Research Proposal

THE SOCIOLOGY OF INFORMAL LEARNING IN/ABOUT DESIGN

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Submitted in partial completion of PhD in Architecture

Discipline: Design Computing and Cognition

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Date: February.2006
Abstract

Design is a field that encompasses many disciplines and professions (e.g. engineering, arts and architecture, digital media, fashion design and others). But how are knowledge and identity specialized in the design field and within the different disciplines? When learning a professional trade, besides learning specific procedures to perform, one has to learn the “rules”, “processes” and “language” of the field. The understanding of such processes is essential – it is through these that one actually establishes a sense of what is a legitimate practice in a given field. This research draws on a development of Basil Bernstein’s sociology to analyze how those who are new to the design field learn about this specialized knowledge within an informal environment. The aims of the project are to investigate how new designers recognize and realize design practices within four sub-disciplines of design: engineering, architecture, digital media and fashion design; and to define and implement ways of supporting new designers’ inquiry through an ICT mediated learning environment. The expected contributions of this research include: (1) a model representing the underlying principles structuring knowledge within 4 design disciplines and strategies used by designers to recognize and realize legitimate practices; and (2) an informal e-learning environment to experience design grounded on socio-educational concepts.
1. Introduction

The practice of design professionals is moulded by the way knowledge is specialised within the field. In the same way, the social structuring of design knowledge also shapes the teaching and learning of design disciplines. This is not unique to the design field and the same can be inferred from other intellectual and educational fields. Social structuring of knowledge refers to the arrangement of knowledge and knowers within fields (Maton, 2006). The design field however, still lacks sociological analysis of how knowledge, discourses and actors are framed. Social and intellectual changes will only take place if we understand how knowledge and identity are specialised, or what makes some ideas, actors or groups “special” in a given field (Maton, 2006). In design, this task is especially complex, because of its diverse disciplines (e.g. engineering, architecture, digital media and fashion design), and a range of newly emergent fields (e.g. HCI, experience design, sustainable design).

Although most studies of design education focus on academic or formal instruction, settings in which opportunities for informal learning are present (e.g. museums) are still under explored. However, such settings may potentially make design accessible to a wider variety of people. They might provide an opportunity to experience design, and raise interest in individuals who may otherwise never come across this topic, or who would not encounter opportunities to further develop such interests.

The basic motivations for this research include:

- To represent the relationships between knowledge, discourses and actors, in the design field, with an emphasis on how specialized knowledge may relate to the construction of identities outside institutional settings. The focus is the disciplines of engineering, architecture, digital media, and fashion design.

- To offer the general public an opportunity to experience design outside formal educational institutions, supporting their inquiry of specialized design knowledge within an informal environment.
The context for this research takes place in informal settings for design education. It investigates how those who are new to the design field learn about this specialized knowledge within an informal environment. More specifically it addresses how new designers orient themselves towards an image of what they recognize and characterize as genuine design practice.

Firstly, this research will identify the underlying principles structuring specialist design knowledge. Secondly, it will identify strategies and tactics used by designers when inquiring on, and constructing an image of legitimate design practice. Such an inquiry process may involve formal and/or informal strategies for questioning, analyzing, and evaluating not only their own practices, but the practices of their peers, as well as professionals from other design disciplines. Thirdly, this research will model the perceptions of these underlying principles and strategies/tactics used by designers in the following design disciplines: engineering, architecture, digital media and fashion design.

Finally, this research will identify ways of supporting those strategies within an ICT-mediated learning environment. The model representing the perceptions of the underlying principles and strategies/tactics used by designers will form the base for an e-learning environment, which will be developed, implemented and evaluated in a field study.

1.1. Aims

The aims of this research are:

1.1.1. To conceptualise how new and senior designers recognize and realize design practices, within four disciplines: engineering, architecture, digital media and fashion design; and
1.1.2. To define and implement ways of supporting new designers’ inquiry into legitimate design practices through an ICT mediated learning environment.
1.2. Objectives

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

1.2.2. Identify new and senior designers’ strategies when inquiring on, and constructing, an image of legitimate design practice.

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

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

1.2.5. Define ways of supporting individual and social processes involved in learning in design. Define requirements for an ICT mediated informal environment for learning in/about design.

1.2.6. Develop and implement an ICT mediated informal environment for learning in/about design.

1.2.7. Evaluate the ICT mediated informal environment for learning in/about design.

1.3. Expected Contributions

The theoretical contributions of this research include:

1.3.1. Analysis of the underlying basis of achievement and membership within 4 disciplines of design. This analysis will consider how actors, discourses and practices are specialised within engineering, architecture, digital media and fashion design.

1.3.2. Analysis of strategies used by designers to recognize and realize legitimate practices.
The practical contributions of this research include:

1.3.3. An informal e-learning environment to experience design grounded on socio-educational concepts.
2. Background

2.1. Learning Theories

A variety of meanings can often be associated with the use of the term *learning* (Illeris, 2002). Learning sometimes refers to *what is learned* or in other words to the *results* of individual processes. Other times it refers to the *psychological processes* which would lead to the results or to what is learned. Further, learning may be used to refer to the *interaction processes*, which can be seen as conditions for the psychological processes that would lead to the results or to what is learned. Based on these observations, Illeris (2002) characterises the process of learning as simultaneously involving a cognitive, an emotional and a social dimension. The cognitive dimension refers to the process of acquisition of content (e.g. a skill or meaning), in which the term *cognitive* is used to encompass both knowledge and motor learning. The emotional dimension refers to the psychodynamic process involving feelings, emotions, attitudes and motivations, which will be both *conditions for* and *influenced by* the learning. And finally, the social dimension refers to the person’s interaction with his/her surroundings, and it also encompasses the learners’ dependency on historical and societal conditions.

