TACIT KNOWLEDGE IN CRAFT PEDAGOGY: A SOCIOLOGICAL ANALYSIS

by

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Thesis presented for the degree of

DOCTOR OF PHILOSOPHY

in the School of Education
Graduate School of Humanities

University of Cape Town

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MARCH 2004

Declaration

I declare that *Tacit knowledge in craft pedagogy: a sociological analysis* is my own work, except where indicated, and that it has not been submitted before for any degree or examination at any university.

Signed:

Signed by candidate

Jeanne Gamble

March 2004

Acknowledgements

This research was supervised by Professor Johan Muller of the University of Cape Town. He taught me to be disciplined in my thinking and to be ruthless in discarding that which adds nothing to an argument, but above all he taught me not be afraid of being close to the 'unthinkable'. For that and for all his support over the years I thank him sincerely.

I also thank the staff and apprentices at the Furniture Industry Training Board in Cape Town who allowed me to be an honorary apprentice for a while. Special gratitude goes to Stanley Leeuwendal, who does not mind that I use his name here. From him I learned not only about cabinet making but about the deep joy that lies in mastery of one's craft.

The members of our initial PhD group, Mignonne Breier, Zain Davis and Rob Moore listened patiently to my early ramblings, while my colleagues at the Human Sciences Research Council carried me through the last part. Linda Cooper, Glenda Kruss, Mignonne Breier, Karen Collett, Hester Rossouw, Astrid von Kotze, Desi Angelis, Judy Harris, Lynn Hewlett, Stephanie Matseleng Allais and Michael Young fall into a special category and I thank them for all those opportune phone calls, encouraging emails and many gestures of support.

Yoesrie Toefy and Tom Prins waited patiently until the very last minute to add their special touch. Their assistance with formatting, printing and binding is greatly appreciated.

Most of all I thank the members of my family who endured what came to be known as the 'dreaded unmentionable' for so many years. Patric, Kay and all the four-legged ones in our house lived through the dejection and elation that are part of prolonged writing, Carel took on the thankless task of proof reading, Marianne, Sarah and James knew just when to make contact and my aged mother carried me in her prayers. I would have liked to tease my father about the fact that medical doctors are not the only kind of doctors around, but I think he will know.

The National Research Foundation is acknowledged for their financial assistance towards this research. Opinions expressed and conclusions arrived at in the thesis are those of the author and are not necessarily to be attributed to the National Research Foundation.

Abstract

> Though a very silent man he was so mild and calm that Ged soon lost his awe of him, and in a day or two he was bold enough to ask his master 'When will my apprenticeship begin, Sir?'
>
> 'It has begun', said Ogion.
>
> There was silence, as if Ged was keeping back something he had to say. Then he said it: 'But I haven't learned anything yet!'
>
> 'Because you haven't found out what I am teaching,' replied the mage, going on at his steady long-legged pace along their road ...
>
> *From: The Earthsea Quartet, by Ursula le Guin*

This thesis explores the relationship between tacit knowledge and a pedagogy that centres round a master-apprentice relationship, in order to locate tacit craft knowledge within a broader taxonomy of knowledge forms and their transmission practices. By its own definition tacit knowledge constitutes a unique class of phenomenon, namely that which is not presentable in language. It is thus a difficult concept to grasp and an even more difficult concept to represent in words.

Evidence from a single qualitative case study on craft transmission practices in the institutional training centre of the Furniture Industry Training Board (known as the 'trade school') in Cape Town is presented and analysed in accordance with a conceptual scheme that derives from the earlier work of Basil Bernstein. Against the background of this analysis of craft pedagogy, the nature of the 'tacit' is explored through a detailed analysis of the evaluative requirements of the final trade test. Thereafter a conceptual model is developed to provide a theoretical explanation for the form that tacit craft knowledge takes.

The findings show that strong external 'classification' and 'framing' relations (terms developed by Bernstein) constitute the trade school as a specialised context that is temporarily insulated from the work practices of mass production factories. It is a particular relation between work organisation, tool and materials usage, that retains the traditional craft or trade of cabinet making as the 'identity' recognised as legitimate in the trade school.

Internal 'framing' displays two modalities. While strong macro pacing that resembles the daily routine in a factory is maintained throughout the five stages of the apprenticeship

curriculum, very weak initial framing over selection, sequencing and micro pacing allows apprentices to develop their own rhythms of work and to make their own decisions about task realisation. However, just before the end of the final stage and before apprentices take their final trade test framing over selection, sequencing and pacing is strengthened and made explicit. Evaluation criteria are very strongly framed in all stages of the apprenticeship curriculum.

In terms of the regulative discourse of the trade school the master-apprentice relation is undoubtedly an asymmetrical relation that is mediated through a surrogate kinship role taken on by the master-trainer to exercise a form of positional control. The qualities of character and conduct that are transmitted are those of the autonomous artisan representing a collective craft tradition.

The outcome of a strongly classified and framed craft pedagogy that centres round a master-apprentice relationship is found to be an external performance that is grounded or embedded in an internally held competence. Such internalised competence refers to a capacity for *visualisation* that acts as a proxy for a relationship between 'parts' and 'whole' that cannot be rendered in words. This relationship is held in the body and constitutes what can be called the 'tacit' in craft. The identity of the craft worker or 'tradesman' rests crucially on this combination of external performance and internalised time-space relation.

Given this understanding of craft it becomes possible to describe craft as a restricted form of context independent 'knowledge' rather than merely as 'skill'. The conceptual model that is developed in the later part of the thesis locates craft as a form of knowledge that is independent of context in the sense that all craft knowledge realises an order of relation between the features of the object being made that is given by a particular embodied principle of arrangement. It is on this basis that craft takes its place in a systematic taxonomy of knowledge forms, which, although functioning at a fairly high level of abstraction is, nevertheless consistent with the empirical findings of the study.

Implications of thesis findings and conclusions for an understanding of knowledge and pedagogy more generally are presented in the final chapter.

Language conventions used

The reader should be aware of the conventions adopted in this thesis:

1. The terms 'master' and 'mastery' are used in a historical sense. The writer attaches no gender specificity to such terms.

2. It is not possible to present a historical overview of the apprenticeship system without referring to the impact that racial segregation has had on the way in which the system developed over time. In South Africa the term 'race' has been replaced by 'population group'. The convention used in this thesis is to indicate all references to population groups in capital letters. (Usually it is just the terms 'Coloured' and 'Asian' that are singled out in this way.) The term 'African Black' is used to signal that for many people 'Black' is a broad category that does not refer to only one population group.

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Chapter 1: The puzzle of tacit knowledge

> Technology, whether medium or high technology, 'appropriate' or 'sustainable', has increasingly come to be seen as central to all forms of development, especially economic development ... the condition of effective development is the knowledgeable deployment of that technology: the condition of 'knowledgeable deployment' is education (Muller, 2000: 26).

Introduction

This thesis is about tacit knowledge and pedagogy in general and specifically about tacit knowledge in craft. The thesis focuses on tacit craft knowledge within a broader taxonomy of knowledge forms and their transmission practices. The term 'tacit' is often used to refer to implicit knowledge that is not clearly expressed; yet, by its own definition, tacit knowledge constitutes a unique class of phenomenon, namely that which is not presentable in language. It is thus a difficult concept to grasp and an even more difficult concept to represent in words.

This thesis is located within the ambit of the vocational curriculum. While the framing of the study is done from an educational rather than from a training vantage point, it is accepted that the direct relationship between education and work, or what Moore (1987: 227) calls 'behavioural occupationalism' as the derivation of 'educational' objectives from behaviourally defined occupational skills currently gives this form of educational provision a far more restricted scope than found in liberal education approaches where, historically, issues of moral citizenship, democracy and general 'training of the mind' have been central to curriculum intent (Gamble, 2003: 13). This restricted scope is, however, not the only way in which the vocational curriculum can be framed. The apprenticeship tradition, which for centuries was the main source of formal vocational training for crafts and trades (Wolf, 2002: 58), constitutes an alternative curricular mode, although no longer one that is considered salient in modern workplaces where continuous change is the norm; or, as Sennett (1998: 48) explains it, in workplaces where the rhythms of labour must respond to flexible change which seeks to reinvent institutions irreversibly so that the present becomes discontinuous from the past. The contention of this thesis is that craft apprenticeship, as relay for an identity based on mastery, remains a rich curriculum resource, not despite but *because of* the current emphasis

on 'flexible specialisation' (Brown, 1992: 224-227; Ashton and Green, 1996: 70; Crouch, Finegold and Sako, 1999: 181).

In research terms, the vocational curriculum is rarely treated in the same way as general education where a number of researchers have drawn on the work of Basil Bernstein to analyse the knowledge and pedagogy of school subjects (references to some of these studies are provided in chapter 4). One of the main reasons for the lack of similar research in relation to the vocational curriculum lies in the so-called 'tacit' nature of much that is termed vocational knowledge and hence of the pedagogy. The 'tacit' has come to be a stumbling block, both practically and conceptually, for treating tacitly held knowledge as knowledge at all. This study wants to understand craft knowledge and pedagogy in the same terms as knowledge and transmission practices are understood in conventional education. In order to do so, the question of the 'tacit' has to be addressed. Following this route, the study hopes to present a unified theory of knowledge and transmission that shows the similarities and differences between forms of knowledge and their transmission.

The first part of the chapter explains why a study of tacit knowledge in craft and its pedagogy is considered germane despite a dramatic decline in trade apprenticeships in many countries (Maguire, 1999; Kraak and Hall, 1999). While trade apprenticeships have declined there is a growing consensus that it is not apprenticeship as such, but rather the idea of apprenticeship that remains useful for developing a more general social theory of learning (Ainley and Rainbird, 1999: 1). The position put forward in this study is that a conceptual interest in a general model of apprenticeship that focuses on learners as active participants in the organisation of their own learning (Guile and Young, 1998: 174) poses the 'tacit' as the kind of learning that happens in a piecemeal and incidental manner in the workplace; the kind of learning that happens by virtue of 'being there' rather than through conscious effort (Fuller, 1996: 239). Once this move is made the possibility that the 'tacit' may have something to do with knowledge and pedagogy itself, is obscured. The study aims to retrieve such a possibility, with the rationale for doing so deriving from a renewed interest in the 'tacit' that emanates from the literature on knowledge innovation. A second and connected point of origin lies inside the educational domain itself and relates to the way in which outcomes-based or standards-based curriculum formulations, currently in force in South Africa and elsewhere, cannot allow for the 'tacit' in any other way than by assuming that local or

practically acquired knowledge incorporates the 'tacit'; or, alternatively, that tacit knowledge can be made explicit and specified as assessment criteria.

In the second part of the chapter the research question is discussed and the organisation of the study is outlined.

Tacit competence and innovation

An economic focus on 'flexibility' of product, organisation and worker (Brown, 1992; Crouch Finegold and Sako, 1999) in an era where the 'network' is the new operating unit at the level of state, economy and multinational firm, as well as at lower levels of production and distribution of high value added goods and services (Castells, 1999; Carnoy and Castells, 1999), has led to a renewed interest in tacit knowledge and its relation to innovation. Sabel (1995) argues that tacit knowledge is what renders the individual inventive in everyday matters. New decentralised organisational forms depend crucially on a capacity to perform beyond the explicit knowledge held by any single member or group. In times when knowledge develops at a faster pace than the codification of such knowledge in company manuals, firms increasingly have to rely on the knowledge distributed when workers share stories about problems and their solutions in an informal manner around the 'proverbial water cooler' (Sabel, 1995: 12). Such practices ensure that organisational knowledge is retained and disseminated, thus creating the local flexibility on which the global depends in a competitive environment where new products or services must be brought into the market before there is time to dissect their production into procedural steps that can be executed mechanically.

Muller (2000: 30-31), on the other hand, argues that the nature and practice of innovation is poorly understood. Referring to technological invention, technological 'borrowing' and adaptation and technological improvement as different development paths to the innovation required under conditions of global competitiveness, he distinguishes between *knowledge-driven innovation*, such as advanced research and development where innovation is driven by an increase in scientific knowledge and *social practice-driven innovation*, where 'the tacit knowledge accrued by the long practice of craft and instrumental practice, of "doing the job", in itself can come to suggest new ways of doing things' (2000: 31). In Muller's view this is not an either-or choice between 'product' and 'process'.

> Approaches that valorize 'product' only tend to lose sight of the tacit knowledge of the researchers, which is at least as productive a resource as the product, and to underestimate the tacit knowledge of the workers needed to put the product 'to use' in the production cycle... Equally, approaches that valorize learning-by-doing downplay the codified and hence transmittable dimensions of knowledge in both generic (research) and non-generic (production) activity. The message in much of the recent literature is clear: 'product' and 'process' as well as their fruitful interaction all are essential for productive innovation (Muller, 2000: 32).

One of the implications of Muller's argument is that whether innovation is achieved through what Medway (1993: 21) calls 'engineering design', where design is viewed as at the centre of the intrinsic yet complex relationship between science and technology, or through the 'inspired tinkering' of technicians as 'practical creators' on the production line (Scriven, cited in Medway, 1993: 23), an understanding that all forms of practice have a tacit dimension is crucial to the quest for successful innovation. This explains the current resurgence of interest in the 'tacit'.

The different interpretations of the 'tacit' provided by Sabel and Muller respectively, are based on different assumptions about the nature of the knowledge and skill required as basis for innovation and the ways in which such knowledge and skill are transmitted and acquired. The next sections draw broadly on Muller's distinction between knowledge-driven and social practice-driven innovation (as cited above) and translates it into corresponding educational theories and/or curriculum practices.

Learning as social practice

Although not necessarily explicitly linked to the above debates, there has, in recent years, been a resurgence of research that focuses on apprenticeship as a mode of transmission[1]. Academics in the field of vocational education and training, attempting to reconceptualise learning under contemporary conditions of work and in response to the global call for flexible

[1] See, for instance, individual studies by Singleton; Buehler; Graves; Gamst; Haas; and Dilley in an edited collection on apprenticeship (Coy, 1989); studies on apprenticeship in a wide range of fields by Scandinavian researchers – medicine (Akre and Ludvigsen), music (Nielsen), sales (Osterlund), sports (Jespersen), science (Kvale) reported in a special issue on apprenticeship in *Nordisk Pedagogik*, 1997, Vol. 17, No. 3, with Klaus Nielsen and Steinar Kvale as editors; as well as various studies cited in Ainley and Rainbird (1999).

specialisation, have been particularly enthusiastic about the theoretical work of Jean Lave and Etienne Wenger (1991), which depicts apprenticeship learning as situated learning through 'legitimate peripheral participation' in a 'community of practice'.

The empirical justification for a situated approach emerges from the cases presented by Lave and Wenger (1991), which range from Yucatec midwives in Mexico, to Vai and Gola tailors in Liberia[2], to quartermasters in the United States navy, to butchers in supermarkets in the United States, to non-drinking alcoholics in Alcoholics Anonymous. In these cases researchers found very little observable teaching. Learning was found to be the more basic phenomenon and opportunities for learning were mostly given by the structure of work practices, instead of by asymmetrical master-apprentice relations (1991: 92-93). An analytical decoupling of learning from pedagogy results from this analysis.

> We argue here that a coherent explanation of these observations depends upon *decentering* common notions of mastery and pedagogy. This decentering strategy is, in fact, deeply embedded in our situated approach – for to shift as we have from the notion of an individual learner to the concept of legitimate peripheral participation in communities of practices is precisely to decenter analysis of learning. To take a decentered view of master-apprentice relations leads to an understanding that mastery resides not in the master but in the organisation of the community of practice of which the master is part: The master as the locus of authority (in several senses) is, after all as much a product of the conventional centered theory of learning as is the individual learner. Similarly, a decentered view of the master as pedagogue moves the focus of analysis away from teaching and onto the intricate structuring of a community's learning resources (1991: 94).

The authors distinguish explicitly between what they call a *teaching curriculum* and a *learning curriculum,* with a learning curriculum described as 'a field of learning resources in everyday practice viewed from the perspective of learners' (1991: 97). This distinction is definitive of a social practice theory of learning, where a focus on 'situated activity' (Lave 1993: 4) obscures the nature of the knowledge transmitted and the form of its transmission. Both of these are subsumed into the notion of 'shared practice'.

The work of Lave and her colleagues cannot be construed as crude constructivism. They do not make claims that, for instance, arithmetical problem-solving in formal mathematics and in

[2] The study of Vai and Gola tailors is reported in greater detail in Lave (1977) and Lave (1997).

everyday practices such as tailoring or supermarket shopping are the same kinds of knowledge, but argue that each kind of knowledge is shaped by its context (Lave, 1988; also discussed in Ensor, 1997); nor do they assert that mastery is always just beyond the horizon, a claim that Rikowski (1999) attributes to what he calls (post) modern apprenticeships in Britain that function under the banner of lifelong learning. However, in order to focus on the structure of social practice, it is essential for these theorists to give learning and teaching independent status as analytic concepts (Lave and Wenger, 1991: 113). In doing so they occupy what one might call a quasi-hybridising position, which is, nevertheless, inherently constructivist in nature[3]. Situated learning reduces all knowledge and skill practices to the level of local practice, an interpretation perhaps better captured in Wenger's later formulation of community of practice as a 'locally negotiated regime of competence' (Wenger, 1998: 137).

That highly specialised and universal knowledge and skill, often of a tacit nature, is reproduced within such local contexts is not denied; the acquisition of such knowledge and skill is simply subsumed within the greater *telos* of 'becoming a respected, practicing participant' among others in a community of practice (Lave, 1996: 157). Knowing is regarded as 'inherent in the growth and transformation of identities and it is located in relations among practitioners, their practice, the artifacts of that practice, and the social organisation and political economy of communities of practice' (Lave and Wenger, 1991: 122).

At an ideological level Nielsen and Kvale (1997: 134) view a decentered approach to apprenticeship as articulating with a post-modern focus on heterogeneous local knowledges, not transferable to a universal or context-independent knowledge. The individual is conceived as part of a network of social relations, with knowledge dispersed among individuals and environmental structures. Pragmatic knowledge, conceptualised as the ability to perform effective actions, is deemed non-reducible to technical rational knowledge of facts and rules.

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[3] I am drawing here on the distinction between insulation and hybridity posited by Muller and Taylor (1995: 257). They characterise insulation as stressing the 'interdictory and impermeable quality of cultural boundaries' and hybridity as 'the essential identity and continuity of forms and kinds of knowledge, the permeability of classificatory boundaries, and the promiscuity of cultural meanings and domains'.

Both tacit personal knowledge and communal knowledge embodied in the rituals and culture of the community of practice are foregrounded (Nielsen and Kvale, 1997: 138).

Gee (1997) similarly argues that what he calls the 'new capitalism', or what Sennett (1998: 9) calls 'flexible capitalism', wants to engender trust and commitment through a largely unconscious ('irrational') immersion in culture. The problem is that the sort of objective, socio-culturally distanced knowledge that the new capitalism seeks to recruit, does not articulate with the notion of culture. Culture ultimately bonds people to a larger group (be it the firm, an ethnic group, or the nation-state) through affective bonds to each other, as being of a similar 'kind'.

> Such socialised kinds are too fixed for the new capitalism. Culture creates bonds between people that often disallow the flexible regroupings, boundary crossings, project turnovers and identity shape-shifting that the new capitalism demands (Gee, 1997: 77).

The solution to this dilemma, Gee argues, is to ensure absolute personal commitment through bonding people, cognitively and affectively, not to each other, but to a *practice*. Hence a 'community of practice' is created, albeit not a community of practice directly under the control and at the discretion of the group of workers, as occurred in the craft or guild precedent from which the concept is derived. Under the conditions of the knowledge economy and flexible specialisation, knowledge practices are tacit, extensive, distributed and dispersed, with knowledge developing in a co-ordinated network of people, tools and technologies, serving multiple, integrated and overlapping functions. The notion of 'community' is thus misleading, because when the practice changes teams change. In Gee's view, the new type of 'community of practice' is anything but a community in the traditional sense. Recruitment of the notion of 'community', which is a close kin to culture, is rather an ideological device that masks socio-technical engineering as a primary force in the contemporary world. Gee therefore agrees with Nielsen and Kvale that 'communities of practice' under the new capitalism are worlds without clear and fixed boundaries. In Gee's view, they are 'the crucial node at which business, schools and society are aligning and merging in the new capitalism' (Gee, 1997: 80).

In the field of vocational education and training (VET) initial and rather uncritical endorsement of the potential of social practice theories is increasingly giving way to a

questioning of the implications of the radical shift from a 'teaching curriculum' to a 'learning curriculum' that is inherent in Lave and Wenger's social practice theory (as cited above). While generally recognising the value of learner centred approaches, Fuller and Unwin (1998: 159), for instance, raise concerns about the downplaying of the teacher's role. Young (2000a), arguing from a knowledge perspective, similarly criticises the model of curriculum that results when all knowledge is treated as embedded in specific contexts. In Young's view, such a model emphasises the meanings that people create for themselves and ignores the fact that many of the meanings that need to be acquired have already been 'pre-constructed' elsewhere (Young, 2000a: 10).

Despite attempts to expand conceptualisations of apprenticeship (Unwin and Fuller, 2003) and to draw conceptual distinctions between different types of vocational knowledge (Young, 2001b), tacit knowledge is not the focus of analysis in most of the literature around technical and vocational education and training. Its nature and forms of transmission remain largely unelaborated in terms other than the formulations provided by social practice theorists, where the local and the 'tacit' are viewed as synonymous. To put it more crudely: 'go local and you will catch the 'tacit'' seems to be the general prescription emanating from a social practice or situated activity perspective.

At the same time language and the sharing of narratives between old-timers and newcomers are signalled as key features of situated practice; as is the capacity to reflect on what has been learned and to formulate alternatives (as discussed in Fuller, 1996: 240; Nielsen and Kvale, 1997: 134, Guile and Young, 1999: 117). Both these features of social practice theory emphasise the use of language and the making explicit of the 'tacit', rather than the 'tacit' itself. It could thus be concluded that such theorisation provides an explanation for the acquisition and dissemination of the kind of local knowledge described by Sabel (as cited in the previous section), but it does not explain that which cannot be put into words, or what Polanyi (1958: 88) calls the 'ineffable'. Social practice theory does not illuminate the 'tacit'.

The 'tacit' in the apprenticeship curriculum

The master-apprentice relation as relay of the 'tacit'

Although the 'tacit' has not tended to enjoy discreet attention in writing on apprenticeship (Coy, 1989; Mjelde, 1993; Ainley and Rainbird, 1999) its presence is discernible in the use of metaphors as a stand-in for that which is at the heart of the apprenticing relation but not stated in words. Donnelly (1993: 42-43) argues, for instance, that while formal indentured apprenticeships have long been public in the sense of being subject to clear national legislative frameworks, the transmission of skills and knowledge through the relationship of master and apprentice has been, in its content, in the private domain, where it has been restricted to a well-defined group of individuals in the guild or trade union and often termed a 'mystery'. In his depiction of apprenticeship in Japanese folkcraft pottery, Singleton compares his study to other accounts of apprenticeship in Coy (1989) and concludes that 'stealing the master's secrets' (Singleton, 1989: 29) seems to be a widely shared theme. It is also the 'tacit' that is recognised in Nielsen and Kvale's (1997: 134) example of the master car mechanic in North Jutland who was known for two things: that his apprentices became the best car mechanics in the region and that he hardly ever said a word to his apprentices.

In each case the 'tacit' is linked to the relationship between master and apprentice, although not explicated in a way that sheds light on the 'mystery' or 'secret' on which the relationship is based.

The 'tacit' as the link between theory and practice in the apprenticeship curriculum

The history of industrial development shows how, in the late nineteenth-century when technology started drawing more strongly on general scientific principles (Layton, 1984), a knowledge base that was deemed a 'mystery' was no longer considered adequate for the preparation of artisans who had to work in factories where the level of technology had increased significantly and required the intensive use of conceptual skills (Ashton and Green, 1996: 3) that could no longer be acquired only through practical work.

In order to establish a basis for understanding the scientific principles on which work was increasingly based, it became necessary to introduce mathematics and science into the

apprenticeship curriculum, especially in relation to the engineering trades. The development of a system of technical and industrial education first introduced by Kerschensteiner in Germany in the late 1800s (Deissinger, 1994: 25) marked the beginning of a curricular move that found its way to many other countries. It is from this time onwards that we find traditional work-based apprenticeships shifting to a theory-practice combination, with technical institutions offering theoretical instruction in mathematics and science, on a day or block release basis or through evening classes, to apprentices indentured under formal contracts of apprenticeship.

The South African system of formal apprenticeship is directly descended from the English system. However, it should be borne in mind that the system of technical education that evolved in England also differed markedly from systems of technical education that developed on the European continent in countries such as France and Germany, which industrialised later and therefore needed to develop a competitive edge based on technical and technological expertise. In a comparison between the development of scientific and technical education in nineteenth-century England and France, Green is critical of the English system.

> Technical education had been cast in a mould that subsequent legislation would find hard to break. Growing up as an extension of the apprenticeship system and reliant on employer initiatives, it developed in a fragmented and improvised manner: perennially low in status, conservatively rooted in workshop practice and hostile to theoretical knowledge, publicly funded technical education became normatively part-time and institutionally marooned between the workplace and mainstream education. A century later we have still not overcome the deep divisions between theory and practice and between academic knowledge and vocational learning which were first entrenched in these nineteenth-century institutional structures. Nor, would it seem have we quite outgrown the voluntarist reflex which gave rise to them (1995:139).

Green's analysis may be overly negative if one bears in mind the significant numbers of artisans in both England (and South Africa) who have traditionally attained artisan status through this route, but he is right in pointing to the difficult relationship between theory and workshop practice as a feature of certain types of vocational systems. The City and Guilds of London Institute for the Advancement of Technical Education, founded in 1878 and generally acknowledged as providing the curriculum base for technical colleges as we know them, offers but one example of how difficult it was to combine practical 'know how' with

scientific knowledge. Although now an awarding body rather than a provider, the City and Guilds originally attempted to come to terms with a modernising world through offering scientific and technical education. The main offering of mathematics, chemistry, physics and mechanics, with third-year specialisation in pure or applied research, ended up being aimed typically at young people with a special aptitude for mathematics and science and at persons training as technical teachers. Tuition for apprentices and artisans, as well as for those already employed in industrial and technical occupations, was offered through evening classes, summer schools and specialised short courses, thus separating the academically-inclined from the more practically-inclined student (Gay, 2000: 390-393). Green (1995: 126) attributes this distinction between two forms of technical education to the lack of provision of sound general education, on which technical education could rest, being available to working class people in England at the time.

Nevertheless, the combination of theory taught in a college linked to on-job apprenticeships became the model for what Young (2001b) calls a 'knowledge-based approach' to vocational preparation. A particular feature of this curriculum mode was the exclusion of practical application from the tuition offered by colleges. In the English Technical Instruction Act of 1889 technical education was defined as being 'limited to instruction in the principles of science and art[4] applicable to industry' and *not* to include 'teaching the practice of any trade or industry or employment' (Layton, 1984: 24-25, original emphasis). Learning how to apply scientific knowledge was left to apprentices and employers and not included in college tuition.[5] It was precisely because the nature of the relationship between theory and practice was not specified that a place for the 'tacit' was retained. It was assumed that a scientifically grounded knowledge base would enable apprentices to engage in the kind of problem solving required by more advanced levels of technology while still relying on tacit knowledge and competence that could only be acquired through practical work.

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[4] Layton notes that 'science and art' would today be called 'science and design' (1984: 24).

[5] Again the difference between the English, and by derivative the South African system, and the European continental system should be borne in mind. The French trade schools of the nineteenth century offered a combination of theoretical and practical training. It was not assumed that years of serving as an apprentice, very often doing the same thing over and over, was an adequate proxy for systematic practical training (Green, 1995: 137).

In Britain this knowledge-based or discipline-based approach to the formal vocational curriculum in colleges and technical institutes continued for almost a century before being challenged in the late 1970s and early 1980s and replaced by the current standards-based approach that again positions workplace learning at the centre of the vocational curriculum and privileges what learners are able to do over what they have to know in order to do (Young, 2001b, 2002). Even though the more recently introduced 'connective approach' (Young, 2001b: 7) attempts to strengthen the knowledge-based component of apprenticeships through the introduction of Technical Certificates attained through off-job tuition, priority is still given to knowledge acquired at work.

A return to workplace knowledge

The shift back to a focus on the workplace as the prime site of learning should not be interpreted as a shift back to master-apprentice relations as a relay for the 'tacit'. In Britain a system of Scottish and National Vocational Qualifications (S/NVQs) was introduced in the mid 1980s, followed by the introduction of Modern Apprenticeships in the early to mid 1990s. New forms of apprenticeship are based on NVQs, which, in their turn, are premised on a deliberate separation of outcome and process.

The turn to standards-based or outcomes-based vocational qualifications, as it has played itself out in Britain, has been described by various commentators (Unwin, 1996; Barnett, 2002; Wolf, 2002). It was in response to the procedural kind of teaching and student performance evoked by a detailed specification of learning outcomes and leading to what Unwin (2002b: 7) calls 'competence-based checklists' that the work of Lave and Wenger, Engestrom and Vygotsky, under the broad banner of socio-cultural activity theory, was used to argue for a return to 'process' (Fuller, 1996: 231) and a refocusing of attention on learning within active processes of knowledge construction (Guile and Young, 1998 and 1999). At the time British writers strove to broaden the scope of apprenticeship learning to, amongst other things, include informal and tacitly acquired workplace knowledge.

Later responses have taken a different approach, arguing for the continued importance of knowledge-based vocational qualifications, while at the same time warning that 'policy makers and educationalists should be wary of codifying tacit knowledge and skills for the purpose of allocating them to a level within the hierarchical straightjacket of the national

qualifications and skills framework' (Unwin, 2002: 8). Young (2002a), for instance, argues that while vocational knowledge is always acquired in a context and is always partly tacit and embedded in particular workplaces, much of what future employers need is not tied to particular contexts.

The next section shows how dominant approaches to apprenticeship in South Africa, are similarly based on an assumption that knowledge can be made explicit in procedural form. Such formulations allow no place for the 'tacit'.

Shifts in the apprenticeship curriculum in South Africa

In South Africa the vocational curriculum is currently undergoing extensive and even dramatic reform (Dept. of Education, 2001; Gewer, 2001). Current policy in South Africa seeks not only to bring education and training in line with what is deemed to be required to compete successfully in the global economy, but also to eradicate previous unequal provision through a series of reforms aligned with a broader national human resource development strategy entitled *A Nation at Work for a Better Life for All* (Departments of Education and Labour, 2001).

With regard to the apprenticeship system it should be noted that, although statutory deracialisation of apprenticeships occurred with the passing of the Manpower Training Act in 1981, the deracialisation of technical colleges only occurred officially in 1994. It has thus only been in the last decade that Black South Africans have had access to college-based study in the theoretical component of trade apprenticeships that allows them to enter the labour market at a higher level of technological understanding than that which can be acquired solely through work-based apprenticeships. However, this opening of access has coincided with the collapse of the apprenticeship labour market so that the majority of students, who currently enter the college system, do so as full-time students rather than as indentured apprentices (Kraak and Hall, 1999: 225-228). While the theoretical component has thus become available, the opportunity to gain practical knowledge under the tutelage of master-artisans in the workplace has virtually disappeared. Given that a racially based system of job reservation prevented the majority of the parents of these students from entering artisan and trade occupations (DoE, 2001: 3-4), exposure to a home background of 'tinkering' that could provide a grounding in the tacit knowledge of a trade is mostly precluded.

As in Britain, a new form of apprenticeship, known as a learnership, has been introduced in South Africa to give people who are already employed as well as those who are unemployed access to a combination of structured learning and practical work experience[6] that is deemed to be an extension of previous systems of apprenticeship. This route to a vocational qualification has been linked to the 'unit standard' approach required by the National Qualifications Framework (NQF). Unit standards are based on the same logic as quality assurance systems such as ISO 9000, which focus on itemising each stage of a production process, partly in an attempt to remove the need for judgement (Shalem, Allais and Steinberg, 2004: 3). Learning outcomes, as explicated in unit standard format, focus on what can be observed and stated in procedural form and derive from a functional analysis of work itself. Units are assessed separately and then added together to obtain the required number of credits for a particular qualification.

As can be seen from the extract of a unit standard presented below[7], the procedural description required by this format not only has no place for the specification of a formal knowledge component (other than stating that such knowledge should be in place), it also compels those wishing to be assessed against such a unit standard to present in words that which they may know in ways other than what can be expressed in words.

SPECIFIC OUTCOME 1

Explain the wood quality requirements generally specified by the main users of wood products.

OUTCOME RANGE

All relevant appearance specifications and strength specifications.

