirds of the timetab. This translates to 4hours daily.

Bar Chart indicating the distribution of projects over the year.

9.2 Summary of the project sequence

Following the sequence in the bar chart (Appendix 9.3), I will name and briefly summarize the projects:

The studiowork component of the curriculum starts with a Graphic Design project titled 'Less is More'(P1), which requires translating a naturalistically rendered pencil drawing of an insect into graphic form by means of three processes of visual abstraction: simplification and stylization, positive and negative shape and the selection of a part to stand for the whole. This project is followed by a twelve stage colour wheel (P2) which involves translating basic colour theory, and its grammar of colour relationships, into visual form.

The Gouache Repeat pattern (P3) introduces further core design principles of design like contrast, harmony, balance, gestalt and rhythm by means of four different repeat patterns. Contrast of hue, warm/cool and dark/light are explored by means of colour ways and rendered in gouache. These design principles and repeat patterns are again applied in the Block Print (P4) project, which also introduces the technique of relief printing and the use of transparent colour.

The Industrial design Tile project (P5) involves creating a Positive for the manufacture of identical, monochromatic, low relief ceramic tiles suited for use as a border pattern. This is the first simulated project of the year and the first to move from two into three dimensional design.

The Fashion design Bag project (P6) requires the creation of a personalized cover for a bag, which has to be hand sewn using different fabric embellishment techniques and be machine stitched together. It provides an opportunity to apply prior knowledge of design theory and principles and is the first artifact fabricated from start to finish during the year.

The GD typography project (P7), Type and Meaning, introduces type as a formal element of design, governed by rules of character formation. Students are required to explore the semantic potential of typefaces to communicate personal and professional identity.

Project 8, the Industrial design Puzzle project involves identifying the leitmotifs of a carnival or festival, and then drawing, stylizing and translating this image into a free-

standing, three- dimensional puzzle consisting of interlocking pieces of flat card with applied decoration synchronous with the thematic content. The Box project (P9), involves making a lidded cardboard box to contain the abovementioned puzzle pieces whilst Project 10 involves completing the packaging by making labels for the box and rendering these in gouache. This Label project poses a generic design problem- that of combining type and image in a composition.

The Colour Cushion project (P11) requires doing a stylistic analysis of the use and distribution of colour and ornament in traditional artifacts. This project requires using complementary colours to create muted colours, chromatic grays and browns, using specialized textile inks. This simulated project requires a Concept Board to reference visual source material. The following Surface design project (P12), also simulated, introduces the Silkscreen printing method by means of a black and white design inspired by 'Op' art from the 1960's.

The Interior design project (P13) requires the design of a stylistically coherent Workstation, the building of a scale model and the drawing of the plan, sections and axonometric projection (in colour) of this spatial design, using the requisite architectural drawing conventions.

The Fashion illustration project (P14), calls for a stylistic analysis of the current work of an iconic fashion designer. The project is equally about the skillful rendering of fashion illustrations, in colour crayon, as it is about the analysis and synthesis of distinct stylistic traits into a range of three outfits.

The Jewellery design module (P15) consists of three projects which introduce various materials, techniques and methods of fabrication particular to this discipline. Students are required to design and make wearable chandelier earrings and a pendant necklace, inspired by examples from the canon and instructions from a simulated client. They are required to carve a positive for a signet ring which is then cast in silver using the lost wax method.

The Architectural technology project (P16) calls for the design of an Adventure Route for young adults or small children, which contains three generic structures positioned in a site consisting of seven sequentially arranged zones. The brief requires the building of a scale model and drawn plans, elevations and sections two structures. A precedent study of the

work of two published architects, one local and one foreign, is required to inform the design.

The final general project (P17) involves inserting a self portrait into an iconic post impressionist or expressionist portrait and rendering it in the style or manner of the selected artist. This Self Portrait project is positioned to overlap with work being studied in Communications Studies. It concerns the emotional and expressive use of colour in expressing identity, and the choice of work is of personal significance to the students.

9.3. Example of a project brief

An example of a typical project brief appears on the following two pages. Pertinent information about the project, the presenters, duration and deadlines appear in a box heading the brief. This is followed by lists of assessment categories and criteria, and a detailed description of the required process. As an early brief (the third in the project sequence) the content is detailed and strongly framed. The criteria are not weighted.

9.3 Example of a project brief

Brief 2010

Foundation Course

Module title:	Presenter	Subject area	Month	No. of days	Deadline
Surface Design	Diane Steyn, Wendren Milford & Deon Liebenberg	**2 –D Design**	**Feb.**	**6**	**9 Feb.**
Project: 6- Colour repeat pattern rendered in gouache.					

Assessment Categories: concept, research, design, technique, communication/review, time management, and presentation.

Assessment Criteria:

You will demonstrate the ability to do and understand the following:

1. Interpret and respond to the brief.
2. Create a continuous, geometric repeat pattern informed by design principles.
3. Use hues, tints and tones to create 3 different colour ways.
4. Create a design which uses warm/cold and dark/light colour contrasts.
5. Apply gouache evenly and precisely.
6. Consult with lecturers, manage time, meet deadlines and present the project clearly.

Process:

1. Use your initials as a point of departure to design a geometric repeat pattern. Use either full **drop, half-drop, mirror or radiating** repeats. The letters should be interpreted as abstract, geometric shapes rather than as legible characters. The units of the repeat should be *identical.*

2. Apply the following principles of design to your repeat pattern:

Contrast of shape (positive & negative), size, direction, line, distribution and colour

Harmony of the elements and the colours of the design

Rhythm created by the repeat (a complex design may have several rhythms)

Balance of the shapes and colours used in the design

Attempt to create a repeat pattern that is varied, balanced and coherent.

3. Unit size (for repeat): **6cm x 6 cm**. Overall design size: **24 x 36 cm**.

4. When starting the design process, work ***only in line*** **and** ***always in repeat*****.** (You may find using a graph paper template useful at this stage of the design process).

5. Make at least 2 photocopies of your line design for colour experimentation.
Select **6 undiluted hues** for the first colour way. This colour way should consist of predominantly **warm or cold** colours of differing values. (70 - 90%).

6. Plan your colour distribution on the photocopies, using pencil crayons.

7. Paint several colour tabs of each of the 6 hues you plan to use in your design in order to select the contrasts of value that work best for you. Test on a photocopy.

8. By means of evaluation of preparatory work in consultation with a lecturer or fellow students, select the best repeat pattern and colour way to develop into a final, painted design.

9. Trace your design *lightly* in pencil onto the *smooth* side of a sheet of **A3 Ariston** paper.

10. Paint your colours (mix enough!), one at a time and from the lightest to the darkest colour.

11. First paint hues into the 24 x 24cm square. Then paint the tints and tones in the remaining two 12 x 12 cm squares. **Ensure that the contrasts of value are the same in all three colour ways.**

12. Apply gouache evenly and flatly and keep the edges sharp.

13. Paint a colour strip consisting of 2 x 2cm blocks of the 6 hues used in your design, arranged from dark to light, with 1cm spacers between each block. Use paper from your sketchbooks for this strip.

14. Mount the design and attach the colour strip to the mount: 2cm below, and aligned to the left of the design.

15. Submit the completed design and all the preparatory research for assessment.

Deadline: Tuesday 09 February at 15.30h.