Learning can therefore be seen as combining both a direct or indirect social interaction, and also an internal psychological acquisition. In other words learning would always involve both an individual and a social aspect. Although analytically it is possible to focus on the parts of the process or in only one of the three different dimensions separately, they are actually elements of a totality (Illeris, 2002).

In a social level, the learner will share and interact with others (and the environment) mostly through language (Vigotsky, 1978; Wertsch, 1993). At an individual level, reflection will play a crucial role. It is through reflection that the learner assimilates and processes the learning
potential of a given setting, as well as directs his actions within the experience (Boud, 1991; Schön, 1983). Even though, learners may not be really fully aware of the process, learning is more likely to happen when an increased awareness of the learning process is in place. As pointed out by Boud (1991):

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

Educational theories that see reflection as an important mechanism in learning also point to the existence of a number of different reflective levels, higher levels of reflection being associated with a deeper learning (Kolb, 1984; Schön, 1983; McDonnell, Lloyd & Valkenburg, 2004).

2.2. Social Aspects of Learning

Educational theorists centre their attention on the understanding of the learning processes and knowledge construction, whereas sociologists emphasise the social processes related to knowledge. Sociology focuses on understanding the social structures that permeate people’s lives as individuals and as members of groups. Any professional field involves a group of people who in some level agree on the core issues of their practice and see similarities in the characteristics of procedures and performance of professionals. These may also include shared beliefs, which are not questioned or clearly explicit. In order to be part of a certain field, one needs to recognize, understand and identify with the characteristics of the field, at least partially.

When learning a professional trade, besides learning specific procedures to perform, one has to learn the “rules”, “processes” and “language” of the field. The understanding of such processes is essential – it is through these that one actually establishes a sense of what is a legitimate practice in a given field. In other words, whether work X is a valuable original contribution, journal Y is significant reading, or Z is a professional worthy of attention (See Maton, 2006).
In the sociology of education, Basil Bernstein’s theory looks at pedagogic discourses and its various practices, focusing on analysing the underlying rules that shape their social construction (Bernstein, 2000). Within his theory, Bernstein conceptualised how in order to produce legitimate forms of communication, one first needs to identify (or “recognize”) the relevant meanings to the context one is in, in order to communicate (or “realize”) according to what is expected within the context.

Bernstein’s theory of pedagogic discourses sees pedagogic practice in a wide context, beyond the classroom setting. It includes relationships present in any social context in which cultural production-reproduction occurs. In this way, a pedagogic context is defined as any context in which transmission, acquisition and evaluation of any form of knowledge takes place (e.g. family, school, museum, and others). The components of a pedagogic context include three sets of categories, which are represented by:

(1) actors (e.g. students, teachers, mother, child, friend, designer);
(2) spaces or agencies (e.g. student’s space, teacher’s space, exhibit’s space, or school, family, museum)
(3) discourses (e.g. academic or non-academic, within a discipline, or between disciplines)

In the mid 60s and 70s, Bernstein developed his code theory, considering how the use of language reflects and shapes assumptions one has about groups. Bernstein analysed forms of communication within schooling and curriculum, and how these were used as instruments to facilitate class reproduction. The way knowledge is put together and circulates follows underlying social rules, which reinforce class structures, strengthening the distribution of privilege for the dominating classes. People’s speech is therefore not a result of one’s own “free will”, but it comes as a response to strong cultural pressure. For instance, Bernstein noticed that middle class mothers used different codes in their narratives with children, when in comparison with working
class mothers, evidencing how even the way mother and child communicate would be moulded by these underlying social structures (Bernstein, 1977, 2000).

Bernstein’s theory identified that the way actors communicate is influenced by their perceptions of power relations and control relations within their contexts. To analyse these relations Bernstein created the concepts of “classification” and “framing” (1977, 2000).

According to Bernstein’s framework, power relations establish legitimate relations between categories. These relations are conceptualised by classification, which refers to how knowledge is organised and the power of each category in transforming or reproducing knowledge. Different values may be assigned for classification. Stronger values (C+) will be assigned if the category is perceived as having well defined symbolic boundaries. An example can be seen when considering how subjects are organised within the curriculum. Stronger values would be present if its content is highly differentiated within the various subjects and disconnected from each other. Weaker values (C-) are assigned when the symbolic boundaries of a category are blurry, facilitating exchange of knowledge. Weaker values would refer to a curriculum that is integrated and in which subjects are more interconnected (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>C+</th>
<th>C-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundaries</td>
<td>well defined</td>
<td>Blurry</td>
</tr>
</tbody>
</table>

Table 1: Stronger (+) and weaker (-) values for classification

Control relations establish legitimate communication between categories. These relations are expressed by the sociological concept of framing, establishing who is in control of the communication in the pedagogic context. Weaker values (F-) are assigned when the acquirer is perceived as being in control of the communication, whereas stronger values (F+) are assigned when the transmitter is in more explicit control. The control of the communication might be given in relation to the selection of the communication, its sequencing, the pacing of the acquisition, the
criteria, and over the social base in which the interaction is taking place. The values may vary for
each of those, so that for instance the acquirer might be perceived as in control of sequencing
with the transmitter in control of the criteria used for evaluation. Also, as stressed by Bernstein,
the acquirer can only be in “apparent” control, because the way knowledge is accessed and
circulates is really out of the acquirer's hands. For instance, even if as a user I am the one
choosing the path I want to go in an e-learning environment, what is on the screen has previously
been thought and planned by someone else: the transmitter.