ASSESSMENT CRITERIA:

1. The explanation of the wood quality requirements usually specified by the main users of wood, confirms that the learner knows and understands the needs of the end users regarding wood quality.
2. The explanation is given in the correct timber trade and wood technological terminology.
3. The specifications of the end users of wood are correctly explained.
4. The explanation is given within the prescribed time limits.
5. Knowledge of the quality specifications of the main end users of wood is a prerequisite for the successful achievement of this unit standard.

Figure 1: Extract from a unit standard registered on the National Qualifications Framework

[6] Learnerships are discussed in greater detail in chapter 2.

[7] The full unit standard from which this extract was taken is presented in Appendix A (http://regqs.saqa.org.za/index.php).

In the linking of learnerships to 'unit standards', as the basis for both the formal college curriculum and for the assessment that happens in the workplace, the central if unspecified role that the 'tacit' has played in the apprenticeship curriculum has thus finally disappeared and has been replaced by an assumption that all knowledge can be made explicit and stated in terms that are observable and measurable.

Responses from the academic field in South Africa to outcomes- and standards-based approaches

Where outcomes-based or standards-based approaches to education have been adopted in other countries their reach has mostly been limited to vocational training (Allais, 2003b). South Africa is the only country that has attempted to make outcomes-based education a central part of the whole education system, with this move discursively linked to a democratic project aimed at greater social equality. It is this latter feature of the reform initiative that has insulated the assumptions on which the National Qualifications Framework is based from criticism (Allais, 2003a). Nonetheless, analyses of the effects of outcomes-based education on the curriculum have not been slow to emerge, although mostly with reference to the schooling and higher education sectors (various papers in Bak, 1999; Christie and Jansen, 1999; Taylor and Vinjevold, 1999; Muller, 2000 and 2001; Ensor 2003)[8]. There has also been concern about the effect of outcomes-based approaches on teacher education (Shalem and Slonimsky, 1999; Shalem, Allais and Steinberg, 2004).

The vocational sector, on the other hand, has long been used to behaviourist approaches to curriculum. Publications aimed at this sector have tended to adopt a more pragmatic approach intended, for instance, to 'assist FET practitioners to gear up for the implementation of FET by exploring aspects such as curriculum development, qualifications design, quality assurance and learnerships' (National Institute for Community Education Trust, 2001: xvi).

[8] This list is by no means exhaustive, but rather intended give an indication that outcomes- or standards-based approaches to curriculum have not been accepted uncritically in South Africa.

Retrieving the 'tacit'

So far we have found that theoretical debates and current curricular practices in relation to apprenticeship show little evidence of providing an explanation for tacit knowledge as a form of context independent knowledge. It is either treated in a way that makes it synonymous to forms of local or situated knowledge, or it disappears completely in favour of descriptions of workplace activity stated in explicit and procedural terms. In the latter formulation tacit knowledge does not exist. If one accepts that innovation refers to a shift or a change in what has already been established, or the introduction of something new, then it follows that the basis of such innovation must derive from a capacity to extrapolate beyond the concrete and the well known and, equally, beyond practices that are standardised and proceduralised. As long as tacit knowledge is treated in a way that subsumes it into local or context specific knowledge, there is no possibility for recognising that the 'tacit' may in fact refer to a form of knowledge that can reach out beyond the local or the immediate context. This kind of tacit knowledge is exemplified in an example cited by Dowling.

> At one aircraft company they engaged a team of four mathematicians, all of PhD level, to attempt to define in a programme a method of drawing the afterburner of a large jet engine. This was an extremely complex shape, which they attempted to define by using Coon's Patch Surface Definitions. They spent some two years dealing with this problem and could not find a satisfactory solution. When, however, they went to the experimental workshop of the aircraft factory, they found that a skilled sheet metal worker, together with a draughtsman had actually succeeded in drawing and making one of these. One of the mathematicians observed: 'They may have succeeded in making it, but they didn't understand how they did it (Cooley, cited in Dowling, 1998: 4)

This is clearly what the innovation theorists have in mind when they refer to social practice-driven innovation. Not recognising the mathematical nature of their task did not prevent the workers in the aircraft factory from transcending the boundaries of the local or well known to discover the 'new'. They may not have been able explain how they did it but they certainly moved to a new level of synthesis that addressed the hitherto 'unknown'.

In seeking to understand such innovative capacity there is firstly a knowledge question. If tacit knowledge is context independent knowledge, how can this be illuminated? Secondly, there is a pedagogy question. If tacit knowledge is context independent knowledge, how is it transmitted?

The argument and empirical work undertaken in this thesis derive from the above questions. In the next section two theorists, who both have something to say about tacit craft knowledge and its form of transmission, are briefly introduced. Their work is not discussed at this stage, but a key idea is taken from the work of each to provide a hypothetical starting point that is contrary to an unproblematic equation of tacit knowledge with local and context specific knowledge.

Research focus

Alternative theoretical formulations of the 'tacit'

Michael Polanyi has long been recognised for his insights on the nature of tacit or what he calls 'personal knowledge'. Polanyi's enquiry is not about craft or skill *per se*; it is about the nature and justification of scientific knowledge. For him personal knowledge in science is 'not made but discovered, and as such it claims to establish contact with reality beyond the clues on which it relies' (1958: 64). His examination of the structure of skill stems from his interest in the extent to which 'the art of knowing has remained unspecifiable at the very heart of science' (1958: 55). He goes on to argue that an art, which cannot be specified in detail cannot be transmitted by prescription because no such prescription exists. It can only be passed on by example from master to apprentice. This entails submission to the authority of the master as the holder of such unspecifiable knowledge (1958: 53).

Polanyi views the centrality of the master-apprentice relation in the same terms as set by Dowling (1998) when he defines the apprenticing relationship in terms of an adept/novice relationship where the evaluative principles of the practice are controlled by the adept and not by the novice (Dowling, 1998: 29-30). The pedagogy question remains, however. If the adept possesses the evaluative principles, but these are tacit, how then are they exercised?

Accepting that the 'unspecifiable' is transmitted through a master-apprentice relation does not shed light on tacit knowledge as context independent knowledge. In Basil Bernstein's later work (1996, 1999, 2000), or what he describes as a move towards a sociology of knowledge transmission (Bernstein, 2001: 367-368), a clue in this direction is provided by his positioning of tacit transmission in craft as a mode of transmission related to a form of context independent, specialised meaning. What is significant (in relation to the position

taken by social practice theorists) is that craft is not depicted as local or everyday knowledge, even though it is described as exhibiting many of the features of such knowledge.

Although neither of these two theorists writes primarily about craft knowledge or its forms of transmission, both make a connection between the 'tacit' and craft knowledge and pedagogy that sheds light on both the knowledge question and the pedagogy question posed in the previous section. Their work provides the beginnings of an alternative explanation of the grounds of the kind of tacit knowledge and competence that bring about a new synthesis of that which is already known or practised. The research question put forward in the next section shows the study's intention of pursuing such an explanation, in relation to skilled work of the manual kind.

The research question

Social practice theories of learning have been used to place a focus on means as well as ends and in that way extend standards-based or outcomes-based approaches introduced in relation to national qualifications frameworks; yet, they have also introduced the problems inherent in constructivist positions. Although a distinction can be drawn between liberal and radical, or soft and hard versions of constructivism (Taylor, 1999: 113), the different perspectives converge in terms of a focus on learner-centredness that is linked to a requirement for application of knowledge to real world problems. It has already been noted that the social practice theory of Lave and Wenger offers no theory of formal transmission and has no way of explaining how knowledge transcends specific context embeddedness, which clearly knowledge must be able to do if it is to have innovative capacity to extrapolate beyond the well known and the concrete. Given these limitations it is almost inevitable that a conceptual reliance only on variations of constructivist approaches to ward off the worst excesses of the most recent wave of behavioural occupationalism that is sweeping through the educational policy terrain in South Africa and elsewhere, will drive the vocational curriculum towards the local workplace as the site of knowledge production in both ideological and practice terms and it will do so in a unit standard format that has no place for the 'tacit'.

The research questions that shape this study relate to that which is decentered or discarded by social practice theory and by unit standards-based approaches to learnerships, as a new form of apprenticeship in South Africa. Against the theoretical background provided by Bernstein

and Polanyi, a focus is placed on craft knowledge and its related pedagogy as governed by a master-apprentice relationship. The questions to be pursued are:

> *What makes craft knowledge tacit and how is tacit craft knowledge transmitted or passed on?*

The study of craft knowledge and transmission is not an easy terrain. The study treats the apprenticing relation between master and apprentices as the best possible source of evidence of the way in which craft knowledge is passed on, while recognising that language may play a marginal role in this form of pedagogy.

The overriding general aim of the study is to contribute to a sociological understanding of knowledge and pedagogy in the apprenticeship curriculum, as well as to an understanding of knowledge and pedagogy more generally. The route taken towards realising this aim is through a study of the nature of craft knowledge, the nature of craft pedagogy and the relation between the two.

Organisation of the study

This chapter has set out the originating puzzle that triggered the research study. In chapter 2 the case that constitutes the empirical focus of the thesis, is introduced, against the backdrop of a review of the historical development of the apprenticeship system in South Africa. From what is called 'traditional' apprenticeships, based on strong master-apprentice relations and regulated first by the individual artisan, then by the craft unions and later by the state, various shifts are traced that culminated in the introduction of learnerships, in 1998. The review shows the drift away from the master-apprentice model to a practice-based focus.

It is explained that the field research, conducted at the trade school of the furniture industry in Cape Town, took place just as the introduction of learnerships was starting to take effect. There were, however, several cohorts of apprentices who were still moving through the five stages of the old system and it was these classes that were observed. The trade of cabinet making was selected as a typical manual trade that would yield insight into craft knowledge that is associated with the labour of the hand.

Chapter 3 deals with issues of methodology and research design. The study's ontological assumptions are discussed, followed by an explanation of how field work was conducted and which analytical tools were used to overcome the inevitable limitations inherent in a single case study's potential for generalisability. Through this discussion it is shown how the study attempts to break away from the mould in which qualitative research and case study research in particular is often cast, while still using methods and techniques associated with a qualitative approach.

In Chapters 4, 5 and 6 a characterisation of craft pedagogy in cabinet making is presented. Basil Bernstein's conceptual language in relation to pedagogic practice, which was developed in his earlier work, is introduced in chapter 4. Thereafter the theoretical concepts of 'classification' and 'framing' are operationalised in each of the three chapters. In the remainder of chapter 4 the external and internal classificatory values that constitute the trade school as a specialised context, are presented. In chapters 5 and 6 the framing values of trade school pedagogy are described and analysed. Chapter 5 focuses on the framing values that relate to the instructional discourse, as constituted by the discursive rules of selection, sequencing and pacing, as well as by evaluative criteria, or criterial rules. Chapter 6 depicts the framing values of the regulative discourse, through a focus on the rules of hierarchy, character and conduct whereby the artisanal identity of cabinet-maker is reproduced. The chapter concludes with an overall summary and discussion of the classification and framing relations in trade school pedagogy in cabinet making.

Chapter 7 starts with the development of a conceptual framework that draws on the work of David Pye and Michael Polanyi. This framework is then employed to analyse and interpret the trade test in cabinet making. The findings of the chapter show the relations of spatiality that apprentices must hold as an internalised competence, in order to be successful in the production of the test item. It is argued that the key to understanding the tacit nature of craft knowledge lies in an understanding of *visualisation* as a proxy for the relationship between part and whole, which cannot be rendered in words. This relationship is held in the body and constitutes what can be called the 'tacit' in craft.

In chapter 8 a more general positioning of craft knowledge is undertaken. Bernstein's later work on vertical and horizontal discourses and knowledge structures is used as a theoretical starting point. Drawing on Abbott's logic of self-similarity in the fractal division of social

and cultural structures, historical-empirical data is used to establish a structural distinction between empirical and non-empirical meaning generation. This distinction is then used to develop a conceptual model that positions craft in relation to other knowledge forms. The theoretical work done in this chapter is able to explain Bernstein's positioning of craft as a specialised knowledge structure in a way that is consistent with the findings of previous chapters. In the light of this explanation it also makes sense that, in order to be maximally successful, craft pedagogy has to be a form of transmission that is based on a master-apprentice relationship.

In the concluding chapter, chapter 9, an overview of the thesis is presented and the limitations of the research are discussed. Thereafter conclusions are drawn about the relationship between tacit craft knowledge and its transmission practices. The discussion refers back to the puzzle set up in chapter 1 to show how the findings of the thesis contribute to an understanding of the grounds on which tacit knowledge is deemed to provide the basis for social-practice driven innovation. The final section draws out implications of the findings for the vocational curriculum and for education and training more generally.

Chapter 2: Situating the case study

Introduction

The historical-institutional overview of the development of the apprenticeship system in South Africa presented in the first part of the chapter shows how some of the broader vocational curriculum traditions discussed in the previous chapter have impacted on the shape and form of apprenticeship systems locally. This history also shows how what Webster (1985: 23) calls the 'colour of craft' has had significant effects on the ways in which the apprenticeship system developed.

The case study, which focuses on the workshop pedagogy in the cabinet making section of the furniture industry's 'trade school' in Cape Town, is introduced in the second part of the chapter, against the backdrop provided by the historical overview.

A brief history of the development of the apprenticeship system in South Africa

Apprenticeship as master-apprentice relation

Early forms of formal apprenticeship in South Africa displayed most of the features traditionally associated with medieval apprenticeships in England and other European countries. Aldrich (1999) describes this form of apprenticeship as follows:

> Apprentices (who were usually male) were bound by indentures to a master for a term of years, commonly seven, and invariably between five and nine, while they were initiated into the theory and practice and other mysteries associated with a particular occupation. Parents (or other guardians) of the apprentice paid a premium and signed a contract of articles with the employer which specified the conditions of service. While premiums varied considerably, those for entry to prestigious occupations might be very high indeed. Apprentices were provided with food, clothing, shelter and instruction by the master, and in return worked for him during the term of their apprenticeships. This system ... was enforced both by custom and by law ... (Aldrich, 1999: 15)

In South Africa, many of the formal trades as we know them today were brought into the country by Dutch, French, German and British immigrants in the 1700s and 1800s. The forms

of apprenticeship, which came with the trades, are often described as 'traditional', in the sense that they provided apprentices with an opportunity to work under the close supervision of an artisan or journeyman, in all facets of a trade. In terms of the apprenticeship contract the apprentice undertook to serve the master faithfully for the contracted period, to obey his lawful commands and to keep his secrets. The master undertook to instruct the apprentice in all aspects of the trade, to provide him with board and lodging and to pay him a set wage that would increase in each subsequent year of the apprenticeship (see Appendix B for an example of a contract that dates back to 1857).

From around the mid 1800s the establishment of trade protection societies or craft unions occurred in those trades that traditionally entailed a system of apprenticeship: moulder, engineer, mason, carpenter and printer. In order to maintain a monopoly on skills and to preserve demarcation lines, the craft unions assumed control of the apprenticeship system in crafts or trades so regulated, even though the nature of apprenticeships remained largely unchanged (Lewis, 1984: 18-23)[9].

The introduction of technical education and a formal trade test

The introduction of specialised machinery brought about changes in the organisation of work, which, in its turn, changed the form and nature of apprenticeship. In an extract of evidence, presented to the Transvaal Indigency Commission of 1908, the complaint was that 'the apprentice is not taught the whole theory and practice of the trade, because there is no one in the workshop who does more than a fractional part of the process of manufacture' (Lewis, 1984: 26). Here the terms 'theory and practice' refer to the traditional master-apprentice relationship described above, with 'theory' referring to knowledge that was uncodified and not formally taught yet considered crucial.

State regulation of the apprenticeship system was introduced with the passing of the Apprenticeship Act of 1922[10]. This Act introduced a second component into the

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[9] The Amalgamated Society of Carpenters and Joiners opened branches in the Cape and Natal in the 1880s (Lewis, 1984: 18).

[10] It should be noted that from this time onwards state-regulated apprenticeships related to the training of White apprentices. It was only with the promulgation of the Manpower Training Act (No. 56) of 1981 that the right to training for all workers was institutionalised (De Villiers, 1984).

apprenticeship curriculum, namely classes in technical education to be undertaken at a technical college. In the apprenticeship contract that regulated this phase of the apprenticeship system, the employment relationship became more distanced in the sense that the term 'master' was replaced with 'employer' and compulsory attendance of classes in technical education was stipulated. The code of conduct remained largely unchanged, with the exception of board and lodging, which was no longer included (see Appendix C for an example an apprenticeship contract dating back to 1928).

McKerron (1934), in a review of the history of education in South Africa, explains how supplementing limited practical experience with instruction in the general scientific principles underlying work processes was deemed a resolution to the loss of craft knowledge and skill that occurred when increased mechanisation resulted in a more specialised technical division of labour that often deprived the apprentice from getting exposure to all aspects of a trade. This type of technical education referred to 'education which had reference to manufacturing and industrial pursuits and the scientific principles underlying these' (Smuts, 1937: 97). The origins of the formation of technical colleges from which technikons developed much later, can be traced back to this era (Smuts, 1937; Pittendrigh, 1988; Chisholm, 1992) and to this particular framing of technical education where an off-job component was added to the on-job instruction received in the workplace. Malherbe (1977: 163), however, notes the irony of the origins of vocational and technical education in South Africa, in that the earliest forms of industrial and vocational training were introduced in the Cape colony around the 1850s to provide training for Coloured men in trades such as shoemaking, tailoring, carpentry and masonry - the very trades, amongst others, to which job reservation was later applied. The demand for technical education to be available to White youths occurred nearly fifty years later in the late 1800s, as an outgrowth of industrial development and linked to mining and the development of railways, harbours and small engineering workshops in urban centers.

Further mechanisation in the years prior to and during the Second World War resulted in a massive shift from jobbing practices to largely semi-skilled production practices, or what is known as mass-production or machinofacture (Webster, 1985: 58). The significance of the apprenticeship system was reduced to such an extent that the De Villiers Commission of 1948 recommended a restructuring of the system. Evidence placed before the commission indicated that neither employer, nor foreman or journeyman tended to be interested in teaching apprentices and cases were cited of apprentices kept on one simple operation for

more than half of their contract time (Webster, 1985: 62). The commission was impressed by the system of training, based on mass production methods, developed by the Central Organisation of Technical Training (COTT), which was established at the Pretoria Technical Institute in 1940, under the auspices of the Director-General of War Supplies, to organise training for the thousands of skilled workers required for work in munitions and civil defence and in support of the armed forces fighting in the Second World War. This training lasted for 25 weeks of 48 hours per week and ended with a trade test (Human Sciences Research Council/National Training Board, 1984: 16). In 1945 COTT was placed under the control of the Union Education Department (Department of Labour, 1998: 9). It is worth quoting directly from the commission's report to show the nature of this training.

> The system of training was based on mass production methods, and while it provided experience in various machine shop operations – backswing, chipping, filing, scraping and machine drilling – when the complete job was assembled no trainee could point out that it had been made entirely by himself, although he had made similar constituent parts (Para. 1081 of the Report of the Committee on Technical and Vocational Education, UG 45, 1948, also known as the De Villiers Report, as cited in Webster, 1985: 63)

The commission's main recommendation concerned the introduction of a trade test that would afford above-average apprentices the opportunity to shorten their period of training. A later ministerial committee proposed in 1950 that such a test be made compulsory, although the National Apprenticeship Board softened the legislative change promulgated in 1951 by recommending in 1960 that apprentices who failed the trade test should still receive full journeyman status (Lewis: 1984: 131). A training scheme, which allowed trainees to bypass the apprenticeship requirements and become artisans by efflux of time, was also introduced in 1965 (Webster, 1985: 63). Although Lewis attributes these dilutions to a political compromise 'between industry's demands for skilled labour and the government's desire to retain the political allegiance of White wage-earners' (Lewis, 1984: 131), he mentions that extensive exemptions were granted in the 1950s and 1960s to ease the effects of job reservation.

The apprenticeship curriculum now consisted of three components, namely practical instruction in the workplace, formal theoretical instruction in a technical college and a formal

trade test. In terms of the Manpower Training Act of 1981 all trade tests were conducted at COTT[11], or at venues supervised by COTT (Dept of Labour, 1998: 11).

The shift to competency-based modular training system (CBMT)

The Manpower Training Amendment Act of 1990 devolved responsibility for training from the state to industry and made provision for the establishment of training boards that would be responsible for all training matters in different industry sectors, with a redirection of financial responsibility for training from the state to industry. Through accredited training boards industry sectors now had increased autonomy to make their training as broad or as narrow as they deemed appropriate, although within a strategic framework set by the state.

The Act also required skills training for apprentices and other trainees to change to a competency-based modular training system (CBMT)[12]. Although the requirement for technical education at a technical college[13] remained, a modular training system was introduced, with a compulsory period of what was called 'institutional training' to be offered by an accredited training provider. This training could be provided by the training section of a training board or by an accredited external or workplace provider (Human Sciences Research Council/National Training Board, 1989: 252-286).

The apprenticeship contract relating to this form of apprenticeship specified a number of modular credits to be obtained within specified minimum and maximum times. These credits were to be achieved through a combination of on-job instruction and attendance of practical training at an accredited training centre. The curriculum was divided into various stages, with a stage test at the end of each stage and a trade test at the end of the final stage. Technical education could be undertaken in direct contact mode or through distance-based study. A stated code of conduct between employer and apprentice remained in place (see Appendix D for an example of an apprenticeship contract that reflects these stipulations).

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[11] The acronym was retained when the name was changed to the Central Organisation for Trade Testing in 1952.

[12] See, for instance Davies (1971) or Mager (1984) for examples of the kind of curriculum design that has been influential in the world of industrial training.

[13] Technical Colleges were renamed as Further Education and Training (FET) Colleges in 2001. Several ex-technical colleges make up one FET College.

The four components of the apprenticeship curriculum in place from 1990 onwards, but prior to further legislative changes in 1998, are set out in the table below.

Table 1: Components of the apprenticeship curriculum prior to 1998

Component 1	Component 2	Component 3	Component 4
Trade theory taught in a technical college, or through distance-based study.	Modular practical training in an accredited training centre.	Practical workplace experience though on-job training.	Trade test administered by the Central Organisation for Trade Testing, or by an accredited testing centre.

The official shift to CBMT heralded a major change in the industrial training system. Learner-paced materials were developed for each of the designated trades and training facilities were re-equipped to include areas where students could work through the modules on their own. (Modules were broken up into smaller units called 'elements'.)

Advantages of the CBMT approach were deemed to include the following:

> It [competency-based modular training] consists of a detailed analysis of the occupation into its basic competencies or skills, each of which then forms a module in a training programme. Modules are arranged in a logical training sequence and performance standards are set for each module. The competence of each trainee is tested at the end of each module and he is only able to proceed to the next module when he has reached measurable competence in all subordinate modules. It is possible by means of modular training course maps to arrange training so that all modules lead from the unskilled worker, through jobs requiring limited skills, to more highly skilled occupations. The employee can see a clear career path within the industry and advance by means of modular training to levels compatible with his aptitudes and abilities (Human Sciences Research Council/National Training Board, 1989: 183).

In a CBMT system the role of the technical trainer changes from instructor to tutor or learning facilitator (Gamble, 1993: 145-148). Tutors are no longer at the centre of the instructional process, but act as additional resources to be consulted when learners experience problems. Learning materials include verbal and/or written progress or criterion tests, as well as practical exercises. Apprentices/trainees (called learners) work at their own pace and when an individual learner is confident that s/he has reached the required standard, the learner

approaches the tutor for assessment. Assessment proceeds on a 'go/no go' basis. When the tutor is satisfied that a learner has reached the required standard, both the tutor and the learner sign off that part of the work and the learner proceeds to the next topic (Gamble 2000: 30).

From apprenticeship to learnership

The Skills Development Act (No. 97 of 1998) replaced apprenticeships with learnerships, as a combination of unit standard-based structured learning and practical work experience that leads to a qualification on one of the levels of the National Qualifications Framework (NQF) and guarantees that the successful candidate is competent for the specified occupation. Learnerships extend the old apprenticeship system into new areas not previously served by an apprenticeship system (RSA, 1998). With the approval of the relevant Sector Education and Training Authority (SETA)[14], the practical work experience component may be obtained at one or more workplaces, or development projects, or job creation projects and provided by one or more employers working together (Dept of Labour, 1997: 6).

A learnership does not equate to a full apprenticeship. While traditional apprenticeships had, over the years, been reduced from a statutory seven years to a period of two to four years, employers had remained legally bound to ensure that an apprentice went through all the stages of apprenticeship. Learnerships allow employers to enter into a learnership contract with an apprentice for only one or perhaps two NQF levels. The learner or trainee has no guarantee that the employer will enter into a second or third learnership contract. Each NQF level is accessed through a new and separate learnership agreement. This gives employers in mass production factories, who have long complained that all-round expertise is no longer required in their factories, the opportunity to specify that a learner should be trained on only one or two machines, or on restricted but specialised work routines. Many more people now get access to training, but fewer have the opportunity to attain the all-round knowledge and skill offered by the old apprenticeship system.

The learnership contract signed between employer, learner and registered training provider specifies the unit standards to be achieved by the learner at a certain level of the National Qualifications Framework (NQF) and sets out the times at which the structured learning

[14] In terms of the Skills Development Act of 1998 Industry Training Boards were replaced by Sector Education and Training Authorities (SETAs.).

component will be provided. A requirement for formal technical education is no longer stipulated. As the third party to the contract FET colleges or private providers (as registered training providers) need not necessarily provide tuition that is of a theoretical nature. The term 'structured learning' could be interpreted as college-based tuition but it could also refer to practical training that is offered off-job in a manner similar to the institutionalised training offered under the previous apprenticeship system. A code of conduct between employer and learner is no longer specified. (See Appendix E for an example of a learnership agreement in the furniture industry.)

The impact of revised forms of apprenticeship

Reviewing the progress thus far towards achievement of the learnership participation objectives and equity targets set for March 2005, Lundall sketches out what he calls 'a rather pessimistic picture of the progress and development of learnership training' (2003: 22). Although it could be argued that Lundall's evaluation is premature, given that the system has not been in operation long enough to evaluate its longer-term success or failure, experiences of similar systems introduced elsewhere do not provide grounds for optimism about the attainments of revised forms of apprenticeship system. In this regard it is useful to consider the system of Modern Apprenticeships introduced by the Conservative government in the United Kingdom in the mid 1990s, as a way of building on the positive image held by the general public and by employers of apprenticeship as a mode of formation training for young people (Maguire, 1999: 165-166).

In an analysis of the implementation of Modern Apprenticeships across a range of traditional and non-traditional sectors, Fuller and Unwin (2001) show that the introduction of a more contemporary version of apprenticeship in all industry sectors is not necessarily a panacea for labour market problems. In the ten most populated apprenticeship sectors, up to the end of October 2000[15], six out of the top ten recruiting sectors represented service industries. Their analysis shows that 60% of the overall total of those entering Modern Apprenticeship programmes are leaving without achieving the minimum requirement of a full National Vocational Qualification (NVQ) at level 3, taken as the benchmark of intermediate skill

[15] Modern apprenticeships are now available in 82 sectors in the United Kingdom, many of which have no previous experience of offering apprenticeships or any other substantive form of training for young people (Fuller and Unwin, 2001: 4).

levels. Only three out of ten leavers from the most populated sectors achieve the minimum requirement, with this figure as low as one out of ten in the six service sectors once the engineering sectors have been excluded.

The researchers suggest that these figures call into question the extent to which apprenticeship-style training programmes are appropriate across all sectors of an economy. They single out Business Administration apprenticeship, designed to develop generic, non-context or job-dependent competences, which are applicable across sectors and companies, as an example of an apprenticeship not grounded in clearly defined occupational knowledge and skills. Their interpretation is that an apprenticeship, which has no fixed occupational points, finds itself at odds with the purpose and pedagogy of apprenticeship. It leads to what they call an 'occupational rootlessness' (2001: 7) that is reflected in the broad and non-specific nature of the required curriculum outcomes. This raises for them the question of whether apprenticeships (or learnerships) are the appropriate vehicle for work preparation in all sectors.

The influence of unit standards on the vocational curriculum in South Africa was briefly discussed in chapter 1. Their use, as the basis of learnerships, signals a decisive break with theory and practice traditions that have long characterised apprenticeship, both in its later form when a scientific knowledge base was added to an on-job component and in its earlier form where 'theory and practice' was deemed to be held by the master and passed on to the apprentice. The new approach may not represent a major shift in traditional apprenticeship sectors, such as Hairdressing and certain sections of Engineering, where a shift to CBMT already occurred during the previous dispensation. It may also take hold in non-traditional apprenticeship sectors, such as Tourism and Hospitality and Catering, where the practical nature of training is considered crucial and where bench marking against international standards is an accepted practice. It is, however, an open question whether sectors like the furniture industry that introduced CBMT yet continued to teach within a master-apprentice relation, will make this shift without drastic changes to a time-honoured form of pedagogy. It is these sectors that perhaps best illustrate how far the system has moved away from the characteristics of apprenticeship described by Coy when he views apprenticeship as:

> ... the means of imparting specialized knowledge to a generation of new practitioners. It is the rite of passage that transforms novices into experts. It is a means of learning things that

> cannot easily be communicated by conventional means. Apprenticeship is employed where there is implicit knowledge to be acquired through long-term observation and experience (1989: xi -xii).

Against the backdrop provided by the historical review of the development of the apprenticeships system in South Africa, the chapter now turns to the furniture industry to introduce the case that constitutes the empirical focus of the thesis.

Introduction to the case study

Cabinet making in the trade school of the furniture industry: selection of the case

Case selection depended crucially on finding a site that offered an opportunity to observe a master-apprentice relationship that operated on a formal basis as part of the trade apprenticeship system. Learnerships were relatively new at the time when the research was conducted and their links to unit standards that were registered on the National Qualifications Framework made them an unlikely vehicle for the tacit craft knowledge and pedagogy that I wanted to study.

The training centre of the Furniture Industry Training Board (FITB)[16] in Cape Town was the physical site where intermittent field observation took place over a period of two years, from April 1999 to May 2001. As many factories operate under conditions of mass production or semi-mass production, the factory or workplace itself is no longer the best place to observe forms of pedagogy that are still based on master-apprentice relations. The training centres, set up by the FITB to supplement the more limited exposure to full cycles of work that apprentices receive in factories, are still instructor led even though they are deemed to have converted to a competency-based modular approach. Apprentices commonly refer to these centres as 'trade schools'. This is the term that will be used to refer to the site in the rest of the study.

I had a long association with the staff of the Furniture Industry Training Board and permission to conduct research was readily granted by the Chief Executive Officer who was

[16] Industry Training Boards are no longer in existence. In accordance with the Skills Development Act (No. 97) of 1998 they have been replaced by Sector Education and Training Authorities (SETAs). At the time that the research was initiated this change had not yet been fully implemented.

based in Johannesburg. Preliminary observation consisted of a few days spent in the cabinet making section of the trade school and a brief visit to furniture factories in the George-Knysna area, where most of South Africa's indigenous forests are found and where high-quality furniture is still made. I found that, like in many other industry sectors, the trade school curriculum was organised in a competency-based modular training (CBMT) mode that catered for the requirements of mass production factories. What was different to the practices I had previously encountered in parts of the engineering sector was that the pedagogic mode related to CBMT, namely that of instructor as facilitator of learning monitoring the work of individual learners towards completion of CBMT modules, was not present. It was the traditional trade of cabinet making that was being reproduced, with the hierarchical relation between master and apprentice providing the frame for a pedagogy that relied primarily on modelling. The master-trainers[17] seemed unaware that they were not following the CBMT system. According to them they were 'teaching the trade' and apprentices who reached the end point were well prepared to take the trade test. Even though they assured me that all the modules were covered in each stage, a separation between discreet modules was not discernible and learner guides were distributed but seldom used.

I shall not pre-empt the evidence that is presented in later chapters; suffice it to say that I realised at this point that I had an opportunity to study what in the earlier historical overview was referred to as 'traditional' craft transmission-acquisition, but under conditions that afforded the master-trainer the opportunity to concentrate solely on instruction, rather than on real-time production with apprenticeship training as a side issue. I had thought that, given the shift to competency-based modular training, I would encounter a diluted form of the master-apprentice relationship, yet the preliminary observation period showed that there is no such thing as a diluted apprenticing relationship. It is either present or it is not. In both its typicality and its a-typicality the case therefore appeared *significant* and *critical* (Yin, 1994: 38, 147).

[17] The instructors are all artisans who have extensive experience in their respective trades. The term 'master-trainer', as used in the study is intended to convey this artisanal status. These instructors have not undergone any form of teacher education or trainer preparation. They teach as they were taught in the factory.

Further details about the case

In this section further details are presented about the form of apprenticeship in operation in the furniture industry at the time of the study. The field research took place just as the introduction of learnerships was starting to take effect. There were, however, several cohorts of apprentices who were still moving through the five stages of the old system and it was these classes that were observed.