<table>
<thead>
<tr>
<th>Control of Communication</th>
<th>F+</th>
<th>F-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitter</td>
<td>Acquirer</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Stronger (+) and weaker (-) values for framing

At an individual level, classification and framing are regulated by a set of rules. One first needs to
have recognition rules in order to differentiate contexts and to identify the specificities of the
practices relevant to the context one is in. In other words, it is through these recognition rules that
an individual identifies what meanings are relevant in a given context. Once recognition rules are
established, realization rules will regulate how meanings are to be put together so that the
individual produces texts and/or communicates accordingly to the context one is in. If
classification values change, these recognition rules will have to adapt, and similarly if framing
values change the realization rules will also need to adapt.

Bernstein’s concepts have been used in many empirical studies, involving the analysis of
relationships of power and knowledge within various educational contexts (Botelho & Morais,
Botelho & Morais (2006) investigated relationships between students’ procedures in their
interaction with exhibits and their understanding of scientific concepts from exhibits, within a
science center. They draw on Bernstein’s concepts to characterize the students-exhibits
interaction, and also to analyse the influence of characteristics (of students and exhibits) on
learning. Students’ characteristics included family socio-economic status, gender and achievement. Exhibits characteristics included exhibits design, what happens when exhibit is activated and evaluation criteria. In their findings, the researchers identified that students’ possession of recognition and realization rules will indeed influence students’ performance in regards to their interaction with exhibits and understanding of scientific concepts. These findings are however not conclusive, since the researchers worked with only a small sample of eight students. Nevertheless they suggest that there is a link between such rules and characteristics of exhibits and students, as well as the learning context, and that these relationships still need to be further explored.

2.3. Everyday versus Specialized Knowledge

Building on his early work, Bernstein (1999) conceptualised two different types of discourse: “horizontal discourse” (everyday knowledge) and the “vertical discourse” (formal or educational knowledge). Everyday knowledge was described as “likely to be oral, local, context dependent and specific, tacit, multi-layered, and contradictory across but not within contexts” (Bernstein, 1999, p.159). Under this structure, knowledge circulation follows distributive rules even if it lacks systematic organising principles. In this way, Bernstein argues that everyone possesses a set of individual strategies and analogical potential in regards to contextual transfer (defined by Bernstein as “repertoire”) and so the community as a whole also possesses a total of sets ("reservoir"). The richer the interactions and social exchange are, the greater the circulation of strategies and procedures, with therefore more possibilities for expansion of both “repertoire” and “reservoir”.

On the other hand, and very different from “everyday knowledge” one can find the “specialized knowledge”, which is permeated by a “specialized language” (Bernstein, 1999; Wertsch, 1993; Maton, 2000a). Its structure is “coherent, explicit and systematically principled (…), hierarchically organised” as for example, in the sciences (Bernstein, 1999, p.159) or takes the form of “a series
of specialised languages with specialised modes of interrogation and specialised criteria for the production and circulation of texts" as for example, in the social sciences and humanities (Bernstein, 1999, p.159). Similarly, Wertsch (1993) also discusses the concept of “scientific speeches genres” and the power associated with these sorts of speech. For instance, Wertsch (1993) points out how membership in a given class might be shaped by “reproduction” of speaking and thinking - as if in order to belong, one needs to learn and speak the language.

Building on Bernstein’s work, Maton (2000a, 2000b, 2004, 2006) developed the “Legitimation Code Theory” (LCT). Maton expands Bernstein’s theory by proposing a way to look at how “knowers” are specialised, in addition to “knowledge”. LCT considers that students’ academic performance is the result of the interaction between: (1) the person’s own personal dispositions, practices and beliefs, (2) the educational context itself, which also would have its own intrinsic dispositions.

LCT suggests the analyses of the underlying basis of achievement by considering how actors, discourses and practices are specialised. The rationale behind Maton’s framework is that every practice or knowledge claim is made by “someone” and it is about “something”. Based on these ideas LCT proposes that knowledge and practices would have two sets of relations, in which knowledge claims comprise claims to knowledge:

- “of the world” (epistemic relation to the object) and
- “by authors or actors” (social relation to the subject).

Different practices may emphasise these two relations differently, and as a result these relations may be represented as being stronger or weaker within a continuum of strengths. This means that knowledge might be seen as specialised by its epistemic relation, by its social relation, by both or neither, depending on its specific structure, which would vary depending on the specific field. These ideas were translated into the notion of “legitimation codes of specialisation”. Using the concepts of classification and framing of knowledge, stronger or weaker values may be
assigned to epistemic relation (ER +/-). Following the same notion with classification and framing of knowers, stronger or weaker values may be assigned for social relation (SR +/-) (Maton, 2000a, 2000b, 2006).

As a result, the legitimation codes of specialisation propose four possible codes: “knowledge code” (ER+/SR-), “knower code” (ER-/SR+), “elite code” (ER+/SR+) and “relativist code” (ER-/SR-) (Maton, 2000a, 2000b, 2006). The knowledge code emphasises procedures appropriate to an object, whilst in the knower code, the emphasis lies on personal characteristics of the author. The elite code emphasises both, the possession of specialist knowledge in addition to the “right kinds” of dispositions, whereas in the relativist code neither knowledge nor dispositions are required: anything goes. The four codes are summarised in Table 3:

<table>
<thead>
<tr>
<th>Legitimation Codes of Specialisation</th>
<th>Emphasis on</th>
<th>Epistemic Relation (ER) (Relations to knowledge)</th>
<th>Social Relation (SR) (Relations to knower)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge ER+, SR-</td>
<td>Specialized knowledge, skills or techniques</td>
<td>C+ F+</td>
<td>C- F-</td>
</tr>
<tr>
<td>Knower ER-, SR+</td>
<td>dispositions (natural or cultivated) related to social background</td>
<td>C- F-</td>
<td>C+F+</td>
</tr>
<tr>
<td>Elite ER+, SR+</td>
<td>specialized knowledge and “right kinds” of dispositions</td>
<td>C+F+</td>
<td>C+ F+</td>
</tr>
<tr>
<td>Relativist ER-, SR-</td>
<td>emphasis neither on knowledge, nor on dispositions (anything goes)</td>
<td>C-F-</td>
<td>C-F-</td>
</tr>
</tbody>
</table>

Table 3: Legitimation code of specialisation, epistemic relation and social relation

While Maton explores his framework within formal education (e.g. the schools curriculum context), the present research proposes to explore the use of the framework in regards to the design field, but within informal settings. In addition, the present work also aims to identify
strategies associated with these codes. How does a new designer (who still needs to “learn the rules”) orient him/herself towards the recognition and realisation of design, outside a formal educational setting? Perhaps he/she may have to use his/her own repertoire in his/her understanding of the situation, at least in the first contact with the phenomenon. Then, through dynamic interaction between his/her exchanges with the group and internal reflection, the new designer may work on the concept, moving towards the construction of genuine design practice.

2.4. Learning in Design

Schön (1983, 1987) studied design professionals and others, trying to understand the relationship between practice competence and professional knowledge. Schön was interested in exploring what he called the “artistry” of professionals, and how such an “art” could be acquired. As defined by Schön, similarly to studios and conservatories, professional “artistry” may depend on:

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

In this way, Schön (1983, 1987) draws attention to the idea of coaching, in which the instructor would act as facilitator guiding the learner in constructing their own learning, their own inquiry. Schön’s accounts seem to look at learning in design as following a Knower Code (Maton, 2006), in which the design discipline, or at least architectural design, lays emphasis on developing personal and social dispositions. Schön explores the way one can actually construct such special knowledge, by comparing it to an “art”. The process of how this acquisition should be developed includes the guidance of a coach, who is a person prepared to help students by ‘the right kind of telling’, in which the objective is to develop or to awake the learners’ own sensibility.

Schön (1983, 1987) also developed the concept of “Reflective Practicum”, which has been recently explored by some researchers in design education (Adams, Turns & Atman, 2003;
McDonnell, Lloyd & Valkenburg, 2004). Adams, Turns & Atman (2003) used Schön's model of the reflective practitioner as a framework for exploring engineering design behaviour. The researchers used previous empirical studies of student design behaviour and analysed verbal protocols of beginners and senior students. Their findings characterize differences between beginner and senior students in the way they act and reflect on tasks. Higher reflection-in-action is found on the analysis of senior students' protocols and these were correlated to effective design practice. Seniors were more likely to account for problem setting and to engage in reflective conversation while working out a problem. These findings point out that learning practices, or learning certain behaviours, is part of the "learning in design" process, in this case how to reflect-in-action. That beginners’ behaviour would be different from seniors is not perhaps a surprise, but interesting is the way in which these behaviours can be identified, as expressions of a reflective practice. Ways of supporting new designers may be devised by planning strategies to guide learners towards identified design behaviours that correlate to effective design practice. However, despite identifying differences in the behaviour of new designers as they learn about professional activities, Adams, Turns & Atman's (2003) research does not really explore group interactions, peer influences on these designers, or how new designers legitimate their practices and which strategies they are using.

A recent work connecting experiential learning, reflection and design education, is described by McDonnell, Lloyd & Valkenburg (2004) with the use of video stories to develop design expertise. These authors analysed small design teams of students and their use of video story-making for supporting reflection regarding their design experience. The authors considered that the process of story construction offered rich opportunities for understanding design education and practice. Participants had opportunities to concretely experience events and formulate abstract concepts. In the exercise, the story maker could move from the position of an actor to observer, from deeply involved to a certain detachment, and by doing so, enrich his/her reflection on the experience of the team design process. The validity of their empirical findings are questioned by the authors...
due to their research design, but their work suggests innovative ways of giving designers opportunities for looking at their own practices by concretely taking a different perspective.