The furniture industry is particularly proud of their apprenticeship system and of the quality of tuition offered in the trade school. In an interview with the person who had been Executive Director of the Furniture Industry Training Board during the years 1982 to 1992, he explained that the furniture industry had embarked on the institutional training route long before it was formally introduced. During the late 1970s a number of industry sectors volunteered to pay a levy to Industrial Councils in each area, to be used to set up voluntary training boards, with regional centres in various provinces. The Furniture Industry Training Board (FITB), which had joint manufacturer-trade union representation from the start, dates back to this time. While the Industrial Council administered the apprenticeship contracts, the FITB offered apprenticeship training as well as other training free of charge to the industry and also represented the industry on the Apprenticeship Training Committee.

At the time the British model of competency-based modular training (CBMT) was widely used as a template for developing material, criterion tests and stage tests, with the final trade test remaining under the jurisdiction of the Central Organisation for Trade Testing (COTT). Although there were dissenting voices, the FITB decided to follow this model, albeit with the intention that learner guides should not replace instructors so that CBMT training would be implemented in an 'instructor-led' manner. (This explains why it was possible to observe a strong master-apprentice relation within a competency-based modular training approach.)

The theory component of the apprenticeship curriculum, which had previously been offered through local technical colleges, also underwent early revision. Foremost of these changes related to a downgrading of the theory component. Apprentices were only required to be in possession of a National Technical Certificate Part 1 in trade theory before they completed stage four of the five-stage modular curriculum. The system of block release to attend classes at a college was terminated and apprentices studied N1 trade theory through a

correspondence course. The weak theoretical base provided by trade theory in furniture making at the first level becomes apparent when it is compared to Engineering Studies programmes at N1 to N3 levels, currently offered by Further Education and Training (FET) colleges. In these programmes each level consists of four subjects, namely mathematics, science, technical drawing, and a specific trade theory subject (SAIDE, 2003). The explanation offered for this dilution of the theoretical component of the apprenticeship curriculum was that this component used to resort under the Building Industry, with the result that much of the theory that was taught related more to building trades than to furniture trades. The new CBMT modules were deemed to include all the theory that an apprentice would need. (The content of CBMT modules is discussed in chapter 4.). The first two hours of each day of institutional learning at an accredited training centre (the trade school) were intended for theoretical instruction in N1 trade theory, with the benefit of this approach being that formal training periods would be shorter and more practical.

The second reason related to the fact that technical colleges were still racially segregated during the 1980s, thus making it impossible for a number of apprentices in the furniture industry to attend tuition at local colleges[18].

The apprenticeship contract in operation at the time required an apprentice to attend five stages of training over a stipulated contractual period of 104 weeks, or two years, as minimum period and 208 weeks, or four years, as maximum period. (See Appendix D.) The content of each stage is outlined in chapter 4 but it is perhaps significant to mention that, at the start of the field work, the Regional Manager of the FITB in Cape Town expressed regret about the dilution of the theory part of the apprenticeship curriculum and pointed out that they had re-introduced a module on Technical Drawings in all five stages to compensate for the earlier withdrawal of this subject.

[18] Lewis (1984: 20) notes that in the Cape some craft unions historically adopted a pragmatic approach to racial restrictions on union membership. Coloured workers were admitted as members as long as they agreed to maintain wage standards and did not participate in what was known as 'under cutting'. This was different from the rigid colour bars demanded by the mining unions, usually taken as the dominant union position on this issue.

Conclusion

The aim of this chapter has been to situate the case that constitutes the empirical focus of the thesis. In order to show where the case study fits into the apprenticeship system, a review of the historical development of the apprenticeship system in South Africa was undertaken. The review identified different phases in the development of the apprenticeship system, starting with the formal, traditional master-apprenticing relation that was regulated first by the individual artisan or journeyman, later by various craft unions and ultimately by the state. It was shown how the state-regulated apprenticeship system changed its shape and form, in accordance with shifts in production systems and the organisation of work. The effect of apartheid legislation on the way in which the system developed was noted. The review then traced how the introduction of an off-job technical education component was followed by the introduction of a trade test, although apprentices who failed the trade test could, for a period of time, still receive full journeyman status by efflux of time. A later shift to a competency-based modular training (CBMT) introduced a compulsory institutional training component that changed the role of the technical trainer from instructor to tutor or learning facilitator. The most recent shift from apprenticeships to learnerships was discussed against the background of early indications of low uptake and research done in Britain that calls into question the extent to which apprenticeship-style training programmes are appropriate across all sectors of an economy.

Against this background the case study was introduced. It was explained that the main motivation for selecting the case related to the fact that the institutional training offered by the Furniture Industry Training Board's training centre offered an opportunity to observe instruction in cabinet making, a traditional manual trade, that was still based on the master-apprentice relation that has long been a characteristic of craft apprenticeship.

In the next chapter the limits of generalisability that result from a single case study is one of the methodological issues discussed, with the measures taken to overcome this limitation related to the ontological approach taken in the study.

Chapter 3: Methodological considerations

> If researchers are to contribute to the improvement of education – to the improvement of educational policies and educational practices – they need to raise their sights a little higher than expressing their fervent beliefs or feelings of personal enlightenment, no matter how compelling these beliefs are felt to be. They need to aspire to something a little stronger, seeking beliefs that (1) have been generated through rigorous enquiry and (2) are likely to be true; in short they need to seek *knowledge* (Phillips and Burbules, 2000: 3, original emphasis).

Introduction

This research study focuses on a single qualitative case study in order to study the realisation of craft pedagogy in a formal setting. Qualitative research is usually associated with first-hand observation and participation related to a particular setting. While internal validity and reliability of the evidence presented can usually be attained through adequate triangulation measures and close interaction between researcher and research subjects, external validity or generalisability is a more complex issue. Case studies, by their very nature do not employ statistical sampling procedures that allow inferences to be drawn from a sample to a precisely defined population (Silverman, 2000: 105; Schonfield, 1993: 205); neither can they claim replicability as a key criterion for external validity, as occurs in the experimental tradition. Given the fact that single case studies are often selected on the basis of their representing a critical or unique or revelatory case previously inaccessible to scientific observation (Yin, 1994: 38-40), generalisation on the basis of representativity cannot easily be claimed. A common prescription for achieving generalisability is to generalise the findings to theory (Yin, 1994: 32, Silverman, 2000: 105), or to choose a site with the assistance of a particular theory (Schofield, 1993: 218) so that the case becomes generalisable through theoretical inference. How to get from empirical observation to theory, or vice versa is, however, not always clear.

The chapter starts with a consideration of methodological issues pertinent to case study as one of the options of case selection. The overall position taken is that although the research conducted in this study could well be termed 'ethnographic', an ethnographic approach that urges ethnographers to examine phenomena under study from the point of view of research subjects, does not lead to findings that have a basis for generalisability.

The approach followed in this study is one where a conceptual framework, derived from existing theory, is taken as the starting point. Such an approach poses the challenge of linking the conceptual frameworks employed to observable manifestations of such concepts through adequate concept-indicator links. 'Logical consistency' rather than 'adequacy', or the degree to which constructs used would be understood by the social actors themselves, thus becomes the key criterion for judging the efficacy of a study following this approach. (These two terms derive from Schutz, as cited in Mouton, 1996: 185).

After a discussion of various field work issues the chapter concludes with an explanation of the analytical tools employed, followed by a discussion of the limitations of the methodological approach selected.

Methodological issues

Case study as 'subjective reality'

The trade school pedagogy under investigation in this study bears a close resemblance to everyday production practices in furniture factories, even though it does not take place under stringent conditions of productivity and efficiency. It is certainly far more unpedagogised than schooling practices, not explicitly informed by theories of cognitive or emotional or psycho-motor development and not taught by teachers who have undergone any form of teacher education. These features, linked to the extent of time spent doing observation in the field, would justify the study being described as ethnographic in nature, with the term understood as relating to intensive ongoing involvement with individuals functioning in natural settings (Schofield, 1993: 213). I shall, however not use the term. Claims for the virtues of an ethnographic approach are often based on anti-empiricist critiques of quantitative research methods, rather than offering a distinctive alternative. Furthermore, claims such as the one that ethnography 'frequently involves the abandonment of preconceptions and pre-field research models on the part of the investigator, who has to redefine his/her role in the context of profound difference' (Feldman cited in Breier, 1996 162) urges ethnographers to examine phenomena under study from the point of view of research subjects, with no way of distinguishing between participant accounts - including that of the researcher - and no way of moving beyond particular descriptions.

In arguing against this stance Hammersley (1992), rather than viewing ethnography as a distinctive methodological approach, asserts that it is not a useful category with which to think about social research methodology.

> The meaning of 'ethnography' is not specific enough to form part of a typology that would capture one set of options available to a social researcher. And viewed as a general approach it not only misleads about the range of options available but also about the basis on which choice between options should be made. It implies that decisions should flow from commitment to general methodological principles, instead of being made on the basis of those epistemological, methodological and practical assumptions that are most reasonable in the particular research context (including the capabilities of the researcher) (1992: 202-203).

For Hammersley the idea that there are two methodological paradigms, a quantitative and a qualitative paradigm, is of limited use. Hammersley's argument is not that the two paradigms should be collapsed into one, but rather that a dichotomous position between two paradigms denies the variety of ideas, strategies and techniques to be found in social research. He shows that many research studies combine methods associated with the two approaches to varying degrees (1992: 160 - 161) and therefore argues that, given that all research involves selection of a case in some form or other, 'case study' should rather be viewed as a case selection strategy alongside the 'survey' and the 'experiment' as other possible forms of case selection. Each form of enquiry has advantages and disadvantages in relation to the others. Comparing the case study with the survey, Hammersley argues that case studies have the advantage of 'buying greater detail and likely accuracy of information about particular cases at the cost of being less able to make effective generalisations to a larger population of cases' (1992: 186). A criticism of experiments is often that their findings do not generalise to non-experimental situations because people's behaviour are shaped by their awareness of the experimental situation. In comparison to the experiment the case study is less likely to be affected by reactivity, or influencing the people studied in such a way that error is introduced into the data. On the other hand, variables can be controlled in the experimental situation where the case is 'created', thus maximising the chances of coming to a sound conclusion about causal relationships (Hammersley, 1992: 192).

Helpful though Hammersley's attempt at what he calls 'deconstructing the qualitative-quantitative divide' (1992: 159) may be, the case study remains the most widely used case selection strategy in qualitative research and one most vulnerable to anti-positivist arguments

that the differences between the social world and the natural world are so fundamental that there can be no basis for adopting similar epistemological and methodological approaches or for using the same methods (Mouton, 1996: 47). Debates between relativists and realists are extensively documented (exchange between Hammersley and Gomm, 1997a, 1997b and Romm, 1997; exchange between Humphries, 1997 and Hammersley, 1997; Moore and Muller, 1999 and a response by Young, 2000b; Muller, 2000; Phillips and Burbules, 2000; Moore and Young, 2001; Schmuttermaier and Schmitt, 2001;). No matter how the oppositional poles are framed, disputes revolve centrally around whether or not there is a reality that exists independently of our representations of it and the effect that this has on knowledge, as well as on research and curriculum practices. Although Mouton (1996: 47) stresses that most social scientists 'hold very implicit beliefs about the social world and most of them would see no point in making such beliefs explicit', the ontological assumptions on which a research study is based is not an issue which social researchers can avoid. Even if they do not make explicit statements, their ontological positions are revealed by their treatment of what counts as data and the warrants that they present for truth claims made.

From a philosophical perspective Searle finds no logical inconsistency between an ontologically subjective reality and epistemic objectivity.

> The idea of conceptual relativity is an old, and I believe a correct one. Any system of classification or individuation of objects, any set of categories for describing the world, indeed, any system of representation at all is conventional, and to that extent arbitrary. The world divides up the way we divide it. And if we are ever inclined to think that our present way of dividing it is the right one, or is somehow inevitable, we can always imagine alternative systems of classification (1996: 160).

For Searle what he calls external realism is 'the view that there is a way that things are that is logically independent of all human representations. Realism does not say how things are but only that there is a way that they are' (1996: 155). In this view a reality that exists external to our systems of representation is not a thesis or a hypothesis, but rather the condition for having certain sorts of theses or hypotheses (1996: 178), so that the existence of an external reality is a background condition of intelligibility. A socially constructed reality presupposes a non-socially constructed reality independent of all social construction 'because there has to be something for the construction to be constructed out of' (1996: 190-191).

Muller (2000: 162) argues in similar vein for 'tempering the idea of a constructedness of the world with a certain moderate socially based realism in order to admit the idea of *epistemic* or *cognitive gain*' (original emphasis).

> This means a move beyond relativism. To do this, we do not have to make any claims about the absolute veracity of assertions. A comparative claim is perfectly adequate: 'Its message is: whatever else turns out to be true, you can improve your epistemic position by moving from x to y; *this step is an [epistemic] gain*' (Taylor, 1995: 54, emphasis added). To concede this is to concede no more than that some research findings tell us more than others do. Otherwise put, some claims to knowledge are less valid than others are: 'We are not free to interpret reality just, however, we like, that is part of the meaning of the word "reality" (Hammersley and Gomm, 1997b: 2) (Muller, 2000: 163, references as in the original text).

Rejection of the position of the naive realist, namely that truth and reality coincide (Searle, 1996: 175) and an acceptance that representations are always made from a certain point of view or from a certain conceptual scheme still leaves a number of questions for the researcher. She cannot merely represent her own observations or the explanations provided by research subjects as 'the reality', nor can she simply present an account of multiple realities present in the case. Both are reproductive strategies, which limit the findings of the case to the phenomenon being described, thus raising the perennial question of generalisability or external validity (Yin, 1994: 37, Hammersley, 1992: 85-95; Schofield, 1993: 200-225; Silverman, 2000: 102-111).

The question of generalisability

Two prescriptions are generally offered to qualitative case study researchers for ensuring the generalisability of their findings. One is empirical generalisation and the other is theoretical generalisation. With regard to the former Schofield (1993: 221) emphasises the need for what she calls a 'fit' between the situation studied and others to which the concepts and conclusions of the study may be applied. Hammersley takes the point further by arguing that 'ethnographic researchers, sometimes write as if they are generalising to a category of phenomena occurring in unspecified times and places, rather than to an identified aggregate of settings during a specific time period (or set of time periods)' (1992: 87). What is required, according to this view, is that, once a decision has been made about the appropriate finite population to which a generalisation may be made, use of aggregate data becomes crucial.

Such data needs to be generated by new or existing survey research and/or a systematic coordination of a sample across populations and over time (Hammersley, 1992: 91).

Empirical generalisation is thus not to be viewed as an easy way out of the external validity conundrum. Researchers claiming to offer general descriptions or general explanations on the basis of limited cases need to produce evidence about the validity of such generalisation in the same way that quantitative researchers need to open their sampling techniques to public scrutiny – even if the evidence is of a different kind.

Substituting 'theoretical cogency for the statistical language of quantitative research' (Silverman, 2000: 110) is the position adopted when it is argued that, rather than being generalisable to populations or universes, case studies are generalisable to theoretical propositions through analytic generalisation (Yin, 1994), or through theoretical inference (Hammersley, 1992). Yin (1994: 37) views this process as 'analogous to the way a scientist generalises from experimental results to "theory"' (Yin, 1994: 37).

Where empirical and theoretical generalisation converges is in the move towards combining qualitative research methods with the methods of survey and experimental research in order to address the issue of external validity or generalisability. This in itself is no longer a contentious issue (Mouton, 1996: 38-39) and a move towards combining qualitative and quantitative methods does not imply a regression to a form of foundationalist empiricism. Both Hammersley (1992: 92) and Schofield (1993: 207) note, though, that qualitative researchers in general and ethnographers in particular tend to dismiss the possibility of universal, deterministic sociological laws, as well as the search for probabilistic laws. Although Schofield (1993: 201) reports a widely shared view in the literature on qualitative methodology that generalisability is either unimportant or unachievable, she also notes an increasing interest in the issue.

This study cannot agree that the issue of generalisability is unimportant in qualitative research, neither that it is unachievable. Any form of research, whether qualitative or quantitative aims to produce valid and relevant knowledge, with the claim for external validity resting on the capacity of research findings to be generalised. While relevance to, for instance, policy making is not the primary aim of research, there is a useful contribution to be made by qualitative research that can be interpreted at a more general level than that of the immediate case. Generalisability is also not unachievable. A combination of qualitative and

quantitative methods offers one solution but it is by one means the only one. The relations that the researcher establishes between the general theoretical field and the empirical field, both prior to and during the research process, is of crucial importance in terms of potential for generalisability. This issue is taken up in the next section.

Moving from information to data

A move towards hybridity in choice of research methods does not eliminate the tendency of many qualitative researchers to build their cases through essentially descriptive accounts, without formally adopting a theoretical framework to guide and direct the research. At the other end one finds what Wolcott calls the 'interpretative extreme' of researchers who 'seemingly swoop down into the field for a descriptive morsel or two and then retreat once again to the lofty heights of theory or speculation' (Wolcott, 1994: 11).

It is perhaps Bernstein's specialised term 'languages of description' (2000: 132) that best captures the crucial relation between theory and empirical field that constitutes the validity of any study and provides the basis for generalising beyond a particular case.

> Briefly, a language of description is a translation device whereby one language is transformed into another. We can distinguish between internal and external languages of description ... A language of description constructs what is to count as an empirical referent, how such referents relate to each other to produce a specific text and translate these referential relations into theoretical objects or potential theoretical objects. In other words the external language of description (L^2) is the means by which the internal language (L^1) is activated as a reading device or vice versa (Bernstein, 2000: 132 and 133).

By postulating two languages of description, an internal and an external language Bernstein acknowledges the gap that exists between abstract or formal theoretical constructs and what would count as their realisation. The construction of a 'reading device' is thus regarded as crucial for making the transition from one language to the other in a methodical and systematic manner that goes a long way towards addressing the question: 'How is unruly experience transformed into an authoritative account' (Clifford, cited in Wolcott: 1994: 9). Moore and Muller call the external language of description a 'data-near device' (2002: 634) that categorises what is to count as identifiable instances of the theoretical constructs employed. The notion of internal and external languages of description is similar to the

notion of concept-indicator links (Rose, 1982; Brown and Dowling, 1998), employed more widely in the quantitative tradition. Both sets of concepts succinctly capture the need for a theoretical framework as the basis for the development of an analytic structure that allows information to be read as data.

From the above discussion it is clear that, while it is legitimate for qualitative researchers to be concerned with the meanings that phenomena have for those who inhabit a particular setting, the responsibility for analysis and interpretation remains that of the researcher. Observation notes or accounts given by research subjects cannot be presented as analysis. Such accounts must be constituted as data, with analysis and interpretation based on an explicit analytical framework, or an external language of description that links empirical phenomena to theoretical constructs in order to effect their realisation.

Interrogation of the case

The texts selected to discuss the methodological concepts introduced in this section indicate the realist ontology that shapes this research study. The implication of such an *a priori* ontological position is not that the methods and techniques of information gathering usually associated with grounded theory or interpretivist approaches cannot be used, but rather that the versions of 'reality' obtained from such methods and techniques cannot be taken as representing a reality that is not socially constructed. How the information gathered is turned into data is what will establish the external validity of the study in terms of its capacity to generalise from a single case study.

Field work

Sources of information

A variety of methods were used to obtain information to build the case profile and to construct what Yin, (1994: 98) calls a 'chain of evidence' that would eventually enable the reader of the case to trace the steps from conclusions back to initial research question and/or vice versa, from question to conclusions. The methods and techniques used are briefly outlined in accordance with Mouton's (1996: 144) distinction between direct and indirect observation as a main method of data collection and physical and archival sources as a second method. Thereafter more detail is provided about the sequence and duration of the field work.

Direct observation:

- Extended periods of observation in a range of classroom and workshop situations. All five stages of the apprenticeship curriculum were observed in full, although it was not possible to follow one group of apprentices from start to finish. (See discussion below.)
- Visits to two mass production factories and two craft factories conveyed a sense of the 'workplace practice' component of the curriculum. I gained access by accompanying the master-trainer on his follow-up visits. Thereafter two of the factories agreed that I could return on my own to spend time with various artisans and apprentices. I spent two further days at each of these factories.
- An informal exploration of trade school practices in carpentry-joinery, offered by the Building Industries Federation of South Africa (BIFSA) provided a comparative base, which helped me to understand the pedagogy observed at the FITB trade school. While the content was similar the methods were completely different. During the day spent at BIFSA I interviewed the manager and one of the instructors and also observed apprentices working individually and together.

Indirect observation:

- Unstructured interviews were conducted with seven apprentices. The purpose of these interviews was to get their views on apprenticeship and the differences between instruction in the trade school and instruction in the workplace. Two apprentices were interviewed directly after completion of their trade tests to get them to talk about the test. These individual interviews, which were conducted in a classroom at the trade school, took place between 7 September and 27 September 1999. One of the interviews, conducted after completion of the trade test, took place at the apprentice's workplace.

- Three interviews were conducted with the master-trainer in cabinet making (on 7 September, 1999; 19 October, 2000 and 14 May 2001) and two with the assessor (on 9 September and 28 October 1999). They went through the trade test with me to explain what was required in the interpretation of the drawings and what could go wrong in

the construction of the test item. The master-trainer also related his life story and spoke about conditions in the factories when he was an apprentice in the late 1950s.

All interviews were recorded and transcribed in full.

- Short informal conversations were conducted with various factory owners and managers, as well as with an official of the Industrial Council and with management of the FITB at regional and national level. The purpose of these conversations was mainly to obtain background material about implementation of the apprenticeship system in the furniture industry.

Archival sources:

- Course outlines, course notes, trade tests, marking schedules for trade tests and trade test results were studied. These documents were all connected to the formal curriculum and provided insight into how the formal system was intended to work. Information about the trade test, which was the only part of the formal system strongly endorsed by the master-trainers, constituted an important source of data (taken up in chapter 7).

The field work started in April 1999 with preliminary observation in the cabinet making workshop of the trade school as well as a three-day visit to three furniture factories in the George-Knysna area. I was in the company of the regional manager of the FITB and through him gained access to the three factories, where I was allowed to wander around and talk to artisans, foremen, managers and owner-managers.

Field work proper commenced in September 1999. The trade school curriculum consisted of five stages of trade school attendance of two to three week duration each, with apprentices attending one or two stages per year over a period of four years. Instead of starting with beginner apprentices at stage 1 the first observation period was of stage 5. Thereafter I worked backwards, ending with observation of the Stage 1 apprenticeship. At one level this was a purely pragmatic arrangement, which fitted in with the training schedule, but there was also a deeper rationale in that I needed to get a sense of the end point of the pedagogic trajectory, in order to be able to understand where it was leading. The total time spent

observing master-trainer and apprentices in a workshop and classroom situation was about three months, but it was spread over eighteen months.

In between the periods of time spent at the trade school I accompanied the master-trainer on follow-up visits to factories. He would introduce me as 'a researcher from the university who was studying apprenticeship' and that was usually sufficient. Only in one instance was I asked to leave my handbag in the office and the manager explained that they were worried about industrial espionage and that I might be hiding a camera in my bag. These visits provided the opportunity to observe apprentices in their natural work environments and to talk to them about their work.

A day was spent at the training centre of the Building industries Federation (BIFSA) in Cape Town. The split between cabinet making in the furniture industry and carpentry-joinery in the building industry is a long-standing arrangement, but one which results in a deep-seated division – with regard to the nature of the work, as well as the nature of the training. Although the observation done there was not developed into a full case study, the practices observed served as a useful vantage point from which to understand the pedagogic practices in cabinet making. (This discussion is taken up in chapter 5.)

The final interview with the master-trainer in cabinet making was conducted in May 2001, after completion of the two-week block for Stage 1 apprentices. This marked the end of the field work, except for one subsequent meeting which is described in a later section.

Use of orienting concepts

Recourse to the triangulation of data sources and methods (Cuff and Payne, 1984: 218; Fielding and Fielding, 1986: 23-25; Yin, 1994: 92) is a usual way of claiming that the inevitable shortcomings of any research method have been overcome through internal cross-checking. What is often omitted is that the use of a range of sources of information is usually not so much a result of an intentional strategy of triangulation as representing lines of empirical enquiry suggested by the conceptual scheme that guide the research process.

Although recognising that neither conceptual structure nor empirical setting may be clearly defined at the start of a research process, Brown and Dowling (1998: 10) argue that the conceptual structure a researcher brings to bear on a particular empirical setting must be

made as available as soon as possible. In this regard Layder's notion of 'orienting concepts' is particularly useful. Describing his position as a defence of a moderate form of objectivism within a post-empiricist and post-positivist social science (1998: 114), Layder draws a useful distinction between what he terms 'orienting or background concepts' within a realist tradition and the use of 'sensitising concepts' within an interpretivist or grounded theory approach (1998: 109). Variations on grounded theory may include the use of both 'sensitising' and 'orienting' concepts.

Sensitising concepts are tied to the idea that social analysis is exclusively about the analysis or interpretation of actors' meanings (Layder, 1998: 109) and restricts theorising to concepts and ideas directly suggested by the data (1998: 77). Orienting concepts are drawn from general theory and are geared towards the imposition of a specific order on the data to provide a route into the analysis and interpretation of data at a relatively early stage of the enquiry (1998: 109-111). As orienting concepts are used prior to the data collection stage much of the data collection is shaped around the theoretical questions posed by the research.

The formal theoretical framework that guided my fieldwork was provided by Basil Bernstein's concepts of 'classification' and 'framing' (1975, 1990, 1996, 2000) as a way of characterising different modalities of pedagogic practice, with the unit of analysis 'the structure of social relationships' (Bernstein, 1975: 147) which produces either individual, external, gradable *performance* or shared cognitive, linguistic, affective *competence* internal to the acquirer as the outcome of pedagogic transmission.

A more detailed discussion of classification, framing and related concepts follows at the start of the next chapter. A discussion of the problems encountered when one has a prior conceptual framework, and the use of Bernstein's work in this regard, is undertaken in a later section of this chapter. Here the intention is simply to signal the presence of a prior conceptual scheme, which influenced the lines of enquiry followed. These orienting concepts not only provided an initial lens for focussing on certain aspects of the empirical setting and excluding others, but also became crucial to the formal analysis and interpretation that followed later.

Researcher as observer

Wilkinson (1995: 213) argues that the major strength of direct observation is precisely that it is direct. There is little or no time delay between observations and their recording. Observation also does not require research subjects to respond in words to stimuli (questions). This averts the dangers of self-reporting where respondents report in a way that they think they should. Observation is therefore deemed particularly suitable in situations where non-verbal behaviour occurs. From an anthropological view point Bloch (1998: 8-9) argues that the kind of knowledge that underlies the performance of complex practical tasks *requires* that it be non-linguistic and that, particularly in specialised craft apprenticeship, language plays a surprisingly small role in knowledge transmission[19]. The implication is that observation becomes the only possible way of proceeding in a situation where much of what happens is unspoken.

Observation can de done in a number of ways. Gold (cited in Babbie, 1983: 247 –248) identified four different roles that researchers may play in this regard: complete participant, where research subjects see the researcher only as a participant and not as a researcher; participant-as-observer, where the researcher is a full participant but also makes the research role explicit; observer-as-participant, where the researcher interacts with research subjects in the social process but does not pretend to participate in any way; and, complete observer, where observation is so unobtrusive that research subjects are often not aware of being observed. In terms of this classification the observational role adopted in this study can be described as that of *observer-as-participant* (or non-participant observer). While there are obviously ethical and practical considerations for choosing one or the other role, with each role imposing limitations on what can be studied, being an observer rather than attempting any form of direct participation was the role most in keeping with the empirical setting. Even so, a great concern on my side was that my presence would disrupt everyday trade school practices. Fortunately I already knew most of the trade school staff and after a few days I was included in the familiar tea and lunchtime routines. A cup was included for me on the tea tray and I was given access to a computer and to relevant documentation. I was also given a desk in the staff room and I could use one of the empty workbenches in the workshop as a place where I could sit and write notes. If I arrived after the punctual 8 o'clock start to the day I

[19] Bloch's argument is taken further in chapter 7 where the tacit nature of craft knowledge is explored.

would jokingly be reprimanded and told that they would phone my boss, as they did when apprentices came late. I was thus expected to fit into the daily routine and, although not treated as a guest, the status given to me was that of long-term visitor.

This status was confirmed by my introduction to the apprentices as a researcher from the University of Cape Town who was studying apprenticeship. The apprentices accepted this explanation without comment. After a while they acknowledged my presence with a brief glance or a smile. This was a different role to that adopted by Milroy (1991) who worked as an apprentice for six months when conducting an ethnographic study of the mathematical ideas of a group of carpenters in Cape Town. Her role required a long period of initiation before legitimation of participant status was conferred, whereas my role never became more than that of the 'familiar outsider', thus limiting the temptation of taking on an 'insider' perspective that tips the 'combination of involvement and estrangement' (Hammersley, 1992: 145) required for judicious research too far in the direction of involvement.

During a prolonged period of fieldwork a measure of involvement is perhaps inevitable, but it becomes a problem if the researcher is not aware of the shift that has occurred. In my case, the lens provided by the theoretical concepts selected to guide me through the fieldwork, was the most important safeguard against taking on an 'insider' perspective. When I did appear too involved, which happened occasionally when I was trying to explain some of the dynamics to my supervisor, he had no hesitation in pointing this out to me.

Field notes

In studies where a heavy reliance is placed on observational evidence, systematic recording of observation through detailed field notes is essential. Like Milroy (1991: 9) I did not always find it possible to record events at the time when they occurred. I often scribbled a verbatim note of an exchange between master-trainer and apprentice and then filled in the background details later, when I would recreate the day in detail and record both observations and impressions. At other times I would leave the workshop and sit down in the staff room to record an occurrence as immediately and as fully as possible. Field notes were filed in chronological order and periodically reread to look for consistencies and inconsistencies in the occurrences recorded, as well as for areas where scanty evidence had been gathered thus requiring more intensive focus.

Although I initially planned to supplement field notes by using a video camera and a tape recorder to capture some of the sessions, the tape recorder only proved useful when interviews took place in a quiet room. High noise levels in the workshop, due to the intermittent use of a range of saws that made a high-pitched noise, precluded the use of audiotape equipment. In instances where I did try to use recording equipment in the workshop the resultant transcripts were completely incoherent and of no use. An example of such a transcript is given below.

> [Inaudible] put a [inaudible] on there, a [inaudible] on there, and then you [inaudible] and sand [inaudible]. [Inaudible] put that on there, [inaudible] the one with the bearing on the top or the bottom, it doesn't matter and they actually put it very accurately and they [inaudible] and the router will then [inaudible] down to a hundred [inaudible]. It's going to [inaudible] it up. Am I right? (An attempt to transcribe a recorded discussion between the assessor and an apprentice, with the master-trainer listening in the background, 07/09/99.)

It also became clear that video equipment could not be used. Workshop sessions were extended and the long period of observation precluded continuous recording. Apprentices were usually performing a range of different tasks, with no way of deciding whether it was more useful to watch one rather than the other. Better coverage could be obtained by moving around relatively unobtrusively and by keeping the researcher's presence as discreet as possible.

Ensuring anonymity

Yin (1994: 143) views disclosure of the identities of both the case and the individuals involved as the most desirable option in case study reporting. He argues that this facilitates review of the case and allows readers to recall any previous information they may have about the case that may aid them in reading and interpreting the report. In this study, where the case serves as what can be called an 'ideal type' (Yin, 1994: 143) of a pedagogy based on a strong master-apprentice relation, it could be argued that there is no need for the disclosure of identities. Nevertheless, within a particular period of the apprenticeship system it is not possible to refer to the institutional training site related to the trade of cabinet making without referring to the furniture industry and to the Furniture Industry Training Board (FITB). The research site is thus initially named in the study and thereafter given the general title of 'trade

school' to distinguish the site from the workplace as the other site where apprentices receive instruction (albeit of a more informal kind).

The identity of individuals concerned is protected by similar use of general terms such as 'master-trainer' and 'assessor' and by use of letters in relation to individual apprentices. Where interviews were conducted with individuals their official designations are mentioned and not their names.

While the conventions used to protect the identity of individuals may have an impact on the readability of the study, it is done in the interests of the trust relation that developed between researcher and research subjects over an extended period of time.

Analysis and interpretation

Using Bernstein

The presence of a conceptual scheme that is drawn from general social theory prior to the commencement of fieldwork brings with it a requirement for what Moore and Muller (2002: 633) describe as 'downward conceptual elaboration' of dichotomous concepts, or what Layder (1998: 117) calls 'primary elaboration' of core concepts into further dimensions, properties and characteristics implied by the core concepts selected for use. While these two processes are not identical they are analogous to the extent that both refer to the need to bring abstract terms closer to the point where they bear a clear and direct relation to the empirical setting. In this regard the employment of Bernstein's theoretical framework presents more of a problem than most general theories. The problem, ironically, lies in the degree to which Bernstein's work serves as an exemplary illustration of the injunctions set out above. The researcher choosing to work within a Bernsteinian framework may initially find herself trapped in what feels like a labyrinth of concepts, all related yet all carriers of distinct meanings. (See chapter 4 for a full discussion of these concepts.) This brings with it the danger of encouraging the researcher to fit (or force) empirical evidence into pre-elaborated categories which are already available and to be lulled into a misconception that no further theoretical labour is necessary other than to verify an already established theory.