But how can one bring the reflective process to a computational tool? IT supported collaborative learning environments may offer innovative learning experiences by supporting and guiding learners' enquiries. Although still scarce in the design field, such learning environments can be found in many educational related settings (White, Shimoda & Frederiksen, 1999; Luckin & du Boulay, 1999; Quintana, Zhang & Krajcik, 2005); as well as systems that encourage reflective learning by offering students opportunities to create and experiment their own theories of processes needed to support inquiry (White, Shimoda & Frederiksen, 1999). Design education on the other hand, still has not explored the use of such environments, particularly those supporting informal inquiry and reflective learning in design.

2.5. Informal Learning and Museums

Differently from structured formal education, informal learning has a free-choice character with an emphasis on the experience rather than content. Its routes are in experiential learning, which defines learning as "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 41). In this sense learning may take place anywhere or at anytime, and the learning environment will only be activated as a learning setting by the learner, his/her interactions, and his/her construction of the experience (Kolb, 1984; Boud, 1991). Museums are often seen as settings in which children and teachers can expand formal activities and adults can engage in life-long learning. However, learning in museums or art galleries differs from learning in schools and in formal educational institutions. As an informal setting, learning in museums is usually referred to as having an informal or free-choice nature.

Roberts (1997) points that the early 1980s brought a new trend for exploring the educational possibilities within the museum experience, which affected the process of exhibit making. It was
when exhibit teams started to include educators alongside curators and designers, evidencing the educational character of the museum experience. Nowadays, museum environments are studied as complex and challenging settings, in which visitors may potentially experience a mix of educational, social, and leisure time. It is now evident that researchers and museum staff need to investigate the nature of the visitors experience in order to develop meaningful exhibits. Several recent studies explore learning in connection to visitors’ experiences and interactions with exhibits or museum guides, within such contexts (Allen, 2004; Falk, 2004; Hall and Bannon, 2005; Heath et al, 2005; Knutson and Crowley, 2005; Mantyjarvi et al, 2006; Damala and Kockelkorn, 2006). Researchers have been investigating a range of issues such as the design of exhibitions, the social interactions within these environments, use of technology, collaboration, ways in which to make the museum experience more enjoyable and meaningful for visitors, as well as how to do research in these settings.

Of particular importance is the investigation of issues related to the development of exhibitions that may facilitate and support a social and collaborative museum experience (Heath et al, 2005; Hall and Bannon, 2005). Heath and team’s research focuses on analysing the conduct and interaction of visitors with exhibits as well as around exhibits, in various museums and galleries, examining the use of technologies to instigate visitors’ engagements (2005). They stress the importance of working closely with designers, curators and others in developing interactive exhibits, discussing a need to rethink interactivity and exhibits design. Their aim is to facilitate both social interaction and collaboration within these contexts. Their findings discuss issues to be addressed in such contexts, when designing for “interactivity”. Firstly, they stress that it is important to recognize the significance of social interaction in people’s experiences of exhibits and exhibitions, because visitors usually come to museums and galleries with companions and are often aware of others who happen to be sharing the exhibit space. Secondly, it is important to create spaces for sustained interaction with and around exhibits – in which participants can shape and re-arrange the experience of others. And finally, an inclusion of spaces for individual and
private participation with exhibits in such a way that individual visitors don’t miss out on exhibitions designed for multi-parties.

The problem faced by museums is how to create such interactive spaces. Difficulties are not only with the design of the technology or its interfaces to support social interaction and collaboration, but also include the organization of settings to encourage those (Heath et al, 2005). The result is that most visitors’ experiences still follow the model of variances of “displaying written information about design”, and interactivity is often given by a “click here and see what happens” rule. Under Illeris (2002) model, it seems such museum contexts continue to assume a two dimensional perspective in which the cognitive and perhaps the emotional dimension prevail, whereas the social dimension is inexistent. Despite museum studies showing how learning and cognitive development are affected by people’s engagement in social interaction and discussion, such socio-cultural theories are overseen in these environments (Heath et al, 2005). As pointed by Heath and team (2005), even though people are rarely alone in a museum or gallery context, the prevalent stereotyped perception is still the romantic lone visitor who wanders through exhibitions and eventually has “the greatest” insight.

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

1. how to broaden visitors experience from merely reading information about design (and/or how people do design), to providing an opportunity to experience design, and
2. how to take a social perspective into this experience.

In this way, such a design experience should encompass active interaction with others, in an environment that promotes or encourages insights into how design knowledge is classified and framed in our society. In such an environment, the visitor should be stimulated into their own investigation of what is involved in designing an object, perhaps by discussing and considering
what needs to be taken into account when designing a product. Furthermore, visitors should be
given opportunities to reflect on how designers evaluate their own ideas, how they incorporate
different points of view, how they challenge and question their own design work and the one of
others. In such an environment a social perspective is incorporated to allow visitors to experience
design, rather than just be reading about it.
3. Research Questions

How do new and senior designers perceive the classification and framing of knowledge and knowers in the practice within four design disciplines (engineering, architecture, digital media and fashion design)?

- Are there any differences/similarities in the way each of the design disciplines classifies and frames knowledge and knowers?
- Which legitimation code is emphasised in each design discipline (eg. knowledge code, knower code, elite code, relativist code)?

How do new and senior designers recognise and realize the classification and framing of knowledge and knowers in the different design disciplines?

- What strategies/tactics do they use to construct an image of legitimate design practice?
- Do strategies vary according to specific design disciplines?

How can new designers’ inquiry of a legitimate design practice be supported, in an informal e-learning environment?

- How can computational tools be implemented to support new designers in their development of such strategies?
- How effective is the support provided by the computational tool?
- Do people follow strategies according to model?
4. Research Methodology and Plan

The research design follows a mixed methods approach. The first phase will be a qualitative study to explore and generate themes related to designers’ (and those new to design) perceptions and construction of an image of design practice. It will first identify perceived differences and/or similarities in knowledge classification and framing within four design disciplines (e.g. engineering, architecture, digital media, and fashion design). It will also search for the strategies/tactics that designers (and those new to design) use in order to understand what legitimate design practice is, within these disciplines. A model representing these findings will be proposed.

Following Phase 1 a survey will be performed in order to evaluate findings from the qualitative study. As a result of this phase, a final model of designers’ perceptions of framing and classification of knowledge within the four design disciplines will be proposed. The model will also represent the strategies used by new and senior designers in recognising and realising design practices.

In the third phase of the study (prototype development, implementation and evaluation) these themes will then be developed and incorporated into a computational tool, which will be designed to support new designers’ inquiry in an informal setting. The computational tool will be evaluated in a field study, in the Powerhouse Museum (PHM), in which students using the computational tool will be compared with a control group, in regards to engagement in activities and perceptions of the design experience.
4.1. Phase 1 – Qualitative Study

This phase will involve a qualitative study to conceptualise how senior and new designers perceive and orient themselves towards an image of a legitimate design practice, while learning in/about design.

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

First step will be to interview eight senior designers regarding their views of how design knowledge and knowers are specialized within the following disciplines: engineering, architecture, digital media and fashion Design. The sample will include interviews with two senior designers from each design discipline. The aim of these interviews is to identify the perceptions of classification and framing within the four disciplines. Also the interviews will explore the codes of legitimation of knowledge structures, discourses and actors within design. The framework developed by Maton (2000a, 2000b, 2004, 2006) will be used to analyze the way these design professionals perceive their disciplines, its epistemic and social relations: Knowledge code (ER+, SR-), Knower code (ER-, SR+), Elite code (ER+, SR+) and Relativist code (ER-, SR-).

The second step will include interviews to be performed with museum staff and high school teachers. This sample will have 2 museum staff members and 2 high school teachers from areas related to visual design. The aim of these interviews is to explore themes related to teaching and learning in design, and how those connected to educational practices within design consider knowledge production and/or reproduction within the field.

Forty five Year 10 students who attend the PHM seminars will also be interviewed. These interviews will explore new designers’ perceptions of how knowledge and knowers are specialised in the design disciplines (again following Maton’s framework). Observations of the design seminars will also contribute to the analysis.
4.1.2. **Objective 2:** Identify new and senior designers’ strategies when inquiring on, and constructing, an image of legitimate design practice.

Interviews with new and senior designers will also explore which strategies they use towards structuring an image of design practice, while learning design.

These interviews will include the same sample described in (4.1.1.): senior designers (N=8), museum staff members (N=2), High School Teachers (N=2), and Year 10 students attending the PHM seminars (N=45).

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

Through the analysis of data gathered in Phase 1, themes will be generated, and a model proposed. The model will include a representation of the perceptions of how knowledge and knowers are classified and framed in the various design disciplines, and strategies used by new and senior designers to understand design practice.

Strategies to certify the accuracy of the findings will include:

- Clarifying bias of instruments – Questionnaires and survey will be piloted so that bias on questions can be identified and avoided.

- Triangulation – For the qualitative study, data gathering will include different sources of evidence, and different strategies for data collection:
  
  (a) Interviews with design professionals,

  (b) Interviews with design educators (from both formal and informal educational institutions),
(c) Interviews with new designers from 3 different schools,

(d) Observations of new designers.

- Thick Description – To strengthen the validity of the inferences in the qualitative analysis, rich description will be used to convey findings. As described by Creswell (2003) this strategy allows readers to follow how the findings emerged.

- Sequential evaluation – Phase 2 will re-evaluate the model proposed in this phase.

4.2. Phase 2 – Survey

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

An online survey with tertiary students from the four design disciplines will be performed. The sample will include 24 participants from each discipline (N=96). The aim of the survey is to evaluate the model proposed. As a result, a final model will be proposed. The model will represent the perceptions of how knowledge is classified and framed in the various design disciplines, and strategies used to legitimate design practice.

Strategies to certify the accuracy of the findings will include:

- Instrument development – Themes to be used in the survey will be grounded on the initial qualitative data collection and analysis.

- Clarifying bias of instruments – Questionnaires and survey will be piloted so that bias on questions can be identified and avoided.

- Sequential evaluation – Phase 3 will re-evaluate the model proposed in this phase.
4.3. Phase 3 – Prototype Development, Implementation and Evaluation

4.3.1. Prototype Development and Implementation

4.3.1.1. Objective 5: Define ways of supporting individual and social processes involved in learning in design. Define requirements for an ICT mediated informal environment for learning in/about design.

The requirements for an ICT mediated tool will be defined based on the model resulting from Phase 1 and evaluated on Phase 2. In addition, requirements will include some of the ideas of other ICT mediated tools designed to support inquiry and reflective learning, found in the literature (e.g. Luckin & du Boulay, 1999; White, Shimoda & Frederiksen, 1999; Quintana, Zhang & Krajcik, 2005).