A methodological aim of the study is indeed to test Bernstein's claim that 'the models that I develop here should be able to describe the organisational discursive and transmission

practices in all pedagogic agencies and show the process whereby selective acquisition takes place' (Bernstein, 1996: 17). Bernstein also makes it clear that his concept of pedagogic practice is somewhat wider than the social relations of schooling. Given that Bernstein's theory has not been tested in relation to craft pedagogy, the confirmation or disconfirmation of his claim would serve to reaffirm the importance of continuity and dialogue between current and prior research and also serve to confirm the cumulative nature of both theory and research (Layder, 1998: 35).

The methodological aim of testing an already existing theoretical framework complements rather than displaces the substantive aim of this study, which is to investigate craft and its pedagogy in terms of their capacity to transmit context independent knowledge (or meanings). Within this focus the conceptual framework provided by Bernstein is an extremely useful vantage point from which to drive the conceptual and theoretical elements of the study. Bernstein is, in my view, the obvious choice when one is looking for a theorist who deals directly with issues of curriculum, teaching, evaluation and social relations, in other words, with issues of pedagogy (Davies, 2001: 4).

What should be added is that the complexity of Bernstein's work requires a prospective student of his work to expend a great deal of what Breier calls 'symbolic labour' (Breier, 2003: 235, as well as in personal communication). She uses the term to establish a relation between the labour required in academic work and Bourdieu and Passeron's notion of 'symbolic violence' as the imposition of meanings as legitimate while concealing the power relations that are the basis of their force (Bourdieu and Passeron, 1990: 4). For Breier 'symbolic labour' is a conscious submission to the meanings made available in certain intellectual traditions or disciplinary fields. Put in a more direct way, there is no way through Bernstein other than by immersing oneself in the conceptual world that he created over decades of consistent theorising and related empirical work. The reward is two-fold. His theory (or his language of description) makes provision for almost every aspect of pedagogy and provides a ready-made downward elaboration, or what could be called a first level of operationalisation[20]. A researcher who follows this path is also immediately able to position

[20] This aspect comes through more strongly in the next chapter when the concepts of classification and framing are broken down into constituent categories.

her study in relation to an emerging body of research within the Bernsteinian tradition (numerous examples are cited in chapter 4).

This does not mean, however, that the theory is tailor-made for every empirical situation and that the researcher does not have to do further theoretical elaboration. On the contrary, the requirement for theoretical labour becomes greater not less. What Layder (1998: 122-129) calls ' tertiary elaboration', or recourse to various sources of general and substantive theory is an essential component of the overall theorising process, as well as of what I shall call a process of second-level operationalisation that gets closer to the empirical evidence than the first. Such work also serves to remind the researcher that there is theoretical life beyond Bernstein, so to speak.

Analytical tools as heuristic devices

Ideal types and typologies

Mouton (1996: 195) argues that there are three types of conceptual frameworks that constitute what he calls the 'familiar "structures" of science', namely typologies, models and theories. While theories explain or predict phenomena at the highest level of generality, typologies have mainly a classificatory function. The basic unit of the typology is the 'type', or what Weber calls the 'ideal type', constructed to 'capture the essential features of some social phenomenon' (Ritzer, 1996: 118). An ideal type is thus a heuristic device that enables empirical phenomena to be lifted to an analytic level for the purpose of comparison between the ideal-typical and the actual. Ideal types have an important theoretical function in that they serve as 'the theoretical building blocks for the construction of a variety of theoretical models' (Ritzer, 1996: 120).

Citing Heckman, Ritzer (1996: 118), warns, however, that ideal types are not the product of the whim or fancy of the social scientist; they are logically constructed concepts that are largely but not entirely inductively derived from actual phenomena in the world. Mouton concurs when he describes the process of constructing a typology.

> In a description of the typical characteristics of a phenomenon, the common or outstanding characteristic is emphasised and the trivial or incidental ones are eliminated. Obviously the identification of what is typical involves a process of abstraction. Starting with the concrete level of experience we move to a higher level of abstraction in which the common

> characteristics are emphasised at the expense of whatever is specific. The consequence of abstraction is that no type is ever an exact reproduction of all the characteristics of a phenomenon (Mouton, 1996: 196).

Where typologies are constructed as the first step in a research process they serve as a frame of reference for observation, data collection and later analysis. Where they are constructed as a result of empirical observations they provide a framework for data analysis because, as Mouton (1996: 196) argues, 'possible commonalities between phenomena have already been systematised in the typology'. Morais and Neves, who make extensive use of typologies in their research on science education, explain their construction of typologies as an iterative process. 'The instruments were always the result of previous observation and of our guiding theory modified by further observation' (2001: 191).

Models

A study of a specific phenomenon can also lead to the construction of a model through which, Mouton argues, 'the researcher reveals certain similarities or relationships and systematises these (in a simplified form) as a model of that phenomenon' (Mouton, 1996: 197). He thus distinguishes the typology from the model in the sense that the typology presents a static image or cross-section of a specific class of events, while the model attempts to represent the dynamic aspects of a phenomenon by illustrating the relationship between its elements in a simplified form (1996: 198).

Use of typologies and models in the study

The study uses both the typology and the model as analytical tools. In chapters 4, 5 and 6 the constituent categories of Bernstein's concepts of classification and framing are operationalised through a series of typologies that allow information collected through direct and indirect observation, as well as through the study of archival sources, to be transformed into data at the level of 'class' or 'type'. Findings based on data that is no longer tied to the particularity of an empirical setting achieve the external validity or generalisability so often a problem in qualitative research.

In chapters 7 and 8 a different analytical strategy is followed. The conceptual framework employed in chapter 7 is neither a typology nor a model. It utilises concepts and theoretical explanations external to the specifics of the empirical setting to introduce a new mode of

enquiry that throws light on the nature of craft knowledge rather than on its pedagogy (as in the previous chapters). Chapter 8 similarly starts from a position outside the empirical setting and uses socio-historical information to build a theoretical model that operates at a high level of generality and cuts across historical periods from which the information is drawn. The model allows craft knowledge to be positioned in relation to other knowledge forms, showing both structural similarity and relation between different constitutive elements. Once this position has been reached it becomes possible to understand why craft pedagogy takes the particular form that it does and not another. What was described in chapter 2 as a subversion of the formal CBMT pedagogy adopted within the apprenticeship system at the time is shown to be no more than adherence to the dictates of the kind of knowledge that must be transmitted if holistic craft practice is to be reproduced. At a more general level this link between knowledge structure and pedagogy confirms a move that Bernstein himself made in his work on vertical and horizontal discourses (1996, 1999, 2000).

Issues of verification

Prior to the data analysis stage I made a crucial mistake in relation to verification; pursuing Schutzian 'adequacy' by assuming that it would be possible for one of the research subjects to verify the classificatory categories constructed in the typologies used in chapters 4 to 6. When I asked the master-trainer to work through the classificatory schemes and tell me whether he agreed, he did what he could do, which was to re-interpret the categories in terms which he understood and then to identify the category most applicable to his practice (in his view). Bourdieu (1998: 132) calls this the 'scholastic fallacy ... of asking interviewees to be their own sociologists', which he goes on to describe as 'the most serious epistemological mistake in the human sciences, namely that which consists in putting "a scholar inside the machine", in picturing all agents in the image of the scientist ... to place the models that the scientist must construct to account for practices into the consciousness of the agents' (1998: 132; also discussed in Muller, 2000: 155).

While this would be a typical position to take within an interpretivist approach, my mistake confirmed for me that participant interpretations can only function at the level of being sources of information. Verification of categories constructed by the researcher must be done through disclosure of the reasoning behind the categories and by as full a representation of the data as possible. Millar (1983: 22) argues that case studies are often criticised as being

highly subjective forms of enquiry. Two researchers who study the same case will inevitably differ in what they select as relevant data, how they grasp the dynamics and how they frame their questions. For Millar it is not subjectivity that is the crime but concealment. So case studies must pre-empt the charge of concealment through the presentation of findings, procedures, basic data and frame of reference for public scrutiny and attack. From a realist position I would add to Millar's prescription the requirement of not only making the data available but of also making available the categories that construct information as data, with explicit reference to the theoretical concepts that provide the impetus for the generation of such categories. This then is the methodological position taken in this study.

Limitations of the study

The above discussion of the ontological assumptions and the analytical tools used, make it clear that the study attempts to break away from the mould in which qualitative research and case study research in particular is often cast, while still using methods and techniques that are traditional to a qualitative approach. In seeking to do so the study does not make use of statistical evidence to infer from one case to a larger population, relying instead on a strong conceptual framework, which although already elaborated downwards to the point where it is nearly ready to become a reading device for data, still requires to be operationalised in a way that speaks to the specificity of the case.

The decision not to include statistical data that would provide some sense of how a single case could be representative of a larger population, resides with the particular nature of the case. Statistics about the number of completed apprenticeships, or the number of people currently still within the old system of apprenticeships would not constitute a claim for the generalisability of the case. Firstly, trades are too different in their nature and forms of work organisation to allow an assumption that a study of cabinet making could extend to all other trades. Secondly, the reason for studying cabinet making was to discover something about the capacity of a craft or trade that is context-bound and tacit in its transmission practices to generate context-independent or specialised knowledge or meanings. Cabinet making is a formally designated trade, but it is a craft-intensive trade and thus unlike many of the machine or engineering trades that rely far more strongly on a formal scientific knowledge base. The crucial reliance on tacit knowledge in craft-based trades might thus not be found in all trades. Thirdly, the study focuses on tacit knowledge as transmitted through the master-apprentice relation, rather than on apprenticeships in general. Cabinet making and its

particular form of transmission is an instantiation of a pedagogy that is still cast in this form, but it could not be said that this is the case in other trades, where competency-based modular training (CBMT) is implemented in a more systematic and standardised manner.

Given these considerations the study thus had to forego the strategy of strengthening the generalisability of the case through quantitative measures of populations, thereby rendering itself vulnerable to the charge of lack of generalisability.

A second limitation was imposed by the time-consuming nature of the close observation that was required to do justice to the intricacies of the case. This prevented the researcher from conducting a second comparative study that would have strengthened the potential for generalisability.

The study therefore has to rely strongly on the logical consistency of the typologies and models developed, as well as on the generalisation that becomes possible when the theoretical concepts used, such as the ones drawn from Bernstein, have already been tested by other researchers in other settings. While this does not enable the study to claim empirical generalisability, it does enable a claim to theoretical generalisability that allows the findings to be interpreted at a level more general than that which arises from the specificity of the case.

Conclusion

In pursuing the question about the capacity of a craft or trade that is context bound and tacit in its transmission practices to generate context independent or specialised knowledge or meanings, the case selection strategy followed was to select the case study as the most appropriate form of enquiry. This decision could have led to an interpretivist approach within a grounded theory perspective. Instead a realist stance was adopted, which necessitated the development of typologies that enable information to be coded as data and the subsequent development of a model that could act as a heuristic device for the interpretation of data. The next chapters show how this was achieved. In chapters 4, 5 and 6 the classification and framing values of craft pedagogy, as observed in the FITB trade school are characterised. In chapter 7 the focus moves to an exploration and explanation of the tacit nature of craft knowledge, with the model that is developed in chapter 8 providing the explanatory framework for the findings of the preceding chapters.

Chapter 4: Characterisation of craft pedagogy in cabinet making in terms of classification values

Introduction

The analytical framework provided by Basil Bernstein's earlier work and, in particular, his conceptual language in relation to pedagogic practice, is introduced in this chapter. This framework is then used as the basis for the characterisation of craft pedagogy in cabinet making that is undertaken in the remainder of the chapter and in the next two chapters.

Bernstein's conceptual language for the characterisation of pedagogy

In contrast to perspectives that view pedagogic communication as what Bernstein calls merely a 'carrier' or 'relay' for ideological messages and for external power relations; or, alternatively, as an apparently neutral relay or carrier of various sorts of skills, Bernstein's quest in his earlier work is to describe and analyse the nature of the pedagogic relay itself (2000: 25). He does not deny that pedagogic communication is a relay for patterns of dominance external to education itself, such as class, gender and religious relations, but he wants to explain the medium that makes such relaying possible (1990: 169). His original question is: 'How does power and control translate into principles of communication, and how do these principles of communication differentially regulate forms of consciousness with respect to their reproduction and the possibilities of change?' (2000: 4).

The thesis, which arises out of fundamental questions about the nature and process of social control, is that 'there is a causal relationship between the structure of social relationships and the structure of communication' (1975: 30). Power always operates on relations between categories to establish legitimate relations of order. Control carries the boundary relations of power and socialises individuals into these relations. Control not only carries the power of reproduction but it also carries the potential for change (2000: 5). The relationship between power and control (defined analytically as the relationship between 'classification' and 'framing') is fundamental to analysis at all levels, with ideology posed as 'the mode of making relations' (2000: 104). The concepts of classification and framing hold together structural and interactional levels in such a way that change can be initiated at either level (1975: 8).

The concept of 'code' as a culturally determined positioning device that regulates 'dispositions, identities and practices, as these are formed in official and localizing pedagogizing agencies (schools and family)' (1990: 3), is central to an interpretation of 'how the category *class* is constituted in our consciousness' (1975: 29-30). A distinction between restricted (or context dependent) and elaborated (or context independent) orientations to meaning relates to the 'distributive function of class relations' (1990: 13).

Bernstein's own work and that of researchers using his theoretical schema focus mainly on the transmission of elaborated educational codes in public educational institutions within a broader context of the pedagogic relation between school and home. Explaining the absence of an analysis of manual practices Bernstein argues that in historical terms 'manual practice was never integrated into formal public systems of knowledge and transmission. Manual practice was relayed through the family and guild' (2000: 8). Elsewhere he says:

> ... the relay for the production and reproduction of manual practices – lay outside education. The relay operated in the family and in the guilds. That is, it was invisible to education and invisible to those who operated a mental practice. It is probably for this reason that, whereas we know something about the transmission and acquisition of mental practices, we know very little about the transmission and acquisition of manual practices. For the latter is not part of the consciousness entailed in the formation of mental practices, or if it is, it is not likely to be formed by education (1990: 147).

Bernstein, however, regards pedagogic practice as 'a fundamental social practice through which cultural reproduction-production takes place' (1996: 17) and argues that his conceptual models of description should be able to describe any pedagogic practice and any pedagogic relation. This part of the study is therefore theoretically framed in Bernsteinian terms. Using his conceptual language of description the chapters that follow analyse the transmission of manual practices in terms that are analytically homologous to the way in which the transmission of mental practices have been researched (Brooker, 2000; Daniels, 1989, 1995; Davis, 1995, 1996; Morais, 2002, Morais and Pires, 2002[21]). Although some of the concepts

[21] This list contains an arbitrary and limited selection of academic publications where one or more of Bernstein's theoretical schema are used to frame empirical research. Some of the authors cited have written far more extensively. In his own writing Bernstein also refers to many more empirical studies. In South Africa itself there

are interpreted in ways that accord with the specificities of manual practice, the categories of analysis are consistent with his theoretical precepts. As Bernstein's theoretical project spanned a number of decades with concepts reworked, amplified and refined through ongoing theoretical inquiry and empirical testing, the order in which the concepts are presented does not necessarily correspond to their chronological development.

Classification and framing

> If the principle of classification provides us with our voice and the means of its recognition then the principle of framing is the means of acquiring the legitimate message (Bernstein, 2000: 12)

Bernstein asserts that formal educational knowledge is realised through three message systems: curriculum, pedagogy and evaluation. He uses the concepts 'classification' and 'frame' to analyse the underlying structure of these systems. *Classification* focuses attention on boundary strength, as the critical distinguishing feature of the division of labour of educational knowledge (1971: 88) and refers to 'the degree of insulation between categories of discourse, agents, practices, contexts, and provides recognition rules for both transmitters and acquirers for the degree of specialisation of their texts' (1990: 214). *Frame* refers to the form of the context in which knowledge is transmitted and received and thus to the specific pedagogical relationship between teacher and taught (1971: 88).

The spatial and temporal features of any communicative context can be represented by two principles: a locational principle (classification) and an interactional principle (framing). The locational or classificatory principle creates specific recognition rules whereby a context is distinguished and given its position in relation to other contexts. The degree of insulation constitutes the degree of specialisation of a communicative context, with weak or strong classification indicating the strength of the boundary. The interactional or framing principle regulates the selection, sequencing, pacing and criteria of oral, written and visual

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is a growing body of research that employs theoretical perspectives derived from Bernstein's work. Two international symposia, dedicated to academic work that employs and furthers Bernstein's theoretical contributions to the sociology of knowledge and the sociology of education, have been held and another is planned for 2004. References to his work are thus not exhaustive and no attempt is made here to represent the full impact of his theoretical influence.

communication, as well as the conduct, character and manner of transmitters and acquirers. At a higher conceptual level these two aspects of the framing relation are depicted as an instructional discourse (the rules of discursive or instructional order) and a regulative discourse (the rules of social order). The instructional discourse is always embedded in the regulative discourse and the regulative discourse is the dominant discourse (1990: 108, 1996: 28).

> Often people in schools and in classrooms make a distinction between what they call the transmission of skills and the transmission of values. These are always kept apart as if there were a conspiracy to disguise the fact that there is only one discourse. In my opinion there is only one discourse, not two. Most researchers are continually studying two, or thinking as if there were two: as if education is about values on the one hand, and about competence on the other. In my view there are not two discourses but one.
>
> From one point of view, pedagogic discourse appears to be a discourse without a discourse. It seems to have no discourse of its own. Pedagogic discourse is not physics, chemistry or psychology. Whatever it is, it cannot be identified with the discourse it transmits. ... Pedagogic discourse is a principle for the circulation and reordering of discourses. In this sense it is not so much a discourse as a principle. (2000: 32).

If the classificatory principle establishes recognition rules by indicating how one context differs from another then the framing principle establishes realisation rules that determine what counts as a legitimate text in a specific communicative context. Similar to classification, framing over both the regulative or instructional discourse can be strong or weak. Where framing is strong the transmitter explicitly controls features of the framing relation; where framing is weak the acquirer apparently has more control over features of the framing relation (1990: 34-37).

The strength of classification and framing can vary independently of each other. It is, for instance, possible to have weak classification and strong framing of certain or all of the features of the communicative context, just as it is possible to have strong classification and weak framing. Framing values can also vary independently of one another. Framing over evaluative criteria could, for instance, be strong while framing over pacing is weak. (1971: 89, 1996: 27). By further assigning external and internal values for classification and framing, again with the possibility of independent variations between external and internal values

(1990: 36-37), a language of description of considerable delicacy becomes available as an analytical tool.

Bernstein uses a form of algebraic notation to distinguish between external and internal classification or framing, as well as between strong and weak classification or framing. The modalities on the four-point scale usually employed range from 'very strong' to 'strong' to 'weak' to 'very weak'.

Table 2: Notation used by Bernstein to depict modalities of classification and framing

External classification	C^{e}	Internal classification	C^{i}
External framing	F^{e}	Internal framing	F^{i}
Very strong classification	C^{++}	Strong classification	C^{+}
Weak classification	C^{-}	Very weak classification	C^{--}
Very strong framing	F^{++}	Strong framing	F^{+}
Weak framing	F^{-}	Very weak	F^{--}

The symbols are combined to give a full description.

Table 3: Notation used by Bernstein to combine modalities of classification and framing

Very strong external or internal classification	C^{e++} or C^{i++}	Strong external or internal classification	C^{e+} or C^{i+}
Weak external or internal classification	C^{e-} or C^{i-}	Very weak external or internal classification	C^{e--} or C^{i--}
Very strong external or internal framing	F^{e++} or F^{i++}	Strong external or internal framing	F^{e+} or F^{i+}
Weak external or internal framing	F^{e-} or F^{i-}	Very weak external or internal classification	F^{e--} or F^{i--}

This notation is also used in this study as it provides a short-hand for depicting variations in modalities of classification and framing.

Pedagogic practice

What Bernstein calls 'the inner logic of pedagogic practice' refers to the relationship between three sets of rules that are prior to the content to be relayed (1975: 117).

Hierarchical rules, whether formal or informal, are the rules by which the social relationship between a transmitter and an acquirer are initially constituted and maintained. These rules establish the conditions for order, character and manner. They determine the hierarchical form of the transmission and constitute the relationship between a transmitter and an acquirer as intrinsically asymmetrical. Even though Bernstein acknowledges that the realisation of this asymmetry may be complex and that there may be space for negotiation with regard to the rules of conduct, he views a hierarchical relationship as 'a prerequisite of any enduring pedagogic relation (1990: 66).

> There may be various strategies for disguising, masking, hiding the asymmetry. For example, in certain modalities of practice the acquirer is perceived as a transmitter, and, perhaps the transmitter appears to be the acquirer, but these are essentially arabesques (1990: 65).

The second set of rules refers to *selection, sequencing and pacing*. In any pedagogic transmission something comes before something else and something comes after something else. There is thus progression and sequencing. Sequencing further implies selection of content and pacing, or how much the acquirer has to learn within a given amount of time (1990: 66-69).

Criterial or *evaluative* rules establish what counts as legitimate communication and text production and what would be termed illegitimate. Criterial rules enable the acquirer to evaluate her/his own performance and the performances of others (1990: 66, 69-70).

As these three sets of rules are the rules generated by the framing principle it follows that a pedagogic practice is characterised by its framing values and by their relationship to the classification values by which the pedagogic context is distinguished from other contexts.

Visible and invisible pedagogy

The concepts of classification and frame, together with the relationship between the three rules that constitute a pedagogic practice as a cultural relay, allow Bernstein to characterise pedagogic practices as either *visible* or *invisible*. What marks out a visible from an invisible pedagogy at the level of pedagogic practice is the difference in the strength of classification and framing.

Visible pedagogies are realised through strong classification and strong framing. Space is strongly classified, with explicit hierarchical relations transmitting the rules of social order. Explicit rules of selection, sequencing and pacing regulate the unfolding of the syllabus, curricula and system of assessment. The transmitter continuously makes the acquirer aware in oral/written form of what is not in her/his production (transmission of evaluative criteria).

Invisible pedagogies are characterised by weak classification and weak framing. An implicit hierarchy masks power relationships so that the acquirer appears to have greater control over the regulation of her/his movements, activities and communication. The selection, sequencing and pacing rules are also implicit and only the transmitter knows them. The teacher is less likely to create in the acquirer a consciousness of what it missing in the production of a text. Such consciousness is created indirectly through general and diffuse support (1975: 116-120).

At a more abstract level the conflict between visible and invisible pedagogies are posed as an ideological conflict within the middle class, which translates into socialisation into individualised or personalised organic solidarity. It is a conflict between forms of transmission of class relationships.

> Whereas the concept of the *individual* leads to specific and unambiguous role identities and relatively inflexible role performances, the *concept* of the person leads to ambiguous personal identity and flexible role performances (1975: 125, original emphasis).

Although Bernstein emphasises that the way in which he uses invisible pedagogy is specifically in the context of the early years of a child's life in the home or the school, (1975: 120), he also mentions the movement towards institutionalisation of an invisible pedagogy in primary and secondary schools where visible pedagogies are provided for the middle class and invisible pedagogies for the working class. This prevents working class children from

gaining access to specialised forms of communication, or what Bernstein (1975: 132) calls 'symbolic property', as the means whereby a middle class position is reproduced through schooling, thus relegating them to the manual side of the social division of labour.

Visible and invisible pedagogies lead to different pedagogic emphases. In the case of a visible pedagogic practice the focus is on external gradable performance. In invisible pedagogies the focus is on shared competence, or cognitive, linguistic, affective and motivational procedures internal to the acquirer. Invisible pedagogies emphasise acquisition-competence and visible pedagogies emphasise transmission-performance (1990: 70-71).

A framework for analysing pedagogic practice

The relation between concept and indicator variables

Once a conceptual language has been established indicators need to be developed to enable the linking of empirical evidence to a theoretically generated network of related concepts (Rose, 1982; Brown and Dowling 1998[22]). The operationalisation of conceptual categories allow for information from the setting to be read as data in relation to locations on the theoretically generated network.

It has been argued that an analytical framework that derives from already established conceptual categories, which were in place prior to embarking on field study, minimises the dialogue between developing theoretical and empirical domains and thereby the impact of the empirical work (Brown and Dowling, 1998: 91). In this study it is, however, considered crucial to characterise the transmission of manual practice through the use of established conceptual categories that enable a comparison between the transmission of mental and manual practices. This does not mean that the resulting analytical network is not generated through a dialogic relation between the theoretical and empirical domains. Each theory-derived conceptual category still has to be specialised to the specificity of the empirical domain. This is achieved through a process of induction from the information collected about the setting and deduction from theoretical work that relates specifically to the context under

[22] Rose (1982: 34-36) describes a concept as 'a theoretical idea' and an indicator as 'an empirical linkage with a concept'. Brown and Dowling (1998: 105) describe concept variables as 'theoretical objects' and indicator variables as 'empirical objects that enable recognition of the concept'.

investigation. This form of triangulation provides the operationalised categories with greater general explanatory capacity than would be possible if only the empirical setting was used.

The theory-derived conceptual framework is set out below. These concepts are then operationalised in the remainder of this chapter as well as in the next two chapters.

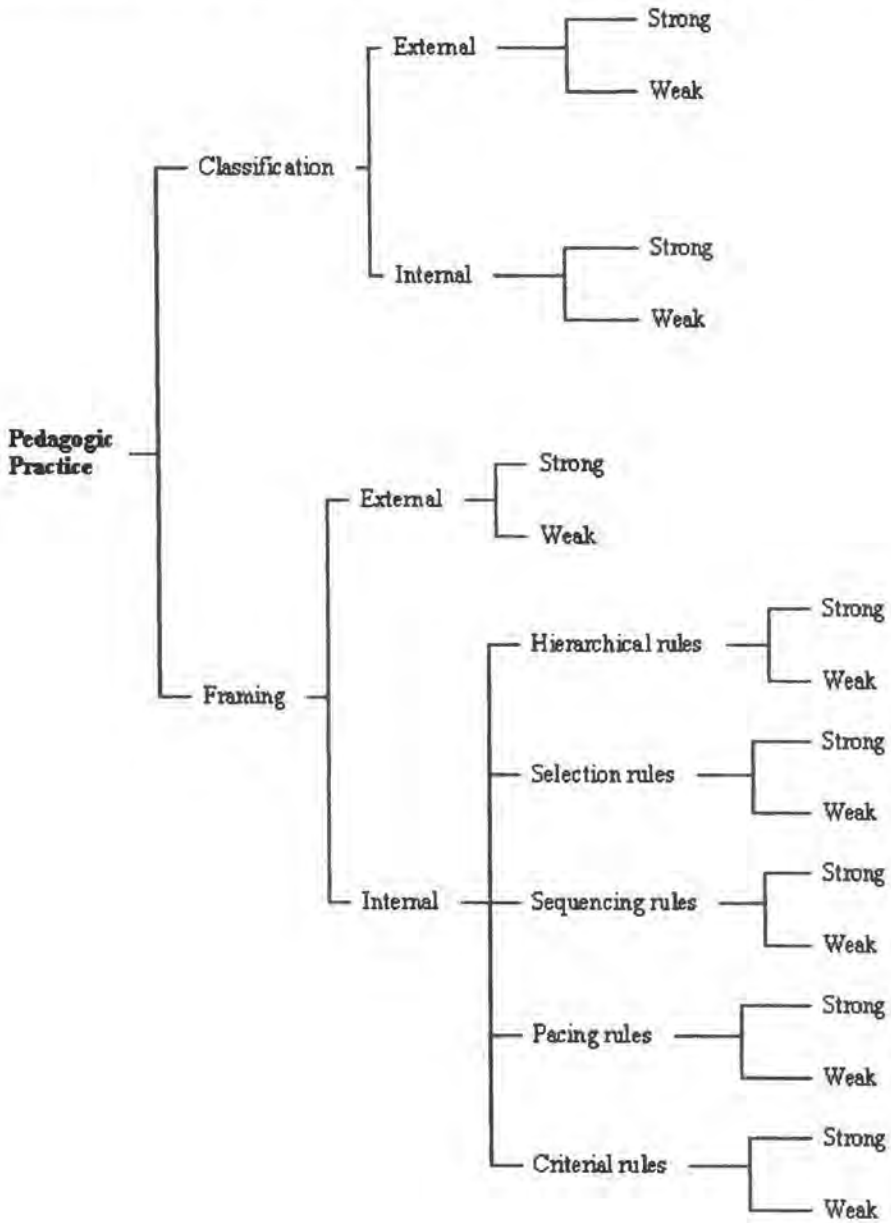

Figure 2: Diagrammatic representation of the full range of classification and framing values that can be used to characterise a pedagogic practice

Classificatory relationships in craft pedagogy

External classification (C^e)

In an earlier section a brief overview of the concepts of 'classification' and 'frame' was provided. Bernstein regards classification as a concept that can relate macro-structural and micro-interactional levels of analysis (2000: 100). At both levels the principle of classification establishes category relations and Bernstein asserts that it is power relations that maintain the degree of insulation between categories (2000: 99). What is called the external value of classification thus refers to the category relations that regulate '*what* discourse is to be transmitted and its relation to other discourses in a given set (e.g. a curriculum)' (Bernstein, 2000: 100, original emphasis).

Curriculum in craft pedagogy does not consist of discipline-based subjects or cross cutting themes as one may find in an ordinary school. What counts as curriculum in any particular craft or trade needs to be understood in terms of the way in which crafts or trades are demarcated. It is the relationship between (1) purposeful activity, or work itself and the way in which it is organised (2) the materials used or what Marx calls the 'objects of labour' and (3) the tools or instruments of work (Marx, 1976: 284; Mumford, cited in Pye, 1968: 11), that marks out any particular craft or trade. This inter-relationship constitutes the context of specialisation, both at the point of production in the workplace itself and in the transmission practice of the trade school.

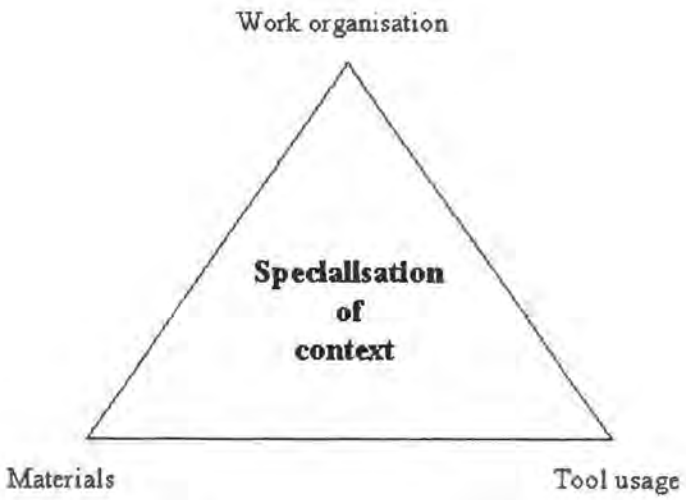

Figure 3: Categories that constitute craft demarcation, or specialisation of context (external classification)

Craft or trade curriculum can thus be depicted in terms of the external classification values attached to each of the above categories. By drawing on general historical material as well as on information obtained about the trade school curriculum in cabinet making, each category is operationalised to enable fieldwork observations to be transformed into data that informs the modal value assigned in relation to each category.

Classification of craft in terms of work organisation (C^{+++})

Marx's depiction of the three phases in the transformation of the labour process under capitalist production is the foundation of labour process theory. For Marx the phases of cooperation, manufacture and machinofacture, or large-scale industry (1976: 438-639) are abstractions. They are not meant to sum up any particular historical period but are part of a model of capitalist development (Webster, 1985: 6). Pre-industrial craft is the starting point of his analysis and it is likewise the starting point of Braverman's later renewal of the link between capitalism and work.

> From earliest times to the Industrial Revolution the craft or skilled trade was the basic unit, the elementary cell of the labor process. In each craft, the worker was presumed to be the master of a body of traditional knowledge, and methods and procedures were left to his or her discretion. In each such worker reposed the accumulated knowledge of materials and processes by which production was accomplished in the craft (Braverman, 1974: 109)

Marx sees *cooperation*, or the rise of the factory system, as an enlargement of the workshop of the master craftsman during the time of the guilds. Under relations of cooperation a number of craft workers belonging to the same craft work together under one roof and are involved in the same or in different but connected processes. Each of these craft workers (with the assistance of one or more apprentices) still makes the entire commodity and performs in succession all the operations necessary to produce it. (Marx, 1976: 439-443; also discussed in Webster, 1985: 2-4).

In *manufacture* a particular handicraft is divided into a series of partial operations. Marx illustrates two versions of this process. Instead of one craft worker being able to realise the craft in a number of ways[23], that worker now specialises in the manufacture of one particular item. What could also happen is that this partial realisation of a particular handicraft is

divided between various craft workers. Instead of each one performing the various operations in succession, the operations are disconnected and isolated and each task is assigned to a different craft worker. The technical basis of manufacture remains handcraft, as each partial operation is capable of being done by hand and the organisation of the social labour process is subjective.

In *machinofacture* 'an entirely objective organisation of production ... confronts the worker as a pre-existing material condition of production' (Marx, 1976: 508). Labour under the machine becomes repetitious and unvaryingly uniform (1976: 533). Craft does not, however, disappear altogether. The machine trades found in engineering fields originate at this time as many parts of machinery continue to be produced by handicraft or by manufacture.

Using Marx's depiction of the segmentation of the labour process the external classification of craft can be operationalised in terms of a four-point scale.

Table 4: Classification (external) of forms of work organisation

C^{e++}	C^{e+}	C^{e-}	C^{e--}
Crafts/trades are strictly demarcated with the individual craftsperson capable of producing the full spectrum of craft realisations; performing all the operations required in production. (Extended craft-based production)	A craft/trade is divided into partial operations. A craftsperson specialises in the production of a single item or a restricted number of items, although still performing the full sequence of operations. (Restricted craft-based production)	A production item is divided between various crafts/trades. Operations are disconnected and isolated. Each craft worker performs one and only one of the constituent operations (Craft-based mass production)	Craft is no longer the basis of technical production. The logic of the machine replaces craft skill, with resultant deskilling of skilled work into semi-skilled and unskilled work. (Fully mechanised mass production)

These indicators adequately represent the production conditions in furniture manufacturing in South Africa. The production process is not highly developed in terms of high-technology production methods, even though computer-aided design (CAD) and certain fully automated machines have been introduced in some factories[24]. Manufacturers are generally divided into

[23] A cabinet maker would , for instance be able to make various and diverse items of furniture

[24] This was ascertained through visits to a number of furniture factories in the Western and Southern Cape.

small, medium and large firms depending on the size of their workforce and are identified as either 'craft factories' or mass production factories.

The trade school curriculum seeks to amend diluted or fragmented work practices by compelling the apprentice to undertake all the operations required in the production of a variety of furniture pieces (a C^{++} modality.) In procedural terms the full sequence of craft-based manufacture can be described as follows:

1. The starting point is a rough drawing of the article to be made with measurements included.
2. The rough drawing is used as the basis for either a scale or full-scale drawing with exact measurements (This is called the 'lay out'.)
3. The scale drawing is used as a basis for preparing a cutting list, which lists all component parts with both their rough and finished sizes.
4. If component parts are going to be made by different workers (as happens in mass production factories) a routing sheet is prepared, for each component indicated on the cutting list. The routing sheet contains a small drawing of the part and includes instructions on the quantity required, the materials to be used, the machines to be used and the operations to be carried out on each machine. It could also contain an indication of the time the operation should take.
5. Wood selection and preparation is called 'taking out the wood'. This involves selecting wood according to colour, grain, texture and fitness for purpose. Various pieces of wood are joined together through a process called lamination, to provide surfaces that are large enough for the manufacture of bigger items such as tables and cupboards. Wood preparation involves the planning of two surfaces on each individual piece of wood to get straight edges for joining the wood together.
6. Each component part is made individually, with templates (or patterns) made and used to mark off even and standardised joints. Jigs are made and used to stabilise pieces of wood as they are pushed through various sawing machines. A jig is the reverse of a template and acts as a cradle in which the wood rests to ensure that it does not move during the cutting process. This is an important safety procedure.
7. Assembling of the parts happens in stages, with different parts glued and clamped together until finally the whole piece is assembled and clamped.
8. Sanding is an integral part of the process. Each part is sanded individually before assembly and the final article is sanded several times. Marks made by machines, chips, dents or slight imperfections in the surface are removed and the grain patterns of the wood are accentuated. Sanding is done both by machine and by hand, moving from coarsely to finely grained paper.
9. Throughout the process measurements are checked continuously to ensure that all parts 'square up' perfectly in the final assembly (information obtained during fieldwork, 09/09/99).

The related apprenticeship curriculum offered by the accredited training centre or 'trade school'[25] is divided into five stages. All apprentices undergo sixteen hours of introductory modular training on productivity improvement, measuring skills, shop floor safety and timber handling. The subsequent stages for cabinet making are set out in the table below.

Table 5: Formal curriculum for the five stages of institutional training in cabinet making

Stage 1 (3 weeks)	Stage 2 (3 weeks)	Stage 3 (4 weeks)	Stage 4 (4 weeks)	Stage 5 (3 weeks)
• Drawings • Timber Technology • Hand Sanding • Hand Tools • Cabinet Joints	• Drawings • Electric Tools • Pneumatic Tools • Screw and Nail • Adhesives • Hand Cramping • Door & Drawer • Construction	• Drawings & Cutting Lists • Cabinet Machines • Modern Carcass Construction • Fixtures and Fittings • Hinges & Locks • Jigs & Templates	• Drawings • Factory Regulations • Specialised Tools • Laminating & Bending • Chair Making • Veneering • Reproduction Period Furniture	• Drawings • Furniture Design • Repair Work **TRADE TEST**
STAGE 1 TEST	**STAGE 2 TEST**	**STAGE 3 TEST**	**STAGE 4 TEST**	**STAGE 5**

There are few factories where the craftsperson still produces the full spectrum of craft realisations and performs all the operations required in the production of each item (C^{e++}). While the individual cabinet maker working at home or in a small workshop may still work under extended craft-based production conditions, apprentices who are indentured in what are called craft factories are usually exposed to either a C^{e+} or a C^{e-} variation of craft. This depends on whether a craftsperson specialises in the production or a single item, while still performing the full sequence of operations (C^{e+}), or whether the factory has moved to craft-based mass production where the craftsperson would perform only one of the constituent operations in the production of a single item (C^{e-}). The following extract from an interview transcript illustrates C^{e+} and C^{e} manufacturing processes.

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[25] As already indicated, this is the term used by apprentices to describe the formal off-job component of their apprenticeship. The term also distinguishes the formal transmission process from the informal workplace transmission process.

Transcript extract 1: From interview with apprentice D (identified as AD)

Apprentice D is talking about his apprenticeship process in the craft factory. [Only initials are used to indicate the names of the artisans mentioned: JG.]

AD: 'After 6 months [of working as a labourer: JG] they indentured me and I started with stage 1 and so they allowed me to work on the machines. So I started to learn. Made chairs and then I worked with L.... Sideboards, and then after that I went to J... to make chairs. And now they sent me to JJ.... We make those extension tables. Nice tables.'

JG 'What is the big difference when you move from one piece of furniture to another?'

AD: 'No, it's normally all the same. You just learn a different way because a chair is normally ... everything is already made. The chair comes to you with mortise, tenon, everything. You must just glue it up, check it to be square, put in the corner blocks. Do the chair up. Whereas with the sideboards you just get the boards, you have to cut it to the size you want and run it down and put tails on, mortise the doors. You have to do all that, so there is more work going into a sideboard than into a table. I mean a chair also takes a lot of work, but you don't do all that stuff yourself. You just glue it on. The sanding on the chair takes long. Doing a cupboard takes a lot of work. A table goes quick because it's a big surface. There are no joints there, there is only the column you have to glue on.'

JG: 'So you don't even work off a cutting list anymore?'

AD: 'Ja, we get a cutting list. We have to check that the parts are there and the height of the chairs.'

JG: 'But you wouldn't necessarily work with a drawing then?'

AD: 'Not with a chair we're familiar with. If it's a chair that we are not familiar with then we have to work with a drawing.'

While cabinet making has been broken into partial operations this apprentice gets the opportunity to make various items of furniture before being placed in a specialised position.

In mass production factories (of the C^- or $C^=$ modalities) craft expertise is hardly recognisable.

Transcript extract 2: From interview with apprentice G (identified as AG)

AG: 'They [the wood machinists: JG] get the cutting list and they do all the machining. We just put it together.'

JG: 'So do you have to put in the dowels?'

AG: 'Yes. Put the dowels in there. We just ...'

JG: 'So you don't even do any handwork on it either?'

AG: 'Nothing at all.'

JG: 'So you clamp and glue?'

AG: 'Just put in the clamp, shoot with the staple gun and just go for it. If there's a door you just put the door on. You understand, there's no drawing.'

Transcript extract 3: From interview with apprentice E (identified as EG)

EG: 'We've got machinists, sanders and cabinetmakers. The cabinetmakers at our factory do not do any cabinet making because they are actually only assembling. And it goes into a press and then it goes out.'

The very strong external (C^{e++}) classification that sets the cabinet making practices in the trade school apart from workplace practices aims to reproduce the trade of cabinet making in its extended form, even though this is not what many apprentices or artisans do in their day-to-day work in furniture factories. If one could speak of 'everyday knowledge' it would refer to the restricted craft practices that apprentices encounter in their factory environments and which they bring into the trade school as the basis of their work experience. Site-specific, habituated and partial practices are the 'everyday' that must be kept out to ensure that the craft continues as a whole process.

Extract from Field Notes (1):

[Comment made by master-trainer (MT1) while watching an apprentice whom he considers to be good: JG.]

'I always tell them to make the rebate 15. But in the test it's 16. They all make it 15 because they do not think.'

Later I ask the apprentice about this incident. He explains: 'Each factory has standard ways of doing things. You get so used to it that you don't think about it any longer. That's what that was about' (Field Notes, 15/02/2001).

Materials as a classificatory category (C^{e+})

Medieval craft guilds or trade companies were divided according to the materials that companies had the royal privilege to sell (Clarke, 1999: 6). Members of a trade were not allowed to undertake the work of other trades, thereby literally making trade a *material-bound* practice and establishing the means for maintaining skill boundaries. Those boundaries exist to this day even though in furniture production they have been extended to include, for instance in the case of furniture, not only solid wood but also processed timber products such as chipboard and medium density fibre board (also known as supawood). What would be considered a transgression of the boundary would be the combining of wood with non-wood related materials, such as glass or steel.

Table 6: Classification (external) of different forms of material usage

C^{e++}	C^{e+}	C^{e-}	C^{e--}
High-quality wood is the only material allowed in the manufacture of single items of furniture. Originally indigenous wood such as yellow wood and stinkwood were used, but latterly more imported woods such as oak, beech, birch, cherry and maple are used.	Wood is still the only material to be used but cheaper woods, such as pine, are used for standardised lower-quality furniture.	Wood is combined with other materials such as steel and glass to produce more modern furniture.	Wood is replaced by plywood, chipboard or supawood. These processed timber products are overlaid with wood veneer or melamine. Surfaces are also painted or treated to look as if they are made from wood.

In terms of these categories the trade school would fall into the C^{+} category, but this is only because they cannot afford the more expensive woods. Processed timber products are never used and wood is never combined with other materials. What must be kept apart is contamination of the primacy of the material around which the trade revolves.

> Some kinds of workmanship rely for their effect almost entirely on the adventitious diversity introduced by certain materials, of which wood is the prime example. Wood can be selected and cut so as to control its figure, but only to a limited extent; and indeed no one wants to

control it too much. The beauty of cabinet-work is in the infinite diversity of the wood setting off the precise regulation of the work (Pye, 1968: 32).

None of the interviewees at the trade school or in the factories offered such an eloquent explanation, even though their passion and respect for the material of their craft was evident. They did explain, however, that a high level of craft skill is required to work with wood. Wood 'moves' and 'breathes' as it responds to the moisture content in the air. Unlike processed timber it also cracks and splinters if not handled correctly. In their explanations the status hierarchy attached to materials used in different factories came out clearly.

Transcript extract 4: From interview with apprentice B (identified as AB)

This apprentice works in a highly regarded craft factory (C^{++}) where they use mostly high-quality imported wood. He is comparing the trade school to his factory and his main basis of comparison is the inferior quality of the wood used at the trade school.

AB: 'It's like totally different because at work we use the upturns, because we do reproduction of antique furniture. Everything is done basically the old way. So our standard, like I say, is much higher than what we do here. And I mean, you know the type of wood we work with here, and everything is rough. But I'd say that training is not too bad. I mean, I learn a lot.'

For an apprentice from a mass production factory (of the C^{-} modality) the opportunity to work with solid wood is one of the advantages of attending the trade school.

Transcript extract 5: From interview with apprentice E (identified as AE)

This is the first statement he makes when asked to describe the difference between the trade school and his workplace.

AE: 'Okay, firstly at our factory we only work with plywood and chipboard. Being here it's more like a craft because you work mostly with solid woods. In the mass production factory it's more quantity than quality.'

Transcript extract 6: From interview with apprentice D (identified as AD)

An apprentice from a craft factory compares this experience to his previous job in a mass production factory.

JG: 'What's the difference between the two factories?'

AD: 'At X [the mass production factory: JG] there's not a lot of work you do there. I mean there isn't a lot you can learn. With Y [the craft factory: JG] you work on your own, you work with wood, you learn to

shape. At X you don't shape anything. You get the boards, put in the screws. That's all you do – put in screws, shooting backs. Whereas if you work with solid wood you can shape it like you want it; glue it, dovetail it. You learn a lot.'

JG: 'When you work with chipboard, you don't even do dovetails or anything?'

AD. 'No. You don't even work according to a plan. With solid wood you learn to think, get the job card and work out something. With chipboard you just get everything and just screw it together.'

Evidence of pride and respect for the primary material used in the trade also came up repeatedly.

Extract from Field Notes (2) :

[During a visit to a craft factory: JG.]

The factory owner explained how his father used to go to the sale of precious indigenous wood in Knysna every year. He would look at the stumps of rough wood lying at the edge of the forest and be able to assess the quality of the wood, as well as being able to see exactly which piece of furniture would eventually emerge from a particular stump. He could predict exactly how the wood would break down in the cutting yard and how much wastage there would be. Selection of wood was regarded as a personal accomplishment and errors in judgement were never forgotten (Field Notes, 15/02/2001).

Extract from Field Notes (3):

On the last day [of Stage 4] apprentices were taken on a visit to Koopmans De Wet Huis, an old Cape-Dutch house in the centre of the city that is now a museum. Although signboards warned visitors not to touch the furniture, they had no effect. With exuberance the apprentices moved from room to room, stroking the wood, calling out the names of different types of wood, admiring the intricate inlays, opening drawers to look at the joints and even lying on the floor to look underneath. The master-trainer (MT1) made no attempt to stop them; neither did he attempt to turn the visit into an overtly educational event. He intervened once or twice when they argued about the type of wood used, but otherwise was content to let them wander around on their own. When I asked him why he had brought them his answer was: 'To see the wood. You know, many of these youngsters work in mass production. They mustn't think that is our trade' (Field Notes, 28/10/99).

Tool usage as a classificatory category (C^{++})

The distinction between handicraft and manufacture is often taken as the basis for a distinction between the use of hand tools and machine tools. This is not Marx's interpretation and it also has no technical basis. Making use of a variety of tools assists in hand labour, but it does not supplant the work of the hand. Pye puts the matter into perspective when he asserts that *'"Handicraft" and "Hand-made" are historical or social terms, not technical*

ones. Their ordinary usage nowadays seems to refer to workmanship *of any kind* which could have been found before the Industrial Revolution' (original emphasis) (1968: 11). For Pye a distinction between hand-made and machine-made is all but meaningless. He argues that it was the Arts and Crafts movement of the mid to late nineteenth century, spearheaded by John Ruskin and later taken up by William Morris and his colleagues, in protest against the workmanship and aesthetics of the Industrial Revolution, that gave rise to the idea that everything that was made before the Industrial Revolution was made without machines (1968: 12). In a fascinating exploration of the evolution of craft Lucie-Smith concurs that 'it is mistaken, in many crafts, to talk of an innocent pre-industrial age followed by a corrupt industrial one' (1981: 13). He, for instance, explains that wood is a perishable material that survives best in dry climates. Most surviving specimens of ancient carpentry were therefore found in Egypt where a shortage of wood resulted in the Ancient Egyptians perfecting the techniques of piecing and joining at an early date to make sophisticated and elaborate furniture. A great variety of joints such as the dovetail, the plain butt joint and various mitre joints were known at that time, while the only basic woodworking tool that the Egyptians lacked was the lathe, which only came into use in the seventh century B.C. The plane, which was known and used at that time, strangely dropped out of use until it was revived in the twelfth century (1981: 32, 124).

While few cabinet makers are able to recount the long history of the tools of their trade, the use of hand tools has remained a way of distinguishing the original handicraft trades from the later machine trades. It also signals the autonomy of the craftsperson as someone who, while using only hand tools, can make anything a machine can make. Artisans take great pride in building up their toolboxes as their personal property and they do not share their hand tools easily (conversation and observation during factory visit, 14/02/01). A master-trainer (MT2), recalling his experiences as an apprentice, remembered how he used to carry the keys to his master's toolbox. He had to be in before the master each morning, so that by the time the master arrived the tools were set out. At night he had to ensure that each tool was back in the correct place and that the box was locked (Interview with MT2, 13/04/99).

Table 7: Classification (external) of forms of tool usage

C^{e++}	C^{e+}	C^{e-}	C^{e--}
Restricted range of tools used to achieve regulated workmanship[26], according to the trade demarcation. Hand tools remain the basis of the special forms of care, dexterity and judgement belonging to any one trade.	Wider range of tools allowed, often outside the trade boundaries. Hand tools still remain the basis of craft expertise.	Mainly machine tools used to achieve quantity and a high degree of standardisation. Hand tools no longer the basis of craft expertise.	Most work done by automated machines with outcome predetermined and outside the control of the operative once production starts.

In South Africa the traditional craft of furniture making has been broken up into the associated trades of cabinet maker, wood machinist, frame maker, furniture polisher, upholsterer and wood carver. The trade of cabinet maker is also to be distinguished from the various carpentry-joinery trades regulated by the building industry. Crucial to this distinction is a restriction on tool usage. Cabinet makers may only use seven specialised machines (two kinds of planing, three kinds of sawing and two kinds of sanding machines), with hand tools remaining the basis of the trade. In this they are strongly distinguished from the wood machinists (their main rivals in terms of internal trade demarcations) who are not trained on hand tools but use a far wider variety of machine tools.

The C^{++} classification of trade school practice with regard to tool usage is evident in the following workshop incidents.

Extract from Field Notes (4):

On day 7 of stage 5 the master-trainer (MT1) brings an intricate hand-carved clock into the workshop. He hangs it up but does not say a word. Later I ask him whether he made it.

MT1: 'Yes, Saturday and Sunday afternoons when other people watch TV I do this. I want to show them that cabinet makers do not only do their work in the factory. They should be restoring furniture and making things by hand. I used the router to cut out some of the shapes, but look here and here (points to the clock). That's done with a chisel, a plane and hand sanding.'

[26] The term 'regulated workmanship' (Pye, 1968: 22) describes workmanship where 'the achievement appears to correspond exactly with the idea'. In 'free workmanship' there is disparity between idea and achievement.

None of this is said directly to the apprentices, but they are watching and listening to the conversation. The next day the clock is no longer there. There is no further discussion about this (Field Notes, 15/09/99 and 17/09/99).

Extract from Field Notes (5):

[During a 'theory' session for stage 3 apprentices: JG.]

MT1: 'You're a cabinet maker. You don't have to do everything on a machine. You can work it down with a plane, or you sand it down (Field Notes, 14/08/99).

The care and precision required in the use of hand tools is regarded as the basis for good workmanship and it is for this reason that cabinet makers show derision towards furniture trades where hand tools are no longer used.

Transcript extract 7: From interview with master-trainer (identified as MT1)

JG: 'Why are the hand tools so important?'

MT1: 'Because of lots of little things. Like say, it's the way you stand when you cut. If you don't – as soon as you ... I show them to follow the shoulder and the elbow. You must follow your shoulder and your elbow, and the way you stand. If you stand like this (stands up to demonstrate), with your plane like this against the bench, how can you plane the wood straight.... It's important how you use your tools' (abbreviated extract).

Internal classification (C^i)

In this section the internal classificatory values of the trade school are characterised. Bernstein uses the internal value of classification (C^i) to refer to spatial relations within a category. Internal classification refers to the degree of insulation between objects, between tasks and between persons in a classroom in terms of the specialisation of space (2000: 99); or, to the degree of insulation between subjects (or discourses) in a school or university curriculum, or between departments in an educational institution (1990: 33; 2000: 9). Internal classification thus marks out the distinguishing features of the internal context (in this case the trade school). Strong internal classification indicates distinctiveness and separateness, while weak internal classification indicates integration or togetherness. Failure to recognise these distinguishing features leads to inappropriate behaviour by both transmitters and acquirers (2000: 104).

The typologies presented in this section have been developed to interpret various modalities of classification in relation to the internal context of the trade school.

Internal classification of the degree of boundary maintenance between different spaces

Table 8: Classification (internal) of boundaries between spaces

C^{i++}	C^{i+}	C^{i-}	C^{i--}
High degree of specialisation. Strong boundaries between physical spaces, which are never transgressed.	Although there is a high degree of specialisation of physical spaces, the boundaries between spaces are occasionally transgressed.	Significant degree of overlap or intersection, although specialised physical spaces are still clearly identifiable.	Minimal differentiation and little means of distinction between physical spaces.

Indicator 1: Trade workshops: (Ci++)

Although five main trades are taught at the trade school, namely cabinet making, wood machining, upholstery, polishing and spray painting, there is a strict spatial demarcation between trades. Each trade's apprentices are taught separately in their own workshop and by a specialised master-trainer. As the wood store, as well as some of the saws and sanding machines, are located in the wood machining workshop, cabinet making apprentices have to enter this workshop when they select wood or use these machines. However, this should not be interpreted as a weak classification of space. This arrangement only exists because the trade school cannot afford to duplicate expensive machines and wood supplies. When cabinet making apprentices enter the wood-machining workshop there is no overt communication with the apprentices or master-trainer in wood machining.

Indicator 2: Inside and outside the workshop: (C^{i++})

The trade school day is clearly marked out in terms of time and this demarcation has a determining effect on the use of physical space. The day starts promptly at 8h00 and ends at exactly 16h00. There are two fifteen-minute tea breaks and a thirty-minute break for lunch. Even though there is no bell or siren to announce these times, everyone obeys the rules.

Master-trainer and apprentices enter the workshop at exactly 8h00. When it is time for tea or lunch apprentices are not allowed to stay in the workshop, as eating, drinking and smoking

are not allowed in the workshop. They have to move outside into the courtyard or to the common room, which they share with other apprentices attending classes.

All apprentices have to participate in the task of cleaning the workshop at the end of each day. At 15h45 they have to stop what they are doing to sweep away the shavings, clean the bins, and tidy up around their workbenches. They also use the air pipe to blow the fine wood dust from their clothes and hair. This is different to factory practices where factory hands are employed to do the cleaning up. Housekeeping rules and time demarcations thus further specialise the workshop as a space where apprentices have to take full responsibility for both the equipment and for their own workbenches.

Apprentices are also not allowed to leave the premises of the trade school without permission. These are the same conditions as found in the factories visited. The trade school thus specialises space in a manner that reproduces the working conditions of factories.

Indicator 3: Between different sections of the trade school: (C^{i++})

The trade test centre, which is situated on the premises, is out of bounds to all but the apprentices undertaking their stage test or trade test. The test centre has three separate cubicles or work stations and no communication between the assessor and those taking the test is allowed. Apprentices being tested are required to wear read jackets to distinguish them from other apprentices when they enter the workshop to use one of the larger machines. (This does not always happen.)

Classrooms where theory and drawings are taught are separate from the workshops and whilst classrooms are well equipped with blackboard, overhead projectors and tables arranged in a horseshoe formation, these facilities are not used extensively or to maximum effect. It is clearly not a space where the master-trainers or the apprentices feel comfortable. It is the workshop that is the main focus of activity.

Indicator 4: Between apprentices: (C^{i++})

There is a very strong specialisation of space in the workshop. Individual workbenches mark out the space occupied by each apprentice. Apprentices always work individually and there is little if any communal practice. They draw hand tools from the storeroom, which is situated in a corner of the room and they keep these tools on their workbenches for the duration of

their stay. When apprentices move outside their own work spaces it is to work at one of the machines set up at one end of the room, or to move to the next workshop to use one of the machines located there.

Although apprentices choose their own workbenches, an intervention by the master-trainer to separate two apprentices from the same workplace was noted on one occasion (in the teaching block for stage 5 apprentices, 6 to 23 September, 1999). When I asked about this the master-trainer explained that he does not encourage apprentices from the same factory to work too closely together as this can lead to a reinforcement of their factory practices. They should work individually and 'think for themselves'.

A similar situation was observed in a drawing class where five apprentice cabinet makers and seven apprentice wood machinists attended the same drawing module (Observation 17 to 20 July 2000). Cabinet making and wood machining apprentices were clearly differentiated in terms of the desks they occupied and the complexity of the drawings they were asked to complete. It was explained that putting them in the same class was an arrangement that suited the time tabling at that time and not an explicit feature of the curriculum.

Even at an informal level the cabinet making apprentices distinguish between their workshop space and the workshop space of the wood-machining apprentices. Though apprentices share the same common room, the cabinet making apprentices think of themselves as people who keep the space clean, while the wood machining apprentices make a mess.

Extract from Field Notes: (6)

'They don't throw their paper cups into the bin or keep the common room clean.'
(Comment made by cabinet making apprentice.)

'Those guys are very careless' (referring to the wood machinist apprentices in the adjoining workshop). 'You often see tools lying around in the machine shop.' The apprentices laugh and nod their heads. (Comment made by cabinet making master-trainer (MT1). (Field Notes, 14/08/2000)

Indicator 5: Between master-trainer and apprentices: (C^{+-}) and (C^{++})

In the workshop there is no noticeable distinction between teacher spaces and student spaces. There is no blackboard or desk or any space specially demarcated for the master-trainer. While the classification between teacher and students may thus be described as very weak, it

should be noted that there is no contrasting practice of strong separation between teacher and students that could signal an alternative spatial arrangement in a workshop situation. Weak classification (C^{i-}) between teacher and learner spaces is a 'given' in terms of workshop instruction.

There is, however a very strong boundary between master-trainer and apprentice spaces outside the workshop. The master-trainers and the other instructors have their own common room and they do not mix with apprentices during lunch or tea breaks. This classification, which is linked to the rules of hierarchy discussed in chapter 6, can be coded as (C^{i++}).

Summary: There is very strong **(C^{i++})** boundary maintenance in relation to all spatial indicators. The exception is the demarcation of space between master and apprentices in the workshop, where the classification is **C^{i-}**.

Internal classification of the degree of boundary maintenance in relation to discourse (curriculum)

Table 9: Classification (internal) of curriculum boundaries

C^{i++}	C^{i+}	C^{i-}	C^{i--}
High degree of specialisation. Strong internal curriculum boundaries, which are never transgressed.	Although there is a high degree of specialisation, internal curriculum boundaries are occasionally transgressed.	Significant degree of overlap or intersection of internal curriculum boundaries within a system of formally separate curriculum spaces.	Minimal differentiation and little means of distinction between internal curriculum boundaries.

Indicator 6: Between the curriculum for each trade: (C^{i++})

Apart from common introductory modules, the curricular content of one trade is never referenced in relation to another trade. Even where apprentices acquire more than one trade, they are not allowed to transgress the boundaries between trades. In the factory these boundaries may not be strictly observed, but in the trade school the demarcation is strict.

Extract from Field Notes: (7)

Apprentice A (AA) wants to drill holes with the boring machine but the artisan –trainer (MT1) tells him that a boring machine is not allowed in the cabinet making trade. AA (who is already a qualified wood machinist) wants to know why he can't use the machine, seeing that he has already learned how to use it. MT1 replies: 'Because here you're a cabinet maker, not a wood machinist' (Field Notes, 08/09/99).

Indicator 7: Between school woodwork and cabinet making: (Ci+)

Many apprentices take woodwork as a subject at school. Although one would expect continuity between school woodwork and cabinet making, the master-trainer maintains a strong boundary between the two. This does not mean to imply that school woodwork is not useful preparation for apprentice cabinet makers, but rather that the master-trainer wants to inculcate a sense of craft that is not transmitted though the way woodwork is taught in schools. The relation has therefore been coded as C^{i+}.

Transcript extract 8: From interview with apprentice C (identified as AC)

JG: 'So what did you do in matric woodwork?'

AC: 'Well, we work right through the year. Say from April month you start with your model and before that you do a lot of drawings, in between and also at home – a lot of drawings. Something like 40 drawings for the year. I had to do that from books and you just start making your model up. Like we were never allowed to copy[27]... only the hand tools, all the hand tools we can use. I made a small display cabinet ... 700 high by 400 wide. Both panels were glass.'

JG: 'Do you work on that for the whole year?'

AC: 'Yes, we do that for the whole year. From the legs, you do everything ... by hand. Only use the bandsaw.'

Despite the emphasis on drawings in matric woodwork many apprentices struggle with drawings when they come to the trade school

Extract from field notes: (8)

JG 'Why is it that they all seem to have problems with drawings? They do it in school, I've heard. Is it because they do not do it at the factory?'

[27] The term 'copy' here refers to the use of tracing paper to copy a drawing out of a book.

MT1: 'No, its because the guy did not teach them properly in there. They come here with drawings without even proper sizes on it. He's a school teacher, not a cabinet maker. He tells them to make the top rail 80. The standard size is 76 so he should tell them to make it 72' (shakes his head in disgust) (Field Notes, 16/09/99).

On another occasion a stage 3-group moves from the drawing class to the workshop to start their practical work. The master-trainer (MT1) is visibly dissatisfied when he looks at their drawings. He says the measurements are 'silly', so he reconstructs the same drawing on the blackboard but puts in different measurements. The apprentices are told to work with the new drawing (Field Notes, 17/08/2000).

While the usefulness of school woodwork in teaching the basics of tool usage, joints and the construction of drawings is acknowledged, a sense of proportion in relation to the standard sizes of wood seems to be the missing element. Woodwork pupils learn correct procedures. When doing isometric drawings the emphasis is on accurate reproduction of the examples in the book, with hard lines, soft lines and dotted lines correctly shown. In cabinet making the emphasis is on the best and most economic use of wood, with decisions about the proportions of an item of furniture based on the scope provided by standard sizes to which wood is pre-cut. Getting the proportions right is an integral part of constructing a drawing. This is what is not conveyed in school woodwork, hence the strong opposition to teaching drawings the way it is taught in school woodwork.

Indicator 8: Relation between 'theory' and practice: (Ci--)

The distinction between theory and practice in the trade school curriculum is something of an anomaly, which requires some explanation. In the further details provided about the case study, in chapter 3, it was mentioned that the training modules, developed in terms of a competency-based modular training (CBMT) system, were deemed to include the theory that apprentices needed. Apprentices were required to spend time in the classroom at the commencement of each new stage of training.

Although the CBMT system was symbolically rather than formally in place at the time of the field work, what was called 'theory classes' were a part of the curriculum. A scrutiny of one of the modules in the Artisan Training Schedule of the Furniture Industry Training Board shows, however, that the term 'theory' is used for what has to be spoken or written, rather

than done in a practical way. In the extract from one of the training modules that is reproduced below, the dividing line between theory and practice occurs between objectives three and four.

Table 10: Extract from a training module (Cabinet making , Stage 3).

Furniture Industry Training Board: Artisan Training Schedule: Modern Carcass Construction
At the end of this module the delegate will be able to: 1. Differentiate between various frame/carcass component parts with the correct nomenclature. 2. Identify the differing construction techniques for various furniture types. 3. Identify the advantages of various modern assembly techniques. 4. Construct a framed carcass using correct traditional techniques. 5. Produce and assemble a carcass with knock down fitting using jigs and templates.

The example shows that what is called 'theory' in the cabinet making curriculum should not be interpreted in the way in which the term is usually understood. It refers to correct use of terminology, the naming of different techniques and a grasp of the advantages and disadvantages of each technique.

For the master-trainer this kind of procedural knowledge is something that you learn in practice and not 'from a book'. Learning guides are distributed at the beginning of each classroom session, but they are not used. (In the next chapter it will be shown how local practices provide the content of such 'theory' components.)

The relation between theory and practice as found in trade school practices in the furniture industry can thus be characterised as very weak (C^{i-}).

Indicator 9: Relation between modules: (Ci--)

Although the modules, that make up each of the stages of the cabinet making curriculum, were specified separately earlier in the chapter, this is not how they are presented in the workshop. No distinction is drawn between modules. The logic and sequence of the CBMT system are ignored and replaced by a set item (or project) on which each apprentice works individually, using the different procedures as required by the logic of the work to be done, rather than in the sequence prescribed by the CBMT manual. The master-trainer demonstrates

procedures to individual apprentices when they get to certain points in the construction of the item. Only very rarely will he call them together to demonstrate a point of common interest.