The computational formalism will follow a rule-based approach. The tool structure will invite users to experience design. The tool is expected to provide an environment in which users will not only read information related to design practices and/or see examples of design work. Users will be going through an inquiry process in/about design, or in other words, users will learn in/about design by experiencing design. Preliminary structure of the computational tool is discussed in the next session (see 5. Field Centred Learning Tool).

4.3.1.2. Objective 6: Develop and implement an ICT mediated informal environment for learning in/about design.

Based on the requirements defined, an ICT mediated informal environment for learning in/about design will be developed using Flash™. Testing cycles will be performed and the tool will be refined before implementation.
The tool will be implemented in the PHM, and it is expected that it will be used by Year 10 students attending one of the visitors package, offered by the Vector Lab, at the PHM. Year 10 students have been chosen for the sample population as the representatives of the “new designers” in this research. The reason for choosing Year 10 students was so that the requirements for the e-learning environment would include/fit this age group expectations and learning needs. As this age group has not yet started on their senior high school years, they are still to decide on their Higher School Certificate subjects, and consequently on their future career preferences. An exposure to design may therefore provide a rich and life changing experience for this age group.

4.3.2. Prototype Evaluation

4.3.2.1. Objective 7: Evaluate the ICT mediated informal environment for learning in/about design.

This phase involves a field study to evaluate the effectiveness of the ICT mediated tool to support new designers’ inquiry in an informal environment. This will follow a quasi-experimental design with a randomized control group.

Participants from three different schools will be recruited (N=45). A pre and post-test evaluation will be conducted. In the pre-test evaluation all participants will be requested to complete design task (1). In the post-test evaluation participants will be randomly assigned to three different groups. Group 1 will be asked to complete a similar design task (2) following the same activities in task (1) (N=15). Group 2 will be asked to complete design task (2) after being exposed to written information regarding strategies used in design. And finally Group 3 will be asked to complete task (2) using the e-learning environment. Table 4 below summarizes the evaluation design:
<table>
<thead>
<tr>
<th>Pre-Test (N=45)</th>
<th>Post-Test (N=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Randomly assigned to:</td>
</tr>
<tr>
<td></td>
<td>Group 1</td>
</tr>
<tr>
<td>All</td>
<td></td>
</tr>
<tr>
<td>Task 1 (N=45)</td>
<td>Task 2 (N=15)</td>
</tr>
</tbody>
</table>

Table 4: Evaluation

For the evaluation, data will be collected and analysed by:

- Comparing engagement in activities (measured by time),
- Comparing attitudes and perceptions of their design experience (questionnaires), and
- Analysing tool logs for patterns of use of specific features (Group 3)
5. Field Centred Learning Tool

5.1. Learning Objectives

The tool will invite users to go through the process of designing a product. The learning objective is to support the inquiry process related to designing a product, providing as much guidance as requested and suggesting strategies in which users may be able to validate their inquiry.

5.2. Sociological Concepts

The sociological concepts described by Bernstein (1977, 2000), as well as Maton’s Legitimation Code Theory (2000a, 2000b, 2006), will be integrated in the tool.

5.2.1. Framing

Users would be expected to go through a setting up phase, in which they choose weaker or stronger values for framing in their design experience. In other words, the tool will allow users to choose the selection, pacing and sequencing of the communication, e.g. when they want to be guided, what type of guidance they wish to receive during their design experience, and in which step in the design process they wish to start/have their experience. Table 5, 6 and 7 below exemplify how these choices may come in the setting up stage, and their corresponding framing values:

<table>
<thead>
<tr>
<th>Pacing of the Communication – When do I want to receive guidance?</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- - Never pop up the advice.</td>
</tr>
<tr>
<td>F- Pop up the advice just after I request advice.</td>
</tr>
<tr>
<td>F+ Pop up the advice when you think I need.</td>
</tr>
<tr>
<td>F++ Always pop up the advice.</td>
</tr>
</tbody>
</table>

Table 5: Pacing of the Communication
5.2.2. Legitimation Code Theory

Users will also be able to select in which mode they wish to have an experience: e.g. a knowledge oriented design studio, a knower oriented design studio. Each selection will provide an environment with either:

1. Stronger classification and framing on procedures, skills and techniques related to the design of a product, and weaker classification and framing on dispositions, attitudes and aptitudes.
2. Weaker classification and framing on procedures, skills and techniques related to the design of a product, and stronger classification and framing on dispositions, attitudes and aptitudes.
3. Stronger classification and framing on procedures, skills and techniques related to the design of a product, and stronger classification and framing on dispositions, attitudes and aptitudes.
(4) Weaker classification and framing on procedures, skills and techniques related to the design of a product, and weaker classification and framing on dispositions, attitudes and aptitudes.