Once I became aware of this I tried to match what apprentices were doing to the different modules. At the end of a stage they had indeed covered every module specified for that stage, but without reference to the learning guides provided and without any indication by the master-trainer that they had moved from one module to the next. The relation between modules in any of the five stages of the cabinet making curriculum must therefore be coded as very weak (C^{i--}).

Indicator 10: Distribution of tasks and activities: (Ci--)

The distribution of tasks and activities that apprentices undertake in the workshop are very weakly classified. They are never required to all do the same task. They simply start working every morning, with no instruction or direction given by the master-trainer about what they should do. There is never a 'best way' that everyone should follow. I often noted that they would carry out the same operation in different ways, using, for instance, different saws and different hand tools.

In the drawing class a similar situation prevailed. Although they were given the same set of drawings, there was no instruction about which one they should do first or how they should proceed. Some started with the first drawing, but others started on different pages.

Summary: Variations occur in the classification of internal curriculum boundaries. Boundaries that demarcate the trade curriculum in cabinet making and separate it from the curriculum of other trades, or from school woodwork, are strong or very strong (**C^{I+} or C^{I++}**). Demarcations internal to the cabinet making curriculum itself are very weak (**C^{I--}**).

Summary and discussion of the classification values of craft pedagogy

A summary of the different external and internal classificatory values of the specialised context of the trade school is presented below, with a discussion following each table.

Table 11: External classificatory values

Type	Modality	Description
Work organisation	C^{e++}	Crafts/trades are strictly demarcated with the individual craftsperson capable of producing the full spectrum of craft realisations; performing all the operations required in production. (Extended craft-based production)
Use of materials	C^{e+}	Wood is still the only material to be used but cheaper woods, such as pine, are used for standardised lower-quality furniture.
Use of tools	C^{e++}	Restricted range of tools used to achieve regulated workmanship, according to the trade demarcation. Hand tools remain the basis of the special forms of care, dexterity and judgement belonging to any one trade.

While Bernstein asserts that the strength of the classification between education and production is 'the fundamental classificatory relation of education' (1990: 215) this clearly would not apply to technical and vocational education and training, where the fundamental classification between education and production must of necessity be weak. However, if this is the case, how then are the strong external classification values to be understood?

Strong external classification seems to serve a singular purpose, which is to provide a temporary insulation from the disconnected operations that characterise production practices in factories. Even though trade school practices would be closer in form and nature to practices in a craft factory than to those of mass-production factory, trade school practice is insulated against *all* forms of factory practice. This strong boundary ensures that the traditional craft or trade, based on the use of hand tools with wood as the primary material and the individual craftsperson capable of producing the full spectrum of craft realisations and performing all the operations required in production, is reproduced.

Table 12: Internal classificatory values

Category	Indicator	Modality	Description
Boundaries between spaces	Trade workshops	C^{I++}	High degree of specialisation. Strong boundaries between physical spaces, which are never transgressed.
	Inside and outside the workshop	C^{I++}	High degree of specialisation. Strong boundaries between physical spaces, which are never transgressed.
	Between different sections of the trade school	C^{I++}	High degree of specialisation. Strong boundaries between physical spaces, which are never transgressed.
	Between apprentices	C^{I++}	High degree of specialisation. Strong boundaries between physical spaces, which are never transgressed.
	Between master-trainer and apprentices in the workshop	C^{I--}	Minimal differentiation and little means of distinction between physical spaces.
	Between master-trainer and apprentices outside the workshop	C^{I++}	High degree of specialisation. Strong boundaries between physical spaces, which are never transgressed.
Boundaries between discourses	Between the curriculum for each trade	C^{I++}	High degree of specialisation. Strong internal curriculum boundaries, which are never transgressed.
	Between school woodwork and cabinet making	C^{I+}	Although there is a high degree of specialisation, internal curriculum boundaries are occasionally transgressed
	Between 'theory' and practice	C^{I--}	Minimal differentiation and little means of distinction between internal curriculum boundaries
	Between modules	C^{I--}	Minimal differentiation and little means of distinction between internal curriculum boundaries
	Distribution of tasks and activities	C^{I--}	Minimal differentiation and little means of distinction between internal curriculum boundaries

Internal classification is characterised by very strong values as far as it concerns the boundary between cabinet making and other trades or trade-related subjects in the school. This ensures a second form of insulation, namely against any form of knowledge that may interrupt or dilute craft knowledge as held and transmitted by the master-trainer.

A third form of insulation is provided by the non-observance of internal boundaries constructed through the codification and proceduralisation of knowledge, in the form of CBMT modules and step-by-step learner guides. The master-trainer is clearly the repository of a different kind of knowledge, but in order to pass on this knowledge he must be in close contact with the apprentices in the workshop. What is passed on to each new generation is collectively developed practical knowledge, or what Robbins calls a practical sense that is 'embedded in the agents' very bodies in the form of mental dispositions' (cited in Ainley, 1993: 14). Bourdieu would call this the social space for the development of a particular class of 'habitus', which he describes as 'a system of durable cognitive structures and of schemes of action which orient the perception of the situation and the appropriate response. The habitus is this kind of practical sense for what is to be done in a given situation – what is called in sport a "feel" for the game' (Bourdieu, 1998: 25).

The form that this kind of knowledge takes is the central puzzle of this study, but it would be speculative to attempt an explanation at this early stage. What is clear is that, in cabinet making, scientific knowledge is kept out of the formal curriculum and so is local workplace knowledge.

In the next two chapters the framing values of the instructional discourse and regulative discourses in the trade school practice are characterised to achieve the full operationalisation of Bernstein's theoretical schema. At the conclusion of the set of three chapters a full characterisation of a pedagogy that reproduces the craft or trade of cabinet making in a formal educational setting, is presented in summary form.

Chapter 5: Characterisation of craft pedagogy in cabinet making in terms of the framing of the instructional discourse

Introduction

While *classification* marks out what is legitimate in a particular context, *framing* refers to the specialisation of communication within that context, through a set of rules that regulate what counts as appropriate communicative practice within that context (Bernstein, 1996: 106-107). Framing is also described as referring to 'the controls on what is made available, how it is made available, when it is made available and the social relationships' (1975: 176). In the next two chapters the framing values of trade school pedagogy are described and analysed. The aim is to depict the framing relations that characterise an essentially tacit pedagogic discourse, which changes at a certain point to produce an 'embedded pedagogy' (Bernstein, 1990:84), that has a combination of internal competence and explicit performance as transmission-acquisition outcome. What is depicted is an *artisanal or working-class pedagogy*. The instructor or 'master' is a working-class artisan whose actions show little overt evidence of what a trained teacher would call pedagogic expertise. Teaching proceeds mainly through modelling, until the point is reached where he is satisfied that apprentices have acquired the specialised consciousness required for entry into the trade of cabinet making. Then the pedagogic stance becomes far more directive and explicit.

Most of the apprentices could be called 'working-class lads' (Lundall 2002), even though this is a rather old-fashioned term these days. While the researcher was informed that women are also starting to gain entry into the trades no women were present in the classes observed. It is, however, doubtful whether the relations of patriarchy that are foundational to this form of pedagogy would have been disturbed by the presence of a few women. More significant for the purposes of analysis is that there was no contrasting group of middle-class or non-manual research subjects, as is the case in many of the empirical research studies related to Bernstein's theoretical work[28]. In my sample there was one White apprentice from a middle-class background who stood out because he was more talkative than any of the others. His

[28]The work of Holland (Bernstein, 2000: 18-20); Whitty, Rowe and Aggleton (Bernstein, 2000: 20-21) and Morais et al (Bernstein, 2000: 108), as cited by Bernstein, offers examples of empirical work in which differing social class backgrounds of research subjects played a significant role in the interpretation of the findings.

workmanship was, however, in no way significantly different from the other apprentices who were observed.

The conceptual framework set out in the previous chapter, and partially reproduced below, provides the concepts that are operationalised into sets of indicator variables to allow observations and extracts from interviews to be analysed in a systematic manner.

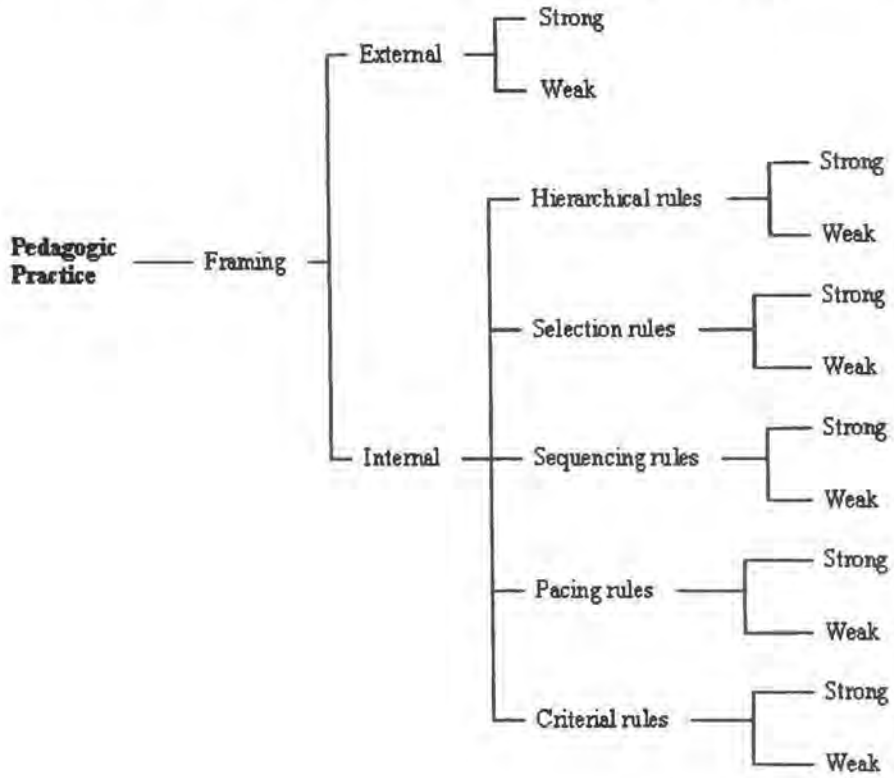

Figure 4: A diagrammatic representation of a pedagogic practice's framing relations, drawn from the work of Basil Bernstein.

While classification makes the distribution of power substantive at the level of consciousness, framing makes control substantive at the level of consciousness (Bernstein, 1975:197), with control over the relations of communication either distributed to the transmitter or to the acquirer. Bernstein distinguishes between *explicit* and *implicit* control. Where control relations are explicitly stated or controlled by the transmitter framing values will be strong. Where control relations are implicit; or, where acquirers have more apparent control, framing values will be weak.

External Framing (F^e)

All framing relations are relations of control over pedagogic communication. Framing values establish the 'legitimate message'. Bernstein asserts that there can be more than one message

for carrying any one voice. Different modalities of framing can relay the same 'voice', or specialised identity (Bernstein, 1996: 26-27).

The external value of framing (F^e) relates to 'the controls over communication outside the pedagogic context entering pedagogic communication within that context' (Bernstein, 1996: 29, 2000: 14). Where F^e is strong the transmitter regulates what features of non-school communication and practice may be realised in the pedagogic context. Where F^e is weak the acquirer has more apparent control over regulation of pedagogic communication (1990: 37). The external value of framing of a specific pedagogic context has a direct relation to the related classification values. If classification between specialised and non-specialised knowledge is weak then this may well have an effect on external framing values.[29]

In the previous chapter the specialisation of the pedagogic context of the trade school was described as reproducing the specialisation of the relationship between work and its organisation, tool usage and materials, as realised in any particular trade. Although strong external classificatory values mark out the trade school context, with site-specific production practices kept out in order to ensure that extended trade practice is reproduced, this does not mean that site-specific practices are not present. Both instructor and apprentices clearly draw on their experiences in the factory in both explicit and implicit ways to plan, interpret and execute tasks. The emphasis in terms of external framing is, however, on the extent to which site-specific or everyday experiences and practices are formally allowed to enter the curriculum and in this regard a sharp distinction can be drawn. In the next table external framing is operationalised in terms of four general modalities. These modalities are then used to analyse specific pedagogic events or instances of pedagogic communication.

[29] The relation between classification and external framing is discussed in Bernstein, 2000: 23.

Table 13: Framing (external) of control over the recruitment of everyday or site-specific practices into the formal trade school curriculum

F^{e++}	F^{e+}	F^{e-}	F^{e--}
Explicit control over the recruitment of everyday or site-specific practices into the formal trade school curriculum		**Implicit control over the recruitment of everyday or site-specific practices into the trade school curriculum**	
Transmitter never allows own or acquirers' site-specific or everyday experiences or practices to enter the formal curriculum.	Transmitter recruits own experience into the formal curriculum as a 'proxy' for general theory, but does not allow acquirers' to recruit their own site-specific or everyday experiences or practices into the formal curriculum.	Acquirers sometimes allowed to use their site-specific or everyday experiences or practices as an experiential base that informs the way in which they proceed with tasks.	Acquirers actively encouraged to use their everyday or common sense experiences or practices as an experiential base that informs the way in which they proceed with tasks.

Transmitter's recruitment of own site-specific or everyday experiences and practices

Instances of communication starting with 'I used to ...' were pervasive. Only two are described here to show how the master-trainer refers to his formal work experience in the factory as well as to informal experience as a 'proxy' for formal theoretical knowledge. Explanations are never given in terms of formal principles or procedures, but always by reference to a 'privileged repertoire' (Ensor, 2002) indicative of practical mastery. References to the master-trainer's work experience are never merely anecdotal. They are drawn from the master-trainer's particular repertoire and for apprentices they constitute what Bernstein calls a 'reservoir of strategies created by *all* the members of the group', (Bernstein, 1996: 171, original emphasis). The master-trainer can be described as the repository of the shared knowledge of the craft developed over time and across generations so that his particular repertoire is elevated to the status of reservoir. In terms of the references made in the historical overview in chapter 2, to 'theory and practice' conveyed through the master-apprenticing relationships, the 'theory' part would relate to the practical knowledge held by the master and mostly conveyed through drawings.

Extract from Field Notes (9):

Stage 5 starts with a theory class on furniture design. After referring to the trade test the master-trainer (MT1) pages through the course notes and stops on pages 3 to 4. His eye falls on alternative drawings of the top of a linen cupboard. He glances briefly at the next page where a mathematical explanation is given of the 'golden proportion' 1: 1.618 [30] and then he puts down the notes.

MT1: 'You don't do cupboards like that.' (Goes to the board and makes a drawing of a cupboard and mentions that he made this cupboard years ago. He puts in the exact measurements from memory.) 'You allow 20mm' (points to the board). 'You have to check the height, sizes etcetera. Think about the furniture that you're making and the way people use furniture. You can look at a piece of furniture and make it. You know your overall sizes – height, width and depth. You just need to know the thickness of the wood. That's why you have standard sizes – so that you always know.'

After saying that it looks professional to give the customer a drawing, he links the term 'professional' to his own experience.

MT1: 'I used to do a lot of work at home. I used to tell them exactly how to do it. I used to run night classes. Doctors, lawyers and their sons used to come' (Field Notes, 06/09/99).

In this instance a formal mathematical explanation is replaced by an explanation which draws on the master-trainer's own experience. A term that may be unfamiliar to them is also given meaning by reference to his own experience. His experience stands in the place of formal theory and formal explanation, which is beyond his reach.

Extract from Field Notes (10):

On the second last day of stage 5 all the apprentices except one has finished their set piece. (The person who has not finished is not an indentured apprentice. His trade is spray painting, but he has paid for himself to come on stage 5. He wants to undertake the trade test in cabinet making as it will help him to obtain the required points score for emigration to New Zealand. His work is clearly not of the same standard as the work of the apprentices.)

There is far more conversation than usual. The topic of conversation is the piece they will have to make for the trade test. MT1 will not be drawn into the discussion. He makes a drawing on a piece of cardboard to show them a shaped chair leg that he once had to make in the factory. Later he fetches some old jigs and rails. He demonstrates and draws to explain the intricacy of the work they used to do. An apprentice remarks: 'When you think about it, we're spoilt. We use machines all the time' (Field Notes, 15/09/99).

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[30] These pages are appended as Appendix F.

In this instance generalisation is sought and achieved by drawing on a particular past, which represents the craft in traditional terms.

Acquirers' recruitment of site-specific or everyday experiences and practices

Acquirers' recruitment of their own site-specific or everyday experiences and practices are dealt with in various ways.

Extract from Field Notes (11):

[The apprentice is identified as AA: JG.] Stage 5 apprentices are working on their projects, which is the construction of a table with a drawer on one side. The assessor walks through the workshop and stops at a workbench. He watches a while.

Assessor: 'How do you know it's right if you haven't measured it?'

AA: 'I know. I trust my judgement.'

Assessor: 'You can't trust anything. You must measure.'

AA: 'You don't see what I'm saying. The final size must be 30mm. So I cut it to 30mm.'

Assessor: 'Yes, but you must still sand. You may lose a mm and then it will only be 29 mm. So how do you get it to 30 exactly?'

AA: 'Yes, but then it gets sprayed so that adds one mm. In the end it will be 30mm.'

The master-trainer (MT1) has moved closer and has been listening to this interchange. After the assessor has moved away he addresses the apprentice:

MT1: 'That's what you do at work. Not here.'

Later he explains to me.

MT1: 'G ... [the apprentice identified as AA: JG] is talking about the finished product, but N ... [the assessor: JG] is talking about workmanship. That's what counts here' (Field Notes, 07/09/99).

Extract from Field Notes (12):

In a 'theory' session at the start of the Stage 3 block the master-trainer (MT1) talks about how apprentices should conduct themselves in the factory.

MT1: 'The bosses want you to start thinking and making plans. You must think; you must show that there are many ways of doing things.'

Apprentice: 'Wie se tyd is dit? As jy laat is betaal hulle jou nie. So wie se tyd is dit? Dis mos myne, Nou hoekom maak die lanie asof dit sy tyd is?'
['Whose time is it? If you are late they do not pay you. So whose time is it? It is mine. So why does the 'lanie' [a local term used pejoratively to signal privilege: JG] make as if it's his time?'

MT1 (ignoring this intervention): 'I won't go into a dirty toilet. It must be clean. If it's dirty I clean it. I painted my cabinet shop myself. You must do yellow lines. Always keep your passages clear. No air pipes or electric cords should run across the passage' (Field Notes, 14/08/2000).

Extract from Field Notes (13):

An apprentice from one of the craft factories uses the biscuit machine in the wood-machining workshop to make a biscuit joint instead of making a mortise and tenon. Even I know a cabinet-maker is not allowed to use a biscuit machine. When I ask him about it he says that this is the way they do it in the factory. It's a perfectly good joint and he doesn't see why he cannot use it. I know that MT1 has noticed this but he says nothing. Later I ask him about this.

MT1: 'Yes, let him use it. He's so smart; he thinks he knows everything. In his trade test he won't think and he'll do the same thing. See what the assessor does with that. Then he'll learn.'

When I ask why he wants this apprentice to learn the hard way he says it is because the apprentice works in a craft factory where they work flexi-time. According to MT1 they are allowed too much freedom and they think they are better than the other apprentices (Field Notes, 13/09/99).

The combination of instances presented above indicates a $\mathbf{F^{e+}}$ value for external framing. The master-trainer's experiences are privileged and frequently recruited as a proxy for the theoretical component of the trade school curriculum, or as a way of generalising beyond what is specified in a learning module, or as a way of conveying rules of conduct. He uses drawings and anecdotes in place of formal teaching notes and never refers to the structured outlines of each module, or to the 'delegate's workbook' handed out to apprentices. It is as if the curriculum is in his head and not on paper.

When apprentices explicitly refer to their own factory practices or every-day life experiences this is ruled out of bounds or simply ignored. Where factory practice is allowed in (as in extract 12), it serves a specific regulative purpose and it is the exception rather than the rule.

Despite coding the external framing value as strong, it would be a misrepresentation to suggest that strong transmitter control over non-trade school communication prevents non-trade school knowledge and experience from entering the curriculum. Apprentices never take notes in theory or drawing sessions. When a drawing is made on the board they make no effort to reproduce it, or to write down any of the terminology mentioned[31]. They sit quietly and they watch. They never ask questions and seldom offer a comment, although it is clear that they are concentrating. In an interview an apprentice explained the process. 'I always compare furniture that I see to the furniture we make' (Interview with AE, 21/10/99).

Using their own factory practices as the standard against which they compare all other practices is the form of site-specific cultural specialisation that the trade school curriculum wants to counter or interrupt. Becoming a member of the trade requires a shift to a differently specialised cultural identity, which has regulated workmanship as the essential criterion of evaluation. The trade test is the ultimate display of the regulated workmanship that marks trade membership. It is often just before the trade test that the effect of this socialisation process becomes visible and explicit.

Extract from Field Notes (14):

A stage 5-apprentice [identified as AA: JG] has his trade test scheduled for the week after the completion of Stage 5. He is at the end of his apprenticeship contract and needs to complete the trade test within the stipulated time. MT1 tells him to practise his 'legs'. He works on the radial arm saw next door and comes back in a state of excitement, showing off his neat cut outs. I ask him later what was so good about what he had done and whether he did anything differently to the first time. (MT1 joins the conversation half way.)

AA: 'The first time I used a handsaw and the band saw. I was going for speed. It's faster that way and I was worried about the time for the trade test. This time round I used a jig and cut on the radial arm saw. It's slower but more accurate.'

MT1 (drily): 'He was being stubborn. He did not want to make a jig.'

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[31] The only exception occurred in a Stage 4 drawing class. The apprentice sitting at the desk next to mine glanced over and saw that I was diligently copying everything off the board. He found a piece of scrap paper and started doing likewise, that is, until the instructor started cleaning the one board. Then he stopped and did not try again (Field Notes, 09/09/99). This apprentice was one of the two African Black cabinet making apprentices in the five groups observed.

AA (looks directly at MT1): 'Yes that's right. I was being stubborn. I was going for speed, but this way is better. Accuracy is more important than speed.'

This is the first time that I have heard any apprentice acknowledging publicly that what he has learned at the trade school is better than his own work practice. They are usually reluctant to let go of their own workplace practices (Field Notes, 15/09/99).

Internal Framing (F^i): Discursive rules

In this section the instructional rules of selection, sequencing and pacing are analysed, followed by an analysis of the rules that regulate the transmission of evaluation criteria. Selection, sequencing and pacing take on different modalities during the course of transmission-acquisition, changing from being weakly framed to being strongly framed at a certain point in the process. A different relationship between strong and weak framing is found in relation to evaluation criteria.

Selection, sequencing and pacing

The close relation between these three curricular activities is a marked feature of practical workshop activity and it would be artificial to separate them. As it is selection of the sequencing of tasks rather than a selection of tasks themselves that is discernible in trade school practice, selection and sequencing are operationalised in one set of variables. Time or speed is important in production practices. It is also a controversial issue in curriculum terms. Pacing is thus operationalised separately.

A basic distinction between explicit or implicit control marks out strong and weak framing values. Each sub-category is broken down into two modalities to create a four-point grading scale. The operational categories are presented and then the initial weak framing over selection and sequencing, as well as over pacing is discussed. The shift to strong framing is discussed in relation to the combination of selection, sequencing and pacing.

Table 14: Framing (internal) of control over selection and sequencing

F^{i++}	F^{i+}	F^{i-}	F^{i--}
Explicit control over selection and sequencing		**Implicit control over selection and sequencing**	
Transmitter selects and sequences tasks and activities and explains or gives reasons for the basis of selection and sequencing.	Transmitter selects and sequences tasks and activities, without necessarily explaining the basis of selection and sequencing.	Acquirers are allowed to select and sequence tasks and activities, as long as they can explain what they are doing and why.	Acquirers are allowed to select tasks and the sequence in which they want to do tasks, without having to give an account of the basis of decisions.

Selection and sequencing in the initial stages (F^{i--})

The nature of trade practices places a number of restrictions on selection and sequencing. Task conception logically precedes task execution and the sequence of activity, described in chapter 4, shows that there is a sequential logic that governs the manufacturing process. This does not mean that a disruption of this sequence of production for purposes of pedagogic transmission does not take place. Goody (1989: 247) referring to apprenticeship practices within a simple domestic division of labour, mentions for instance, how in textile production weaving is one of the simplest tasks, yet comes at the end of the process. The ordering of the tasks allocated to the apprentice seldom corresponds to the sequence involved in the conversion of raw material into finished product. Tasks are scaffolded in a simple to complex sequence that fits the age and experience of the apprentice, as well as the general organisation of the household.

In cabinet making hand sanding comes at the end of the process, yet, in the factory, it is always the task allocated to apprentices first. They start at the end of the production process as it allows them to get to know both the workshop and to develop a 'feel for wood' (Interview with the owner of a craft factory, 14/02/2000; interview with apprentice AA, 08/09/99). What distinguishes the trade school from factory practice is that there is no production in process. In a factory apprentices are attached to various artisans to work and learn beside them, often allocated the more menial tasks and learning by what apprentices call 'stealing with the eyes' (Interview with apprentice AE, 21/10/99). Another apprentice described the process of learning beside a working artisan.

Transcript extract 9: From interview with apprentice D (identified as AD)

JG: ' Now if you think back to all four of those artisans, from which one did you learn the most?'

AD: 'From all of them I learned. It's up to you. I can just wait for him to tell me something or I can ask, which I normally do. I ask why does he take a particular measurement. He tells me and I make a note of it inside my head and keep it there.'

When I interviewed the master-trainer about his days as an apprentice in a factory he used the same phrase that apprentice AE used.

Transcript extract 10: From interview with master-trainer (identified as MT1)

JG: 'When one works with the tradesman, let's talk about that. What is that relationship? Does he tell you how to do it?'

MT1: ' They call that working with Nellie, or next to Nellie. Then they will teach you, show you how it is done. They don't show you, they will just do it and you've got to learn from them. Steal with the eyes.'

In the trade school each apprentice works individually on a set piece and is responsible for the whole production process. Evidence presented in chapter 4 showed that workshop practice in the trade school is an integrated activity, with no partitioning between different modules and no set sequence of task completion laid down. Even though the modules appear to follow in sequential order when they are represented in course outlines (See Appendix F for an example) they are not presented in modular format, or in any discernible order. It is rather the use of hand tools that is regarded as the basis of everything that is done. Over the five stages the set pieces increase in complexity and it is assumed that apprentices are familiar with the techniques taught in the previous stage.

Apprentices never proceed by way of isolated tasks. Everything they do is towards the production of a set piece that is similar but not identical to the item they will be required to make in the stage test. In all five stages decisions about where to start and how to proceed are left to the apprentices. They tend to rely initially on their own factory practices to guide them in their approach. As long as they do not transgress the boundaries of tool usage or breach safety rules they are left to their own devices. The master-trainer moves around continuously and sometimes they will ask, or he will give advice.

The following extracts show that initial framing over selection and sequence can be characterised as *very weak* (F^{--}).

Extract from Field Notes (15):

[At the start of Stage 4, after completion of the first week spent on drawings: JG]

The five apprentices walk into the workshop and find a workbench. They've come in with their completed chair drawings, both to scale and to size. No instructions are given and they all start doing different things. Two apprentices immediately move to the wood store to start taking out wood for their chair legs. (The one seems to be copying the other even though there is no direct communication between them.) Another apprentice stands and studies his drawing for a long time. Then he starts transferring his sizes onto his cutting list.

Before the class started I asked MT1 what they would be doing today. He said the first day is about getting the wood out, cutting to rough size, laminating and starting to put together front legs and rail, using dowels or mortise and tenon. He does not tell them this, even though it is clear that none of them, except one, has made a chair on his own before. It is as if MT1 is waiting to see what they will do. He walks around all the time, stopping here or there to check the measurements on their drawings. He queries the way in which an apprentice has drawn the front view of the leg. The apprentice just shrugs his shoulders. MT1 says: 'OK. Leave it like that. It doesn't always have to be square' (Field Notes, 11/10/99).

Extract from Field Notes (16):

[At the start of stage 5, just after the apprentices have moved from the two-hour 'theory' session in the classroom to the workshop: JG.]

It's difficult to follow what they are doing. They all seem to be doing different things and everyone has their own sequence. MT1 allows them license. When I ask him about this he says they're using the procedures, which they use in their factories. As long as they stay within the boundaries of cabinet making there's no 'one way'.

[A subsequent entry two days later: JG.]

I realise that MT1 is watching them individually. When he speaks he'll say something like: 'Glue that up now so that after lunch it will be dry. By that time you'll have finished shaping the legs and tonight you can assemble and clamp.' Sometimes I think they resent any interference but they never contradict him or argue with him. It does not look as if they really follow his advice. They seem to go on in their own way, although I notice that after he has stopped at their bench they'll start to measure more frequently.

I ask MT1 later about sequence. He says: 'No I let them fiddle around and find out ways to do things. Then I'll make them practice - doing the lay-out, cutting the legs, using the dowelling machine. Then I'll show them a few things - a few tips. On Wednesday I'll go through the sequence with them. ['Wednesday' refers to the second last day of the stage 5-block: JG.]

[A few days later: JG.] When I ask the master-trainer in upholstery whether he also uses this teaching approach he says: 'Yes, you must let them work in their own way. They must make mistakes, but not stupid mistakes.

Sometimes I watch them and I see they're going wrong – but I let them. So they waste a bit of material, but once they've found out their mistake they never make that mistake again' (Field Notes, 6 – 9/9/99 and 15/9/99).

The assessor, who used to work in the building industry's trade centre, offered an explanation of the alternative to very weak framing over selection and sequencing.

Extract from Field Notes (17):

[The assessor is identified as ASS: JG.]

ASS: 'Each apprentice should be given a different part of the job. One should do one part of the drawing and the next one should do the other. The third should start taking out the wood and planning etc. This is so that each works in is own and they can't watch or 'steal with the eyes'. Then all the parts should be brought together.'

JG: 'But then they never learn to do the whole thing, the full sequence.'

ASS: 'That may be, but they are also learning to do things properly.'

Later I ask the master-trainer what he thinks about this way of training. MT1 (after a long pause): 'He teaches to the test. I teach for skill' (Field Notes, 16/09/99).

Table 15: Framing (internal) of control over pacing

F^{i++}	F^{i+}	F^{i-}	F^{i--}
Explicit control over pacing		**Implicit control over pacing**	
Time is a crucial productivity factor. Tasks have to be achieved in pre-determined time units and pacing is strictly controlled.	Time is one of several productivity factors, with broad time limits stipulated according to which acquirers need to pace themselves.	Although time is a key productivity factor, acquirers are allowed some initial control over pacing and must work towards time limits set for each task.	Acquirers are allowed to work according to their own rhythms, with no time limits other than those they set for themselves.

Pacing in the initial stages (macro pacing, F^{i+}; micro pacing, F^{i--})

Pacing practices in the furniture trade school can be more fully understood when they are compared to similar practices in the building trade school (BIFSA). While carpentry and joinery are related to cabinet making the strict competency-based modular approach (CBMT), adopted in the building industry organises the training in a completely different way. Each module consists of a complete task for which an employer would be willing to pay. Should an

employer be involved in specialist work that requires narrower skills from the worker, the employer may specify the modules in which training is required. In order to complete a module the trainee has to meet pre-determined criteria of accuracy and speed. A computerised clock-card system times trainees on each operation until they meet the standard time set by the training performance criteria (TPC). Thereafter the trainee practices the skill on site and then returns to the training centre to be tested against the times stipulated in the production performance criteria (PPC), where the time allowance is much lower than in the TPC. Should trainees perform very well during the TPC test they are immediately credited with the PPC time and they may move on to the next module (BIFSA Skills Training Courses, 1995:2). Every moment of the training day is recorded on the computer. Every time trainees move to a new machine or leave a machine they swipe their card through the system. For each module there is an average mastery time stipulated and the actual mastery time of the individual trainee is recorded against this. At the end of each day a listing is printed which shows the various activities, including lunch and toilet breaks, for each trainee. Employers thus know exactly how training time has been spent (Interview with BIFSA staff, 09/12/99).

Compared to this very strong framing at the level of micro pacing the cabinet making trade school's practices are initially **very weakly framed (F^{i-}) at the level of micro pacing**, although **strongly framed F^{i+} at the level of macro pacing**. As mentioned in the previous chapter, every training day starts exactly at 8h00 and ends at 16h00, punctuated by two fifteen-minute tea breaks and a thirty-minute lunch break. There is no clock or bell that indicates these break times but distinctive modelling practices were observed in this regard. These broad time markers are explicitly used to indicate how work should be planned. The master-trainer will tell them to glue the pieces together so that it can dry over lunch or overnight[32]. He will also tell them to ensure that they do not get to the end of the workday and leave work that has not been glued and clamped.