<table>
<thead>
<tr>
<th>Studios</th>
<th>Strategies that emphasise Procedures, Skills and Techniques</th>
<th>Strategies that emphasise Personal Dispositions (cultivated or innate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Oriented</td>
<td>C+ F+</td>
<td>C- F-</td>
</tr>
<tr>
<td>Knower Oriented</td>
<td>C- F-</td>
<td>C+ F+</td>
</tr>
<tr>
<td>Elite Oriented</td>
<td>C+F+</td>
<td>C+ F+</td>
</tr>
<tr>
<td>Relativist Oriented</td>
<td>C- F-</td>
<td>C- F-</td>
</tr>
</tbody>
</table>

Table 8: Types of design studios

5.3. Learning Dimensions

The tool will also integrate the concepts of learning dimensions as described by Illeris (2002). Users will be prompted with strategies that incorporate an emphasis on cognitive, social and/or emotional dimensions. Examples of such strategies are given on Table 9, with its corresponding learning dimensions and legitimation codes:

<table>
<thead>
<tr>
<th>Learning dimensions</th>
<th>Codes</th>
<th>Strategies (examples)</th>
<th>Academic Context</th>
<th>Museum Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Knowledge</td>
<td>Read a technical book.</td>
<td>Read a critical review of a design exhibition</td>
<td></td>
</tr>
<tr>
<td>Cognitive/Social</td>
<td>Knowledge/Knower</td>
<td>Participate in conferences</td>
<td>Participate in a guided visit.</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Knower</td>
<td>Talk to my colleagues</td>
<td></td>
<td>Post a question on an online forum discussing design.</td>
</tr>
<tr>
<td>Social/Emotional</td>
<td>Knower</td>
<td>Compliment people’s good performances and contributions</td>
<td></td>
<td>Compliment other visitors’ design ideas</td>
</tr>
<tr>
<td>Emotional</td>
<td>Knower</td>
<td>Try to include my own motivations and interests in my practice</td>
<td></td>
<td>Try to include my own motivations and interests in my design experience.</td>
</tr>
</tbody>
</table>
5.4. The Structure of the Learning Environment

The learning environment will first show users examples of design practices and strategies used to legitimate those practices, and users will then choose which mode they would like to have an experience on: e.g. knowledge oriented design studio, a knower oriented design studio (See Figure 1).

Users will then set up the Selection, Pacing and Sequencing of the Communication, by choosing what type of advice they wish to receive, when and in what part of the design process they wish to start their design experience.

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Explanation of design experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studios</td>
<td>Options of orientation: Knowledge, Knower, Elite &amp; Relativist</td>
</tr>
<tr>
<td>Selection: (what type of guidance?)</td>
<td>Do not help me at all (F--)</td>
</tr>
<tr>
<td>Pacing: (when to get advice?)</td>
<td>Never pop up advice (F--)</td>
</tr>
<tr>
<td>Sequencing (where is experience starting?)</td>
<td>I choose where to start experience (F-)</td>
</tr>
</tbody>
</table>

Options to start at: (1) Understand design task, (2) Come up with a plan, (3) Develop concept, (4) Preliminary design, (5) Refine design

Figure 1: Structure and layers

Users will then be able to select a specific design task from a set of different tasks (e.g. design a chair, design an exhibition, design a car, design a dress, etc). In order to complete their chosen
design task, users will have to perform the learning activities described in the next session (see 5.5.), which are connected to each phase of a design process. Users will follow a design process based in an inquiry process, in other words the process will emphasise and stimulate users’ inquiry related to the development of the design product of their choice.

5.5. Learning Activities

Learning activities will be designed following the design process in Figure 2. The phases within the design process are: (1) Understand the design problem, (2) Come up with a plan, (3) Develop the concept, (4) Preliminary design and (5) Refine design.

![Figure 2: The design and the inquiry processes](image)

The proposed design process follows phases of an inquiry process. Figure 2 also shows the inquiry process in which the design process is based (e.g. (1) question, (2) formulate a hypothesis, (3) investigate, (4) analyse data and summarize findings, and (5) evaluate) which will
be guiding the activities that users are expected to complete in each phase of the design process (see Table 10).

At the end of each phase of the design process, users will be expected to have achieved a set of learning outcomes. Table 10 below summarizes the learning activities and the related expected outcome of each phase:

<table>
<thead>
<tr>
<th>Design Step</th>
<th>Activity</th>
<th>Expected Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand the design problem</td>
<td>Come up with a list of factors that may affect the design of the product, the objectives and variables that can be changed when doing the design, and consider what would be affected by these changes</td>
<td>List of questions</td>
</tr>
<tr>
<td>Come up with a plan</td>
<td>Choose from your list, which factors will be taken into account in the design of the product. Formulate what is important to consider in your design, why and how you intend to do it.</td>
<td>Defined “what” (goal) Defined “why” (purpose) Defined “how” (method)</td>
</tr>
<tr>
<td>Develop the concept</td>
<td>Write the design briefing. Think about which tasks need to be done first. Break down your concepts and assign ways you could use to represent each specification in your design.</td>
<td>Defined specifications Prioritized tasks Chosen how to represent</td>
</tr>
<tr>
<td>Preliminary design</td>
<td>Try out the possibilities for representing your concepts. Choose the solution that best fits.</td>
<td>Reflection Evaluation</td>
</tr>
<tr>
<td>Refine design</td>
<td>Change your preliminary design. Consider and try other ways of representing. Think about what you have learned from the experience, and what you could do next.</td>
<td>Reformulation of the problem</td>
</tr>
</tbody>
</table>

Table 10: Learning activities and outcomes
## 6. Research Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Research definition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2  Ethics application</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3  Research Proposal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4  Phase 1: Pilot and Interviews</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5  Phase 2: Pilot and Survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6  Interview and survey data analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7  Phase 3: Prototype development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8  Phase 3: Prototype implementation and evaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9  Write up thesis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Conference and Journal Publications</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. References