Other than these macro time boundaries there is no visible time pressure on apprentices to achieve stipulated time criteria at the micro level, even though there does seem to be implicit criteria at work.

[32] See, for instance, extract (16) from Field Notes.

Extract from Field Notes (18):

I mention to MT1 that a certain apprentice had started off very slowly, but that by the end of the day he had caught up with the faster ones. MT1 says: 'Yes, I revved him. He was taking too long.' (But when did this happen? And what does 'too long' mean if no time indication is ever stated? I think it is rather a case of this apprentice pacing himself in relation to the others) (Field Notes, 09/09/99).

The utilisation of time inside the external boundaries may be under the apparent implicit control of the apprentices, but it is nevertheless an important comparative indicator that distinguishes between different apprentices. When I ask the master-trainer whom of the Stage 5-apprentices he would rate strongly he gives a rating in terms of pacing[33].

Extract from Field Notes (19):

[The numbers used to identify different apprentices are completely random: JG]

'K is very slow. He doesn't know what to do.'

'L has good ideas of how to speed up production, but he's crashed.'

'M also has good ideas, but he used to be very slow. He failed his Stage 4 test the first time, but now he's working faster.'

'N worked at home in his workshop. I don't know what he's done. He may only have been making little boxes' (Field Notes, 13/09/99).

Apprentices themselves were sometimes critical of the pacing practices. What an apprentice had to say about pacing when he was interviewed after completion of his trade test is pertinent here, even though the trade test itself is only discussed in chapter 7.

Transcript extract 11: From interview with apprentice A (identified as AA)

[I question AA about the adequacy of preparation for the trade test: JG]

AA: 'The training was adequate, but there was no pressure on you in that stage of training, whereas in your exam the main pressure is time. So in that sense, no, it was not adequate.'

JG: 'What would you have recommended?'

AA: 'I would have recommended, the table we were given, let's say we started training on a Monday and on Wednesday you must be finished. And then you go again and now that you've got that right it shouldn't take more than a day to finish it. So tomorrow you must have your table finished because now you know where you went wrong. You went wrong there, you did this wrong and so by tomorrow you must finish and if you're not finished you want to know why. What took you too long? You've got

[33] The evaluative dimension of pacing is discussed further in the next section.

two weeks. So in one of those weeks you can go and be rushed and if it doesn't work the first time, the second time around you want to make it again. The second week you have enough time to do it again. But because there's no rush everybody thinks: "Well. I've got two weeks to do this, why rush?" So you're not under any pressure. There is really no time pressure so it doesn't take you any slower or quicker to do what you are doing.'

The apprentice's criticism is also framed in terms of longer time spaces. He is not asking for regulation of the minutiae of pacing to be revealed (as in the building industry). He recognises what is required but he wants more guidance in terms of realisation of self-pacing. Despite these criticisms the very weak framing over micro pacing is maintained throughout each stage. Slower apprentices seem to pace themselves against the faster ones, but this is never discussed. It is, however, clear that they watch the faster ones and try to speed up when they fall too far behind.

Shift to strong framing over selection, sequencing and pacing (F^{i+})

An explicit shift to strong framing over selection, sequencing and pacing occurs towards the end of apprenticeship stages and can be characterised as follows:

Extract from Field Notes (20):

The Stage 4 group is strong and they are keen to learn. After finishing their set piece (which is the design and production of a table) the master-trainer does something unusual. In the second week of the stage he walks in with a set of designs under his arm. He has kept these designs from his days in the factory. Each design is a different chair and they vary between modern and reproduction furniture. The designs are written on board and are covered with plastic. He selects a design for each apprentice. They have no choice and they do not comment on the design allocated to them, but it is obvious that they are excited. Only one has made chairs in his factory, but he is not the one who gets the most difficult piece. That goes to an apprentice from a mass-production factory, who has worked quietly but with great enthusiasm (Field Notes, 18/10/99).

It is especially in stage 5, i.e. as apprentices move towards the final evaluation, that communication about sequencing and pacing become explicit.

Extract from Field Notes (21):

By today, the second last day of the eight-day stage 5-block, all the apprentices, even the slower ones, have finished their set pieces. The only one who has not finished is the spray-painter [mentioned in Field Note (13): JG]. MT1 is suddenly much more directive. He selects different operations for different apprentices to practice and tells them to time themselves. Some are told to practice their lay out; others are instructed to laminate more wood and to practice the tapering of the table legs; or to redo their cutting lists.

I don't know how to describe it but this morning there is a new energy in the room. They are suddenly working faster and also choosing their own bits to practice. Everyone is much more talkative. It is as if, now that they have finished, they can admit their mistakes and talk about different ways of doing things. The trade test is the main topic of discussion and they ask MT1 about it. He says: 'You must think about time. Read your instructions. Plan your time.' For the first time I see him looking at a piece of paper, which he takes out of his pocket. He calls them together (also for the first time in the stage 5 block) and spells out the sequence and timing of the trade test. This is exactly what he had on the piece of paper:

Table 16: Explicit sequencing and pacing criteria as communicated just before the trade test

1st day:
Read everything before doing anything (10 mins)
Day 1:
Cut top to size
Do lay-out
Do cutting list
} 2 hours

Cut and plane timber

Cut and shape legs
Sand legs and rails
Cramp centre frame
Check for square

2nd day:
Dovetail and mortise legs
Shape rails

Cut templates

Sand before assembling [written in thick black letters: JG]

Check for square
Make drawer

3rd day:
Fit drawer
Shape top
Fit hinges
Sand and finish

Later I ask him why he wrote it all down. He says that he was scared he would leave out something. He just knows it and it is hard to think about it in order.

MT1 makes AG (the slowest apprentice) practice his lay out 3 times.

I stand beside AB [another apprentice: JG] when he also starts his lay out for the third time. I ask him to talk aloud so that I can follow what he is doing. This time he completes it in 20 minutes (after taking off 4 minutes for 'talking time'). This is very different to what I've been watching for the last 2 weeks. I ask why he's not working from the drawing and he says it is in his head – he knows the measurements by now. MT1 walks past

and smiles. He tells me later that this is where they often go wrong. They think they know the measurements and they do not read. I ask whether this is why he underlined the bit about reading on the piece of paper. He smiles slightly and walks away (Field Notes, 15/09/99).

The point at which selection, sequencing and pacing rules are made explicit is when there is an indication that mastery has been attained (after completion of the final set piece and just before the end of the fifth stage). This does not mean however, that apprentices have, at this stage, acquired both the recognition and realisation rules. The trade test is the ultimate indication of achievement. In a discussion with the assessor about the trade test he compared an apprentice who had passed the test to the apprentice who was doing his trade test at that time.

Extract from Field Notes (22):

[The assessor is identified as ASS: JG.]

ASS: 'L ....[identified as AA in the transcripts and field notes: JG.] kept everything he had learned together in his head. He came in here [referring to the trade test centre: JG] and did it just like that. This one's confused' [referring to an apprentice identified as AG: JG] (Field Notes, 19/10/99).

I interviewed both these apprentices about their experience of the trade test test. The one who passed well confirmed what the assessor had said about him.

Transcript extract 12: From interview with apprentice A (identified as AA)

[This interview took place about two weeks after his trade test. This apprentice did not have woodwork as a school subject, but he was the one apprentice who came from a middle class background: JG.]

JG: 'Tell me about the trade test?'

AA: 'Yes, well I worried about time. That was the biggest worry I had. Out of time. I forgot to do things in my drawing because I was rushed. But it is ... I don't know how to put it. The time obviously is a major factor in the whole test, but I don't think you have to rush. You've just got to like stop. A lot of people will stop and do something twice or take their time, really take their time on one thing. It's just a case of not rushing. I wasn't rushed but I wasn't taking my time. I think I was lucky where I started.'

JG: 'You weren't rushed but you weren't taking your time either.'

AA: 'Ja, basically.'

JG: 'What was in your head? What were the kind of instructions you were saying to yourself? Do this, don't do this?'

AA: 'I actually had a whole thing written. I did it over the weekend. I made a list of the basic things. I just had an order in which I was going to do things. Day one, get my drawing done obviously. The first thing was to get the top, the centre part cut to size. Use the drawing. And then I wanted to have all my work planed out to finished size. I just had to sweat. Then I got my carcass together, not the whole carcass just the frame. And I made sure that everything was square and that was literally where I wanted to be on day one. But I managed to get my legs tapered and my template made for cutting those angles. I managed to get that done on day one so I was a little bit ahead. My drawing actually took me a lot quicker than I thought. I think that's why. Then on day two I was going to finish my legs, totally finish them.'

JG 'What joints did you have to make?'

AA '..... and then I wanted to have my whole side made up, okay, and my whole carcass together, except obviously for the rails. And that was at the end of day two and I wanted to have my drawers put together, not made up, just put together. I hadn't done my drawers. At the end of day two I had only got to that section. I got a little behind in day two, so although I had made up in day one, I had put a lot of stuff forward in day two. Day three I had set up for fitting the drawer, putting the hinges on and everything. That's all I had down for day three. Sanding was important for looking good. So I knew I had time the next day to do my drawer. So I started sanding while that was drying and I fitted my drawer.'

JG: 'And when were you finished?'

AA: 'I finished about quarter to four on the last day.'

JG: 'And four o'clock was the deadline?'

AA: 'Yes, I cleaned up for the last few minutes. If I had another half an hour I would probably have sanded for another fifteen minutes. So I would have used the time.'

JG: 'Perfect almost?'

AA: 'Yes, literally. Another thing I disagree with is the fact that on day two I had to sweep all the floors, because that's wasted time. It was full on cleaning every day. He still wanted to stop at about twenty to. I carried on for a bit longer. I just thought I could have cleaned up in five minutes on the last day. Cleaned up and make it all fine. I'm not complaining now.'

It is pertinent that the interviewee ignored interjections by the interviewer. It was as if it would interrupt a rhythm in his head, which he did not want to break. The contrast between his experience and that of an apprentice who failed the trade test, is marked.

Transcript extract 13: From conversation with apprentice G (identified as AG)

[This conversation took place at lunchtime on the second day of his trade test: JG.]

AG: 'You see you get past the guys [inaudible]... more slower ... when you are on your nerves you will get nothing right here. You must be cool and calm.'

JG: 'So are you on your nerves?'

AG: 'Who?'

JG: 'You.'

AG: 'Not my nerves. I'm just overdoing it, you know. When you overdo it too much, you must keep calm.'

JG: 'But you say you have already lost time.'

AG: 'I'm supposed to clamp it. Tomorrow I have just to put my drawers in. I didn't even do my ... [inaudible]. I can't make it man. I can't make it. That's the story.'

Both apprentices possess the recognition rule and have a sense that an internal time rhythm is required that allows steadily paced work within the set time limits. The successful candidate realised this rhythm ('I wasn't rushed but I wasn't taking my time'). The second one knew that he was 'overdoing it' but he could not order his activities and pace himself in accordance with the allotted time period. (He continued into the third day but failed his trade test.)

It should not be underestimated how hard it is for apprentices (such as AG above), who come from mass-production factories, to plan their time according to their own rhythms. They are used to working in sequential time, where they do not, for instance, have to think ahead as well as backwards about what is to be done while a component is clamped and glued and they are waiting for it to dry. The rhythms of their work are externally regulated, by the conveyor belt, or by the time it takes to make one component.

Discussion of the shift from weak to strong framing over selection, sequence and pace

The purpose of shift from F^{i-} to F^{i+} is related to the internalisation of selection, sequence and pace. The time relation represented by these framing values is not the 'metric time' of Taylorite logic, neither is it Marx's 'commodified time', nor the micro-level routinisation described in Adams Smith's depiction of a pin factory in *The Wealth of Nations.* It is the kind of time portrayed in Diderot's *Encyclopedia* in a series of plates that show a mid-eighteenth century paper mill south of Paris[34].

> The secret of this industrial order lay in its precise routines. L'Anglèe is a factory in which everything has its appointed place and everyone knows what to do. But for Diderot routine of this sort did not imply the simple, endless, mechanical repetition of a task. The school master who insists a pupil memorize fifty lines of a poem wants the poetry to be stored in the pupil's brain, recoverable at command and usable in judging other poems. In his *Paradox of Acting* Diderot sought to explain how the actor or actress gradually plumbs the depths of a part by repeating the lines again and again. And these same virtues of repetition he expected to find in industrial labor.
>
> Paper-making is not mindless; Diderot believed – again by analogy to the arts – that its routines were in constant evolution, as workers learn how to manipulate and alter each stage of the labor process. More largely, the "rhythm" of work means that by repeating a particular operation, we find how to speed up and slow down, make variations, play with materials, develop new practices – just as a musician learns to manage time in performing a piece of music. Thanks to repetition and rhythm, the worker can achieve, Diderot said, "the unity of mind and hand" in labor. (Sennett, 1998: 34)

Diderot is sketching out an ideal, but there is nevertheless a strong analogy to the trade school practices as described in this section. Routine brings rhythm as an internalised capacity. This is the competence component of craft, which can only be realised under F^{i-} conditions. By the time the framing over selection, sequence and pace is strengthened apprentices should have acquired their own rhythm in relation to the macro pacing time boundaries explicitly present in the background, as the markers around which rhythmical work revolves. If they have not done so, no amount of explicit stating of the rules of selection, sequence and pace helps them. This is demonstrated in a conversation about AG's failure of the trade test.

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[34] I am indebted to Richard Sennett (1998) for his discussion of various kinds of time. Although I have read some of Marx's writings in the original I rely on Sennett's extensive references to Diderot and Smith to illustrate the positive and negative sides of routine.

Extract from Field Notes (23):

[Conversation with instructor-trainer, MT1, after a teatime discussion in the staff room about AG's failure: JG.]

MT1: '[AG] was doing well here. He was keen to do the test. I went to see his boss and he said okay. So I scheduled him. But he must have been nervous. I told them: 'Do the top of your leg first and then you shape the leg and then you sand'. So I see him standing at the sander. [The sanding machine is in the wood machining workshop trade test centre and apprentices have to leave the trade test centre if they want to use the sander: JG.) I say to him: "What are you doing? You're wasting time. How can you be sanding you're legs before you've shaped them?" So he must have been nervous. Nobody would do a silly thing like that' (Field Notes, 27/10/99).

The master-trainer's interpretation of the failure as caused by 'being nervous' does not correlate with the apprentice's own interpretation (refer to Transcript Extract (11)). It is rather an explanation that attributes failure to the apprentice's state of anxiety and not to incompetent performance. Why this should be so is taken up in the next section that deals with the transmission of criteria of evaluation.

Evaluation criteria

In trade school practice evaluation criteria (or criterial rules) manifest at two levels. At a surface level strict and explicitly stated criteria govern the dimensions that specialise the pedagogic context: accuracy, correct use of tools and machines, as well as the correct treatment of the material (wood). These criteria are transmitted in both languaged and non-languaged ways, but modelling is by far the most dominant instructional practice. At a deep level there is, however, an invisible set of criteria that derives from an implicit or even tacit notion of 'readiness'. The presence of these deeper-level criteria is clearly signalled but never fully articulated. They are, however, under the control of the master and the fact that they are not clearly articulated has to do with the nature of the competence to which they refer.

Four indicator variables are used to analyse different ways in which criterial rules operate in trade school practice.

Table 17: Framing (internal) of control over evaluation criteria

F^{i++}	F^{i+}	F^{i-}	F^{i--}
Explicit control over evaluation criteria		**Implicit control over evaluation criteria**	
Explicit and specific criteria are transmitted in oral, written or visual form.	Although criteria are transmitted mainly through modelling their presence is clearly signalled.	Criteria are implicit or diffuse and acquirers are not always made aware that they are being evaluated	Criteria are implicit and diffuse and acquirers are not made aware that they are being evaluated.

Evaluation criteria in relation to accuracy and precision (F^{i++})

Strong emphasis is placed on accuracy and precision. The tolerances allowed are minimal and inaccurate measurement is never condoned. The following extracts depict very strong framing over criteria of accuracy and precision.

Extract from Field Notes (24):

[This incident took place on the 3rd day of the eight-day stage 5-block: JG]

An apprentice (AA) is re-doing his lay out board. MT1 looks at his measurement of the slot for the centre rail and says: 'That's too long - make it 6mm. It shouldn't be over half-way.'

AA measures and says: ' Its 8 mm.'

MT1: ' Make it 6.'

AA shrugs his shoulders and says: ' Well it's 8.' (And this after he found earlier this morning that when he assembled his table it was not square and one leg was out!)

MT1 does not insist. He just says again: 'Make it 6' and walks away' (Field Notes, 09/09/99).

Extract from Field Notes (25):

An apprentice asks the master-trainer whether he perhaps took his tape measure (MT1 was standing at his bench earlier on.)

MT1: 'That's right. Never be without your tape measure. It's everything. It tells you the whole story' (Field Notes, 16/09/99).

In this example the master-trainer is emphasising the importance of accuracy, rather than stating an actual measurement. The master-trainer does not need a tape measure to tell him that a measurement is out. He simply uses it as a way of making apprentices aware of the

need for continual, accurate measurement. As he puts it: 'The tape never lies' (Field Notes, 14/08/2000).

Transmission of explicit criteria of accuracy and precision manifests first and foremost in a requirement for continual measurement, but the ultimate test comes at the point of assembly. It is for this reason that the master-trainer need only point out inaccuracies, while not insisting on correction.

Evaluation criteria in relation to tool usage and materials (F^{i+})

'It's not the joints that count, it's how to use the tools' (Field Notes, 11/02/01).

The correct use of tools and machines is always transmitted through direct modelling. On numerous occasions I observed the instructor-trainer moving an apprentice out of the way and taking over from him to model a bodily stance or a hand movement. He does not explain what he is doing but he watches when the apprentice resumes the operation and he will intervene again if he is not satisfied. He told me that he hears from the sound of the machine whether the wood is being planed or cut correctly, or he can see from the bodily stance whether they know what they are doing. On an occasion when an apprentice snaps the band on the band saw this is not viewed as a transgression. Nobody pays any attention even though there is a loud cracking sound. I ask the master-trainer why he does not reprimand the apprentice. His reply is: 'No, he wasn't doing anything wrong. It happens. Sometimes the band has a weak join. You just twist it slightly and it snaps' (Field Notes, 27/10/99).

Evaluation criteria in relation to wood as the primary material used in cabinet making, are similarly explicit – not so much because they are transmitted explicitly, but rather because errors announce themselves unambiguously. In this regard I heard the phrase 'wood does not forgive' repeated many times. In a discussion with the assessor about the test results of a woman cabinet-maker (who failed the test) I ask the assessor what he looks for when he marks. Criteria that relate to the selection and treatment of wood are evidently as important as construction of the article itself.

Extract from Field Notes (26):

[The assessor is identified as ASS: JG.]

ASS: 'I want to see whether she is capable. She can do it, but she lacks experience. Look here:

(1) She did not select her wood correctly. Look at these dark notches on the legs.
(2) Her measurements are all out – by 2mm or more.
(3) Her two dovetail joints are not the same.
(4) The one leg is tapered on the outside – not the inside.
(5) No sanding – so there are wood splinters in two places' (Field Notes. 16/08/2000).

Another important criterion in relation to material is economy of use. In the trade test the materials to be used are strictly specified. No additional material is allowed when a candidate misuses or spoils the material that has been allocated.

Transcript extract 14: From interview with master master-trainer (identified as MT1)

[He is responding to my request to explain the trade test to me in words: JG.]

MT1: 'They get one block and they have to cut two drawer fronts out of there. Sometimes they don't know. They say it is impossible. It's not impossible because if you take this piece off here you can put it over there and you've got another two drawer fronts. So I always tell them, cut your drawer front on the second day. If you haven't got enough material, or it doesn't work out, add that piece onto there and the next morning it is dry and you can get another two drawer fronts. ... Some people think it is not important but it is. But now these youngsters they don't listen.'

While the emphasis in this extract is on 'telling' and 'listening', the point is conveyed through demonstration (even in an interview situation). In the workshop the criterion would have been conveyed in the same manner - through explicit modelling, rather than through verbal instruction. What the master-trainer considers as 'telling' is in fact a modelling action.

Evaluation criteria in relation to 'readiness' (F^{i+})

An implicit criterion related to 'readiness' functions at a deeper level. Readiness refers to an internalised spatial and temporal order that finds its outward manifestation in bodily discipline. While the existence of a criterion of readiness is constantly signalled to apprentices, the criterion itself cannot be stated in words. Harsh criticism in relation to late coming or physical injury is one of the ways in which is a judgement about readiness is conveyed.

Extract from Field Notes (27):

[This statement was made in a 'theory' class for Stage 3-apprentices: JG]

MT1: 'It doesn't matter how often you come here. I'll see when you're ready and I'll tell N... [the assessor: JG] to schedule you' (Field Notes, 14/08/2000).

Extract from Field Notes (28):

[A comment made to the researcher by the master-trainer (identified as MT1) during a discussion just after the two-week Stage 3-block. Although the stage 3-test involves the construction of a door and a drawer, drawer making is not treated as a single task. During the training session apprentices had worked on a project that required them to make a table with a drawer: JG.]

> MT1: 'The project is a very good measure. From that I can see a lot of things. I can see whether they are ready or not' (Field Notes, 14/05/01).

Extracts from Field Notes (29):

(1) 'He's on stage 5 already and he shows no sense of responsibility' [This comment was made during a telephonic conversation to a factory to report the absence of an apprentice: JG.] (Field Notes, 14/09/99)

(2) '.... (gives the name of an apprentice) still can't make it, even today when he's done his trade test. Three mornings he came late. So what does that tell you? How is he going to be a good tradesman if he's going to come late every morning to work? [Comment made during interview with master-trainer (MT1). He is referring to an apprentice who qualified a few years before, but he still remembers exactly how often he came late: JG.]

(3) 'The prize for Apprentice of the Year should have gone to ..... (gives the name of an apprentice). His work is excellent, but how can I give the prize to someone who comes late all the time? What kind of a tradesman is he going to be? [Comment made during a conversation with the master-trainer (MT1) conversation undated: JG.]

An apprentice is only scheduled for a stage test or the final trade test after the master-trainer has visited the factory to watch the apprentice at work. He also talks to the supervisor about the apprentice's general conduct (whether the apprentice is on time for work, whether s/he is off sick a lot) and the apprentice's attitude (helpful, little wastage and so on) (Field Notes, 14/05/01).

When the master-trainer's judgement of readiness is found wanting (which is how an apprentice's failure in the trade test is interpreted), it is experienced as a personal affront and it is deeply felt. In cases of candidates failing the trade test (as discussed in the above extracts) the result is personalised in a way that is far more pronounced than the disappointment of a teacher when a student does not succeed in a public examination.

Extract from Field Notes (30):

At teatime we talk about the apprentice who has just failed the trade test [identified as AG in the extracts presented: JG]. The assessor says that when someone fails it is the instructor's responsibility (glancing in MT1's direction). He is of the opinion that when an apprentice comes for the trade test the apprentice should not fail.

I can see that MT1 is getting upset but he does not say anything. After tea he walks up to me and says: 'How do you know an apprentice is going to pass or fail? Do you see it in the sky? Do you pray to God?'

I've never seen MT1 so distressed (Field Notes, 27/10/99).

Although the trade test is the ultimate demonstration of 'readiness', the crucial judgement is made at the point where the master-trainer decides that an apprentice is ready to take the final test. That is why failure of the test is interpreted as personal failure on the part of the master-trainer and why it is easier for him to say that the candidate was nervous, than to acknowledge that his judgement was wrong.

The judgement that is made about the 'readiness' of each individual apprentice is based on an inter-meshing of criteria of accuracy and precision, use of tool and materials with criteria of time (selection, sequencing and pacing) to effect an overall internally held competence. Although all these criteria could be explicated separately (and are stated explicitly in, for instance, the building industry's training methods), their inter-relation in the judgement of 'readiness' itself is what Polanyi (as discussed in chapter 7) calls an ineffable judgement. The master can only signal the presence of the evaluative rule, but he cannot state the criterion in words. He can talk about its constituent components (e.g. accuracy, sequence of tasks, not coming late) but 'readiness' itself can only be modelled and not stated in words.

Summary and discussion of framing over the instructional discourse of craft pedagogy

A summary of the external and internal values that characterise the nature of the social relationships of control over pedagogic communication in the context of the trade school is presented below, with a brief discussion following each table.

Table 18: External framing relations

Type	Modality	Description
Control over the recruitment of everyday or site-specific practices into the formal trade school curriculum	F^{e+}	Transmitter recruits own experience into the formal curriculum as a 'proxy' for general theory, but does not allow acquirers' to recruit their own site-specific or everyday experiences or practices into the formal curriculum.

The strong external framing value needs to be interpreted alongside the strong external and internal classification values in the insulation of what apprentices recognise as the 'trade school'. It is through these strong boundaries that reproduction of the reservoir of collective craft knowledge, as realised by the repertoire of the master-trainer, can be reproduced. This repertoire can only attain this privileged status when overt recognition is not given to the local everyday factory practices of apprentices, where machinery and equipment are often more advanced than what is available in the trade school. Potential conflict between apprentices about the putative superiority of some factory practices over others is simultaneously avoided. All apprentices, whether from mass production or craft factories, are treated as the same.

Table 19: Internal framing relations: instructional discourse

Category	Type	Modality	Description
Selection and sequencing rules	Control over selection and sequencing in the initial stages	F^{i-}	Acquirers are allowed to select tasks and the sequence in which they want to do tasks, without having to give an account of the basis of their decisions.
	Control over selection and sequencing rules in the later stages.	F^{i+}	Transmitter selects and sequences tasks and activities, without necessarily explaining the basis of selection and sequencing.
Pacing rules	Control over macro pacing	F^{i+}	Time is one of several productivity factors, with broad time limits stipulated according to which acquirers need to pace themselves.

	Control over micro pacing in the initial stages.	F^{i--}	Acquirers are allowed to work according to their own rhythms, with no time limits other than those they set for themselves.
	Control over micro pacing in the later stages.	F^{i+}	Time is one of several productivity factors, with broad time limits stipulated according to which acquirers need to pace themselves.
Criterial rules (evaluation criteria)	Control over criteria of accuracy and precision	F^{i++}	Explicit and specific criteria are transmitted in oral, written or visual form.
	Control over criteria of tool usage and material	F^{i+}	Although criteria are transmitted mainly through modelling their presence is clearly signalled.
	Control over criteria of 'readiness'	F^{i+}	Although criteria are transmitted mainly through modelling their presence is clearly signalled.

All the internal framing rules are ultimately strong, although some are present in the background while weak initial framing of sequence, selection and pace enables apprentices to develop an internally held sense of rhythm, in accordance with strong macro pacing that marks out the daily routine in a factory. It is only once apprentices are judged to be 'ready' for taking the final trade test that the full strength of the framing relations is revealed. The concept of 'readiness' cannot, however, be fully understood in the absence of an understanding of the regulative discourse in which the instructional discourse is embedded. The regulative discourse is characterised in the next chapter, followed by an overall summary that collates the findings of chapters 4, 5 and 6.

Chapter 6: Characterisation of craft pedagogy in cabinet making in terms of the framing of the regulative discourse

Introduction

In this chapter the rules of hierarchy, order and conduct that govern the pedagogic relations of communication in the trade school are presented. Strong framing of the rules of hierarchy, character and conduct relates to two levels of interaction. The first is the general conduct of artisans or journeymen in relation to their craft and the collegial relations of craft. The second refers to the conduct of the artisan within the factory.

In the first section Bernstein's depiction of hierarchical rules is positioned in relation to craft workers as a strata of the working class often referred to as the 'labour aristocracy', an old and established formation of social identity associated with those who retained considerable initiative and control over the actual process of work, even though no longer owning the means of production. Although this identity is fast disappearing and increasingly under threat, it is the identity position that is reproduced through the regulative discourse of the trade school. This identity formation, in Bernsteinian terms could be termed a local retrospective identity of the elitist kind.

Internal framing: Rules of hierarchy, character and conduct (F^i)

Bernstein again uses explicit versus implicit control as the basic distinction between different manifestations of the rules of hierarchy, order and conduct. Where such rules are explicit the power basis of the social relation is undisguised and visible. Where such rules are implicit the power basis of the social relation is masked, or hidden, or obscured by strategies of communication (1990: 52). He argues that instructional and regulative discourses do not always move in a complementary relation to each other. While both can be strong or weak, the regulative discourse can also be weakly framed while the instructional discourse is strongly framed. However, where there is weak framing over the instructional discourse there must be weak framing over the regulative discourse (2000: 13).

For Bernstein pedagogy refers to 'a sustained process whereby somebody(s) acquires new forms or develops existing forms of conduct, knowledge, practice and criteria from somebody(s) or something deemed to be an appropriate provider and evaluator – appropriate either from the point of view of the acquirer or by some other body(s) or both' (2000: 78). A pedagogic identity is the 'result of embedding a career in a collective base', with the collective base of that career 'provided by the principle of social order ... expected to be relayed in schools and institutionalised by the state. The local base of that career is provided by the orderings of the local context' (2000: 66). Within this distinction between institutionalised identities within the official arena of educational policy and reform and identities constructed on the basis of local resources, the pedagogic identity transmitted in the trade school could be termed a local 'retrospective identity', which uses as resources 'narratives of the past to provide exemplars, criteria, belonging and coherence' (2000: 74).

A further distinction is drawn between two opposing modes of retrospective identity, namely a fundamentalist and an elitist identity. The normative order that underlies trade school practice is of the elitist kind; not constructed on the resource of high culture, as Bernstein depicts it (2000: 75-76), but in terms reminiscent of the notion of 'labour aristocracy' that is used in labour process literature to depict a certain strata of the working class (Lewis, 1984; Webster, 1985; McGuffie, 1986). In South Africa the term is often used to refer to European immigrants who monopolised early craft production and, in more general terms, to refer to the privilege of White skilled workers in relatively secure jobs as members of the independent primary labour market, before the rise of the production worker. Craft unions were able, through the mechanism of social enclosure, to entrench an exclusivity that took on an explicitly racial form (Webster, 1985: 261-262). Lewis (1984: 17-18), however, argues that White workers were never undifferentiated and that non-specific use of the term 'labour aristocracy' tends to obscure the real differences that existed between different strata of White labour. He advocates a wider interpretation of the notion of labour aristocracy: as those who retained considerable initiative and control over the actual process of work, even though no longer owning the means of production and under threat from mechanisation and the reorganisation of the technical division of labour on the basis of semi-skilled labour. For Lewis the position of the labour aristocracy was always ambivalent: 'on the one hand militant, resisting deskilling and attempts by capital to reorganise the labour process; and, at the same time, essentially conservative, seeking to protect sectional interests, and looking with distrust upon the majority of semi-skilled and unskilled workers who could be used to

replace them' (1984: 18). Webster depicts South African craft conditions around the turn of the last century as follows:

> At this stage of formal subordination 'real control of production is not yet firmly in the hands of capital. It is still a relationship between labour and the conditions of labour which provides labour with a degree of control and hence a level with which to enforce its class objectives – [which may be] craft prerogatives over recruitment into the trades and over the content and performance of work'. A craftsman exercises control over production through his possession of the instruments of production, that is, the tools of the trade, which are an extension of his hands, and over which he attempts to maintain exclusive control' (1985: 25, with reference to other sources. Inserts are as they appear in the original text).

Militancy is not evident in the culture of the trade school. The culture can rather be described as essentially conservative, with a strong emphasis on the character and conduct of the individual artisan as representative of a craft tradition. It is this social base that provides the principle of social order relayed.

Characterisation of rules of hierarchy, character and conduct

In terms of the distinction between explicit and implicit control over the regulative discourse four control modalities can be identified.

Table 20: Framing (internal) of the regulative rules of hierarchy, character and conduct

F^{i++}	F^{i+}	F^{i-}	F^{i--}
Explicit control over regulative rules		**Implicit control over regulative rules**	
Expectations about hierarchy, character and conduct are explicitly stated, verbally or in writing. Acquirers are constantly made aware of the rules and of penalties that apply in instances of transgression.	Expectations about hierarchy, character and conduct are not always explicitly stated. They are mainly modelled, but made explicit when acquirers transgress the rules.	Expectations about hierarchy, character and conduct are not explicitly stated, but acquirers generally conduct themselves in an appropriate manner.	Expectations of hierarchy, character and conduct are completely invisible. No strong sense of discipline is maintained and the relation between transmitter and acquirers appears symmetrical.

Indicator 1: Relations of hierarchy between master-trainer and apprentices (F^{++})

'I'm there for them. I tell them that all the time' (Field Notes, 15/02/01).

Relations of hierarchy between master-trainer and apprentices can be characterised as a strongly framed mode of control. Although apprentices are on first-name terms with master-trainers, master-trainers address apprentices by their surnames. The social relations of the family, reminiscent of the domestic mode or production, are strongly in evidence, but the focus is on general attributes of those subject to control (common age, master-apprentice relation, older-younger relation), or what Bernstein calls 'control of the positional type' (2000: 136).

Formal theory sessions are often used for a kind of moral theorising. When I asked the master-trainer about what I considered to be a dubious relation between theory and practice in the trade school his reply was: 'No, of course I teach theory. I get them into the classroom and we talk. I must teach them certain things' (undated conversation). Communication is of the kind that occurs between a parent and a child during the formative years of identity formation. What is to be formed is the *artisanal identity of cabinet-maker* within a workplace milieu no longer characterised by a pre-industrial apprentice-journeyman-master hierarchy in which the master was recognised by the guild as both expert and owner (Goody, 1989: 249). In contemporary mass-production workplaces expertise and ownership are usually separated, with the flattened hierarchy of apprentice-artisan/journeyman under the direct control of the manager/owner, or an appointed substitute. Although the apprentices interviewed all spoke of their dream to one day be 'master of their own shop', this is not the role for which they are prepared in the trade school. It is a more ambiguous specialisation of consciousness that is reproduced, namely that of autonomous expert within relations of subordination. The master-trainer in the trade school assumes the role of 'master' in *surrogate kinship* terms, if no longer within relations of ownership of the means of production.

Extract from Field Notes (31):

[One of the younger master-trainers introduced a written Disciplinary Code, with 20 'do's' and 'don'ts' of the trade school. The decision was made that the Code should be distributed and discussed with apprentices at the start of each block of training. This incident occurred at the start of the Stage 3-block, in the first theory session: JG.]

The master-trainer in cabinet making [identified as MT1: JG] hands out the Disciplinary Code and goes on talking. The apprentices scan the form and also say nothing. MT1 then tells them that if they are late he will report them to their companies. His next sentence is: 'If you have problems you must tell me. We must talk about these things.'

A short while later he returns to the issue of discipline.

'You're not small children and I'm not a police officer. I'm not going to tell you all the time. If I'm out then find something to do. Don't' wait for me to say: "do this" or "do that". It's that extra bit that you do that counts. What I hate is when people never do anything extra. They start cramping a carcass at 5.25 but at 5.30 they leave and it's not squared up.

I don't keep anything back. If there's a good apprentice and there's a position the right person gets it – not the favourite. I've also got a son. He's 28. You've got to be taught, like I taught him. I'm teaching you discipline. It's good. One day you'll teach your children' (Field Notes, 14/08/2000).

In place of the very strong framing of a written Disciplinary Code, with penalties for misconduct clearly stipulated, the relation between master-trainer and apprentices is a paternal relation that requires apprentices to conduct themselves in a way that is in keeping with kinship relations.

Extract from Field Notes (32):

MT1: 'Housekeeping is important. That's how it should be – just like when you make your bed before you go to work in the morning, or don't you? (everyone laughs). Surely you don't leave everything for your mother at home? (more laughter)' (Field Notes, 14/08/2000).

The ease of social relationships should not be interpreted as relations of symmetry. Although the authority of the master is mostly exercised in a benign if formally distanced manner, the asymmetrical relationship is symbolically visible in the white or blue dustcoats worn by all master-trainers. When insubordination is experienced hierarchy is unequivocally invoked.

Extract from Field Notes (33):

[In one of our last conversations I ask again about the relationship between master-trainer and apprentices: JG.]

MT1: 'I once grabbed an apprentice by the chest and held him down on the floor. I was so angry. But he just would not listen!' (Field Notes, 15/02/01).

In terms of the traditional master-apprentice relationship this is not an unusual response.

Transcript extract 15: From interview with master master-trainer (identified as MT1)

'It's not everybody that's a mechanic, it's not everybody that's a cabinet-maker. I've got some unemployed here and I know one or two of them will never make it' [referring to a scheme of the Department of Labour: JG]. I've got a guy taking a nail and he chucks it there and, bang, he knocks it in. But then the nail bends over, or goes in skew, or something. Take the nail, put it down there and tap it in man, and then I've got to show him. Just now you come there again and he's doing it again. Knocks it in, bang, knocks it in. I get so mad. You can't swear at them, you can't hit them, Years ago the tradesman would still hit you. Give you a smack, wake up!'

The difference in regulative stance towards those in apprenticeship roles who are related by kinship and those considered 'outside apprentices' is discussed by Goody (1989: 248 – 251). She compares an actual father/son relationship to a more distanced master/apprentice relation and finds that it is likely for a father to become angry when a son is clumsy or makes a mistake. The ignorance of the 'outsider' is considered obvious and cannot be resented in the same way. Within the trade school context a modelling of kinship relations makes it legitimate to display anger or displeasure when an apprentice errs in some way. The same reaction is, however, contained when trainees on the Unemployment Scheme make mistakes. The investment of the master-trainer in the progress and achievements of indentured apprentices is notably absent in the case of short-term trainees.

The historical basis of such surrogate relations of kinship is found in the regulative role that the actual parents of an apprentice used to play. Besides the formal requirement to sign as a legal guardian, in the case of an apprentice being a minor, parents were also involved in matters of discipline.

Transcript extract 16: From interview with master master-trainer (identified as MT1)

'I started off on three months probation before I was apprenticed. They must see how you are, how you come to work and things like that. And then I became an apprentice, but then they add those three months so that when you sign your papers it's already there. You've got to bring your mother and your father with you and they've got to sign. If you step out of line your mother and your father must come in and check.'

At another time an apprentice does not arrive and the master-trainer phones his factory to report his absence. After putting down the phone he mutters: 'If I did that when I was an apprentice, my parents would have been called to the factory' (Field Notes, 14/09/99).

Nowadays the actual parents of an apprentice seldom get involved in issues of workplace discipline. It is rather the master-trainers from the trade school who act in a surrogate role.

They regularly visit factories to check up on the progress of each apprentice and they fight on behalf of apprentices who are held back by their factories when it is time to attend the next stage of training[35]. The rules of character and conduct transmitted in the trade school refer to how apprentices should conduct themselves in the factory.

Indicator 2: Procedural conduct in the workplace (F^{++})

In the previous state-regulated apprenticeship system both employers and apprentices had right of appeal to the Regional Artisan Training Committee.

> 10. Disputes, Grievances and other references
> 11. All disputes, grievances and proposed alterations regarding Artisan Training in the Industry shall be submitted to the Committee for Investigation.
> 12. The Committee may, in connection with any matter arising out of a dispute or a deadlock on the Committee, refer such matters to the National Artisan Training Committee for a decision. (Extracted from an undated document, entitled *Constitution and Rules of the Regional Artisan Training Committee for the Furniture Manufacturing* Industry under the Manpower Training Act 56 of 1981, amended by the Manpower Training Act 39 of 1990)

The Artisan Training Committee as a legislative mechanism dates back to the Apprenticeship Act of 1922, when the state intervened to regulate employer-employee relations in relation to artisan training. After the introduction of these committees, trade union practices of restriction of the number of apprentices entering a particular trade became illegal, even though strong unions continued to enforce quotas (Lewis, 1984: 24-28) Apprentices were, however, assured of proper training and of legal protection against exploitation.

Extract from Field Notes (34):

[A teatime conversation with the master-trainer in wood machining talking about conditions of work when he was an apprentice in the 1970s; JG.]

'In the old days the apprentices had more protection. You could go to town, to Barrack Street, on a Saturday morning and go and complain to the Apprenticeship Committee and they investigated.

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[35] Such an appeal was, for instance, made during a visit to a factory on 15/02/01 when I accompanied the master-trainer. He insisted that two apprentices (whom he considered to be very good) be sent on the next stage of their training, even though the factory owner's wife (who organised all human resource matters) told him that she was not happy with their attitudes and that she was not going to recommend that they be trained further.

If you signed an apprenticeship contract and the factory closed, the employer had to find you another job. None of this: "Sorry guys, the factory has closed" (he shakes his head angrily) (Field Notes, 15/08/2000).

Although the shift in the apprenticeship system towards learnerships has brought uncertainty about the legal protection to which apprentices have recourse, the master-trainer instils in the apprentices a sense of legal rights and adherence to correct industrial relations procedure. The trade union is never directly mentioned, but the prescriptions offered relate to what the master-trainer knows about the ways in which the trade union instructs workers to protect themselves against exploitation.

Extract from Field Notes (35):

[This comment was made during a conversation with the master-trainer in cabinet making: JG.]

MT1: 'I tell the apprentices always to write down what they are doing. Sometimes they're busy with a job and then they get interrupted and told: "Just do this." Then they don't write it down and at the end of the day the foreman says: "Why did you do so little work today?" And then if you're E ... ([referring to a particular apprentice: JG], you say nothing. You just leave when you can't take it any longer' (Field Notes, 15/02/01).

Extract from Field Notes (36):

[Discussion in a session with Stage 1-apprentices: JG.]

An apprentice gives an example of a mistake by his 'boss' [the artisan under whose supervision he works: JG]. The apprentice explains how the artisan was careless and put a staple through his finger. The master-trainer ignores the implied criticism of the artisan and immediately turns the example into a lesson about health and safety procedures.

MT1: 'If this happens to you, you must make a note and you must go to the doctor. Otherwise you go to the doctor and the boss says, no, you did not get hurt at work. So you must pay the doctor yourself and you don't get 'time off' to go to the doctor (Field Notes, 11/02/01).

The strategy of never agreeing with apprentices when anything negative is raised about their superior is one often used by the master-trainer. It is particularly marked in his response to the strong comments reported in the next section.

Indicator 3: Character and conduct in the workplace (F^{i+})

As mentioned before the slots indicated on the timetable as 'theory' sessions, are often used by the master-trainer to 'talk about things'. It is in these discussions about character and

conduct that the master-trainer assumes the role of 'teacher' most prominently, with his own experiences of factory culture providing the basis of his authority.

Extracts from Field Notes (37):

(1) MT1: 'If you see somebody taking something, please tell him it's wrong.'
Apprentice: 'We must report him. What's the reward?'
MT1: ' No, you tell him yourself.'

(2) MT1: 'If something is wrong, do something or say something. Don't just stand there.'

(3) MT1: 'You complain about the bosses. But maybe the bosses also complain about you.' (The apprentices mumble amongst themselves.) 'Boys must have some fire. A boy mustn't just sit there, accepting everything.' (They all laugh.)

(4) MT1: 'Do something for yourself. You do your trade test for yourself. You think it's okay, you're getting paid an artisan's rate – so don't worry. But your factory closes and you try to get another job – you've got nothing.'

(5) MT1: ' I don't give you bad advice. Yes, you can say: "Oh he just talks – he's in with the boss." But I'm not saying this for the boss. It's for you.' (Comments 1 to 5 from Field Notes, 14/08/2000).

(6) 'You spoil your name by taking short-cuts. You've got to work it out so that it all looks the same.

(7) 'Don't just do it my way. You must find your own way'.
[Master-trainer speaking to Stage 1-apprentices: JG.] (Comments 6 and 7 from Field Notes, 11/02/01).

Admonitions about character and conduct, based on the master-trainer's own experiences of being an apprentice do not always have the intended effect (as illustrated by the extract below).

Extract from Field Notes (38):

[The master -trainer refers to his own days as an apprentice: JG]

MT1: ' When I was a youngster, if you were five minutes late, you had to stand outside for half an hour and they deducted half an hour from your wages.'

1st apprentice: 'In our factory they also deduct, but you don't know what they're deducting – whether it's half an hour or an hour. At the end of the week you get your pay packet from the receptionist

(she's a Jew) and you see it's only 37 hours and not 40. Now you ask and she explains it so that she's always right and you say "yes".'

2nd apprentice: 'Die "lanies" like nie jy moet dink nie. Net hulle kan dink.'
['The "lanies" do not like you to think. Only they can think': JG.]

3rd apprentice: 'Jy't 'n kontrak geteken. Nou's jy 'n hond.'
['You signed a contract. Now you're a dog': JG] (Field Notes, 14/08/2000).

The apprentices in this group were particularly provocative (which may have been because I was present). They did not sit quietly in the usual fashion; it was as if they were trying to better the master-trainer's experience by responding with stronger examples. All the master-trainer said was: 'You mustn't think that way. You'll be sorry one day'. When I asked him about this later he explained that they needed to get these thoughts out of their system. They could not always talk to their parents and he had to teach them (Field Notes, 14/08/2000).

Indicator 4: Relations with superiors (F^{i+})

Despite the constant injuction to 'find your own way', rules of subordination, as interpreted through a craft or trade perspective, require that the prerogative of management be respected.

Extract from Field Notes (39):

[First session with Stage 1- apprentices. This session was conducted on the premises of a craft factory: JG.]

MT1: 'You're young. You don't know how they're running their business. Always check with your supervisor. Work as closely with management as you can. Don't just do your own thing. The job might be a "special" and the customer wants it in a particular way. Always ask management what they want. If he says it must be like that, then you're safe. Then it is management's fault' (Field Notes, 11/02/01).

Social relations with the supervisor or foreman, as a representative of management, feature prominently in these discussions, as this is the immediate level at which apprentices experience relations of subordination.

Extract from Field Notes (40):

[A discussion that takes places in a theory session for Stage 2-apprentices: JG.]

MT1: 'A foreman is not picked as the guy who's got his arm around everyone. The foreman is an individual. He sits alone and reads his paper. He can't be everyone's friend. He must give instructions.'

An apprentice: 'Nobody wants to listen to a Coloured foreman. It must be a "boer" [local term used to refer to a White, Afrikaans-speaking man: JG]. Then they sit up.'

MT1: 'I became foreman in the heart of apartheid. I had guys who were in the trade thirty to forty years ahead of me. Why did they give me the job? Because I do my work well. I'm always on time. I do extra things. So nobody must come and tell me it's about apartheid. It's about you and who you are. Do as you are told and somebody will see it. If someone steals your idea as their own, it's okay. In the end it comes out' (Field Notes, 14/08/99).

In his prescriptions about workplace relations the master-trainer is as concerned about issues of productivity and efficiency as the manager/owner of a factory, but the basis of such prescription is a deeply held moral order that exhorts apprentices to 'become somebody' (Wexler, 1992)). It is in this way that the trade identity of cabinet-maker is conserved and reproduced, even though embedded in social relations of subordination.

Indicator 5: Bodily discipline (F^{i+})

Communication about discipline relates strongly to forms of bodily self-regulation, which include timekeeping and prevention of physical injury in the use of machines.

Extract from Field Notes (41):

(1) MT1: 'Come, come you're late. Your six minutes late. This is no good' (Field Notes, 16/09/99).

(2) [In an aside to the researcher: JG.]
MT1: 'Those two over there – in their factories they have "boys" to clean up. But here they must learn to clean up for themselves' (Field Notes, 07/09/99).

(3) 'Look after the machines. Use the safety guards. Put the band saw out of tension after use. The compressor mustn't be on all the time. It can cost you a lot of money.

Look after yourself. Use earmuffs to dampen the noise of the machines. Clean up where you've worked. You go to the saw and you see an off-cut - throw it into the bin.

Think about safety. Watch out that you do not step on dowels' (Field Notes14/08/2000).

Numerous examples referring to bodily discipline were also reported in previous chapters. They are not repeated in this section.

Summary and interpretation of findings

The framing values of the regulative discourse of the trade school can be summarised as follows:

Table 21: Summary of the framing values of the regulative discourse in the trade school

Category	Indicator	Modality	Description
Rules of hierarchy, character and conduct	Relations of hierarchy between master-trainer and apprentices	F^{i+}	Rules of hierarchy and conduct are not always explicitly stated or written down. They are mainly modelled, but made explicit when acquirers transgress the rules.
	Procedural conduct in the workplace	F^{i+}	Rules of hierarchy, character and conduct are not always explicitly stated. They are mainly modelled, but made explicit when acquirers transgress the rules.
	Character and conduct in the workplace	F^{i+}	Rules of hierarchy, character and conduct are not always explicitly stated. They are mainly modelled, but made explicit when acquirers transgress the rules.
	Relations with superiors (in the workplace)	F^{i+}	Rules of hierarchy, character and conduct are not always explicitly stated. They are mainly modelled, but made explicit when acquirers transgress the rules.
	Bodily discipline	F^{i+}	Rules of hierarchy, character and conduct are not always explicitly stated. They are mainly modelled, but made explicit when acquirers transgress the rules.

The regulative discourse of the trade school can be interpreted in terms of a *backward recontextualisation* to the moral order of craft control, or semi-control, over the organisation of work and production under early industrial capitalism. By reverting to surrogate relations of kinship, the rules of social hierarchy in the trade school enables the transmission of the rules of social order that marks craft or trade membership itself, while at the same time

inducting of apprentices into relations of subordination that govern factory practices at the regulative level. The socialising context created by the trade school could in one sense be termed what Bernstein calls an 'interrupter socialising matrix' (1975:149), but it is not the interruption of the old middle class order by a new middle class that features in Bernstein's analysis; it is the interruption of relations of subordination in contemporary capitalist production by a previous social order that seeks to reproduce itself, even if in diluted or attenuated form. This pedagogy has no intention of changing fundamental class relationships. At no time was mention made of collective union action. It was always the pride and dignity of the trade itself, as exemplified though the individual artisan, that was invoked, rather than collective traditions of resistance to changes in production, or collective craft protectionism [36].

Two particularly noticeable features of the regulative discourse are, firstly, that it is far more clearly articulated than the instructional discourse and, secondly, the way in which prescriptions for moral self-regulation and bodily self-regulation (or discipline) are interwoven. In the previous chapter the evaluative criterion of inner 'readiness' was described as an internalised time-space relation, whose evaluation often finds expression through criticism about lateness or negligence that leads to physical injury. It is in relation to this criterion that the instructional and regulative discourses are almost indistinguishable.

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[36] The old patterns of collective action have not disappeared completely. At the time of dissolution of the Industry Training Boards (ITBs) and the legislative change to Sector Education and Training Authorities (SETAs), the training provision offered by the Furniture Industry Training Board (FITB) was separated from the administrative arm. The training division (or trade school) was legally registered as a private training provider, but when the manager left to take a job outside the industry, there was operational confusion with neither the new SETA nor the old Board of the FITB, which consisted of employer, Industrial Council and union representatives having legal or financial responsibility for the trade school. As the artisan-trainers did not know whether they still had jobs they resorted to collective action. They clubbed together to take legal advice and included in their grouping the secretarial staff, the tea maker and the cleaner (all women, but belonging to three different population groups) – even though these employees could make no financial contribution to legal costs. In the end it was the old craft union, the National Union of Furniture and Allied Workers of South Africa (NUFAWSA) that threw out a lifeline and enabled the trade school to continue operating. I was recently informed that this arrangement has since changed, but full details were not made available.

Overall summary and discussion of the classification and framing relations in trade school pedagogy

Craft pedagogy, as realised in the trade school of the furniture industry, is characterised by the following classification and framing relations:

- *Strong to very strong external classification and framing relations* provide temporary insulation against the disconnected operations that characterise production practices in the majority of furniture factories, as well as from the everyday workplace experience that apprentices bring from such factories. A specialised curricular space is established in which the particular relation between work organisation, tool and materials usage, that constitutes the traditional craft or trade of cabinet making, is reproduced.

  In this curricular space science-based knowledge (or what is termed 'theory') has no place, with low-level procedural knowledge codified in a learner's guide or procedural manual standing in for 'theory'. This content is, however, ignored and replaced by a 'privileged repertoire' that derives from the master-trainer's own expertise and experience as a cabinet maker.

- This particular specialisation of meaning is protected through *strong internal classification* of curricular and physical boundaries between cabinet-making and other trades in the furniture industry. A strong distinction is also drawn between cabinet making and school woodwork.

- *Very strong internal classification* of the spaces between apprentices from different trades, as well as between apprentices in the same trade (in the workshop), shows the individualising nature of the pedagogy. A craft or trade is collectively held but its reproduction practice leads to unambiguous role identity.

- *Very weak internal classification of the space between master-trainer and apprentices in the cabinet making workshop* establishes the workshop as a space where apprentices are under constant surveillance and the master-trainer can intervene at any moment if unsafe practices should occur.

- Through *very weak classification of internal curriculum boundaries* the modular partitioning and sequential activity prescribed by the competency-based modular training (CBMT) format, are overridden and replaced by a set piece (a complete item of furniture) which apprentices have to construct individually and without any direct instructions from the master-trainer. The level of complexity of the prescribed set pieces increases in each of the five stages.

- *Very weak initial framing over selection, sequencing and micro pacing* allows apprentices to make their own decisions about the sequence and pace in which they realise the task, but within the *strong macro pacing* of daily routine in a factory. Just before the end of the final stage and before apprentices take their final trade test *framing over selection sequencing and pacing is strengthened* and made explicit.

- *Evaluation criteria* in relation to use of tools and material are *strongly framed* with criteria of accuracy and precision *very strongly framed*. These criteria are made explicit by the master-trainer through continual modelling of correct practice. The *strongly framed criterion of 'readiness'* is never fully explicated although it features strongly in the instructional discourse.

- *Strongly framed relations of hierarchy, character and conduct* constitute the master-apprentice relation as an asymmetrical relation. Through adopting a surrogate kinship role the master-trainer exercises a form of positional control aimed at developing qualities of character and conduct that are in keeping with those of the autonomous artisan who represents a collective craft tradition in a workplace where expertise and ownership have usually been separated. 'Readiness' is as much a feature of the moral discourse as it is a feature of the instructional discourse. In this sense the instructional and the regulative are one discourse.

The strong classification and framing values of the trade school pedagogy characterised in chapter 4, 5 and 6 is clearly a performance model (Bernstein, 2000: 44), but its positioning in this category is not unambiguous. Its outcome is a performance that is grounded or embedded in an internally held competence and can be represented as:

$$\frac{\text{Externally visible performance}}{\text{Internally held competence}}$$

The use of the term 'competence' needs to be distinguished from other uses of the term. While it shares with Bernstein's use of the term the idea that competence is tacitly acquired, it does not carry the meaning of intrinsic creative potential and in-built virtuous and benign self-regulation as described by Bernstein (2000: 31- 44). The term should also not be associated with the way in which competence or competency is used in formulations such as competency-based modular training, to refer to narrow behavioural specifications of a procedural kind. Its use here is more provisional and is intended to signal the tacit dimension of the pedagogy, or that which provides the intrinsic basis of the strongly classified and framed performance, without yet being able to describe what the substance of such competence may be.

What is clear at this stage is that language plays no great part in this kind of performance or competence, but character, conduct and bodily discipline are crucial underpinnings. This performance/competence relation should, however, not be seen as the inevitable outcome of craft pedagogy. Instances were cited of apprentices being judged competent but nevertheless failing the trade test. There were similarly apprentices who passed the trade test but were not judged by the master-trainer to display the character, conduct and discipline that an artisan should. The performance/competence relationship nevertheless represents what has been referred to previously as the 'privileged repertoire' of craft practice or workmanship. It is the specialised consciousness of a labour aristocracy, that segment of the working-class still managing to retain some initiative and control over the actual process of work even though no longer owning the means of production. The racial exclusivity long associated with the term 'labour aristocracy' in South Africa has disappeared but, like elsewhere in the world, a small minority of the working-class remain dedicated to the continuation of the craft ideal (Wood, 1982, 1989; Thompson, 1989).

Conclusion

In chapters 4, 5 and 6 theoretical concepts from Bernstein's earlier work were operationalised to characterise craft pedagogy, as it occurs in the trade school of the furniture industry. This pedagogic space seeks to impart all-round craft knowledge, skill and disposition, insulated

against both formal scientific knowledge and against restricted site-specific knowledge and skill. Those who teach are masters of their trade. They have not undergone formal educator or teacher training and the pedagogic stance adopted is one couched in surrogate relations of kinship that refer back to traditional master-apprentice relations of days gone by.

While it has been shown how a combined mode of pedagogy transmits craft knowledge, skill and disposition, the tacit nature of such knowledge and skill has not been fully explored. In the next chapter a theoretical framework is developed to shed light on the 'tacit'. The trade test provides the empirical focus that shows what the final performance entails. From this description it is possible to infer the meaning of what in this chapter has been called an 'internally held competence', as a proxy for the 'tacit' in craft.

Chapter 7: Craft as tacit knowledge

> 'The apprentice learns from seeing the master perform the activities of the craft, thereby catching the implicit knowing of the profession. From this position the role of language is marginal.' (Nielsen and Kvale, 1997:134)

Introduction

It is generally understood that tacit knowledge is transmitted through modelling, but it is a circular argument to say that knowledge is tacit because it is transmitted through modelling, or, conversely, that it is transmitted through modelling because it is tacit. The question is: What makes tacit knowledge tacit? At this point it has been shown that performance embedded in competence is the pedagogic outcome of craft pedagogy, but no explanation is yet available as to why manual knowledge and skill requires this particular combination. The 'tacit' clearly relates to the 'competence' part of the combination but how and in what way is not clear.

The chapter starts with the development of a conceptual framework that draws on the work of David Pye and Michael Polanyi. This framework is then employed to analyse and interpret the trade test in cabinet making, as the focus of empirical investigation. The chapter moves away from the Bernsteinian concepts employed thus far but at the same time works towards building an interpretation of Bernstein's positioning of craft in relation to other knowledge forms, which is taken up in chapter 8.

The findings of the chapter show the relations of spatiality that apprentices must hold as an internalised competence, in order to be successful in the production of the test item. It is argued that the key to understanding the tacit nature of craft knowledge lies in an understanding of *visualisation* as a proxy for the relationship between part and whole, which cannot be rendered in words. These findings begin to lay the foundation for a more general positioning of craft knowledge.

Craft as workmanship

In this section the term 'workmanship' is substituted for knowledge and/or skill. This is a move made by David Pye, a professor of furniture design, who argues that the term 'skill', often used to distinguish the manual from the mental, does not assist useful thought and that 'much of what is ordinarily called skill is simply knowledge' (1968: 21-22). For Pye craftsmanship is 'workmanship using any kind of technique or apparatus, in which the quality of the result is not predetermined but depends on the judgement, dexterity and care which the maker exercises' (1968: 7). The distinction that Pye draws between 'workmanship of risk' and 'workmanship of certainty' lies in the degree of pre-determination of the end-result. Where the result is exactly specified beforehand, it is achieved directly, without preliminary approximation or rough work. Where it is not pre-determined and the job can be spoiled at any moment, the end-result depends on the judgement, care and dexterity of the worker - or on what he calls 'free workmanship'. The worker will be working freehand with a hand tool at one moment and using a machine tool a few minutes later. In craft-based forms of production some operations have predetermined results and others are performed through the workmanship of risk (1968: 8), with the apportioning of perfect and rough work often decided by the craft worker (1968: 16).

Since ancient times the use of jigs, templates and other shape-determining systems in the trades, as well as the development of habits of work have been ways in which workers constantly tend to reduce the risk and increase the certainty in any task - so that the risk has almost become invisible. Yet, Pye argues, the 'principle' of uncertainty of end-result, or the degree to which work corresponds to the original and ideal conception of it, remains the criterion against which workmanship is judged. This is a standard which no human creation can attain - workmanship representing instead an 'approximation to a greater or lesser degree' (Pye, 1968: 13)[37].

Pye's term 'regulated workmanship' (1968: 22) offers further insight into the nature of the 'ideal' in relation to workmanship. The designer gives the design to the craft worker on paper and the craft worker has to interpret the diagram. In regulated workmanship the achievement

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[37] I first came across the work of Pye in Ainley (1993) and, although I subsequently studied his work in the original, I am indebted to Ainley for providing the initial stimulus.

appears to correspond exactly to the idea. The quality of workmanship is always judged by reference to the designer's intention but Pye asserts that 'no drawing, however fully and minutely dimensioned can ever be more than a sketch as regards the appearance of the thing drawn' (1968: 24). There is always an interpretation and all workmanship is thus approximation. 'A design is in effect a statement of the ideal form of the thing to be made, to which the workman will approximate in a greater or less degree' (1968: 14). Elsewhere Pye offers a more detailed explanation of the structural relations captured by any design.

> 'We see art, which includes design, by virtue of the relationships in appearance between the formal visible features of a thing, its formal elements, and by virtue of their relationships in space. The point I wish to make is that design – the music of design – depends on the relationships between distinguishable and separable features of things ...' (Pye, 1968: 28).

A design cannot be realised without an interpretation of the ordered relationships between its formal elements.

> Now, many of the formal elements revealed on a close approach to anything, even if it is of the finest workmanship, are commonplace; but then most formal elements in themselves are commonplace. It is in the relating of them to each other, and often in the subtlety of those relations, that the art lies. In general, of course there is far less scope for new formal invention in workmanship than in design, because the possible ways of relating the familiar formal elements which recur in workmanship are often few. The scope varies according to the technique' (1968: 30).

Pye does not explain how the relational order between the formal elements of a design is grasped and interpreted in workmanship but when his explanation is linked to Polanyi's distinction between focal and subsidiary awareness, the crucial role that the 'tacit' plays in craft practices, becomes apparent.

The tacit component of craft

The philosopher of science, Michael Polanyi's famous statement that although expert diagnosticians in various fields can 'indicate their clues and formulate their maxims, they know many more things than they can tell' (1958: 88), has become an oft-cited description of the 'tacit'. The conceptual language, which underpins this statement, is usually not explicated and yet it is crucial to understanding why Polanyi is able to make a statement such as the one cited above. As the nuance of Polanyi's argument emerges through the combination of

everyday examples and fine-grained explanations, this section cites the original text fairly extensively.

Unlike Pye, Polanyi does use the term 'skill'. He asserts that 'the aim of a skilful performance is achieved by observance of a set of rules which are not known as such to the person following them' (1958: 49). In order to explain this assertion Polanyi distinguishes between two kinds of awareness, namely 'focal awareness' and 'subsidiary awareness' (1958: 55). He uses an everyday example to mark out the difference between these two kinds of awareness.

> When we use a hammer to drive in a nail, we attend to both nail and hammer , *but in a different way*. We *watch* the effect of our strokes on the nail and try to wield the hammer so as to hit the nail most effectively. When we bring down the hammer we do not feel that its handle has struck our palm, but [we feel] that its head has struck the nail. Yet in a sense we are certainly alert to the feelings in our palm and the fingers that hold the hammer. They guide us in holding it effectively, and the degree of attention that we give to the nail is given to the same extent but in a different way to these feelings. The difference may be stated by saying that the latter are not, like the nail, objects of our attention, but instruments of it. They are not watched in themselves; we watch something else while keeping intensely aware of them. I have a *subsidiary awareness* of the feeling in the palm of my hand which is merged into my *focal awareness* of my driving in the nail (original emphasis) (1958: 55).

A skilled person accomplishes a performance as a coherent entity, without conscious awareness of the constituent elements (or particulars) of the performance. The person may have acquired each element separately but in skilled performance particulars are no longer observed in themselves.

> The effort we put into acquiring the art of knowing is the attempt to assimilate certain particulars as extensions of our body so that by becoming imbued with our subsidiary awareness they may form a coherent focal entity (1958: 63).

For Polanyi subsidiary awareness and focal awareness are mutually exclusive in the sense that a person cannot focus on both at the same time.

> If a pianist shifts his attention from the piece he is playing to the observation of what he is doing with his fingers while playing it, he gets confused and may have to stop. This happens

generally if we switch our focal attention to particulars of which we had previously been aware only in their subsidiary role...

... the particulars of a skill appear unspecifiable, but ... it is not a case of our being ignorant of them. ... we can ascertain the details of our performance quite well and its unspecifiablity consists in the fact that the performance is paralysed if we focus our attention on these details. We may describe such a performance as *logically unspecifiable*, for we can show that in a sense the specification of the particulars would logically contradict what it is implied in the performance or context in question ... All particulars become meaningless if we lose sight of the pattern which they jointly constitute (original emphasis) (1958: 56 - 57).

Recasting his analysis of focal and subsidiary awareness in terms of parts and wholes, Polanyi is now able to argue that 'when focussing on a whole we are subsidiarily aware of its parts even though there is no difference in the intensity of the two kinds of awareness' (1958: 57). Particularly crucial for understanding the structure of the 'tacit' is the insight offered with regard to the relationship between part and whole.

But the relationship of the particulars jointly forming a whole may be ineffable, even though all the particulars are explicitly specifiable (1958: 88).

It is this ineffable relationship between parts and whole that makes modelling the only possible transmission-acquisition practice.

An art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists. It can be passed on only by example from master to apprentice. This restricts the range of diffusion to that of personal contacts and we find accordingly that craftsmanship tends to survive in closely circumscribed local traditions ...

To learn by example is to submit to authority. You follow your master because you trust his manner of doing things even when you cannot analyse and account in detail for its effectiveness. By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those which are not explicitly known to the master himself. These hidden rules can be assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another. A society which wants to preserve a fund of personal knowledge must submit to tradition (1958: 53).

Pye's depiction of workmanship as the interpretation and realisation of ordered relationships between formal elements in a design, combined with Polanyi's assertion about the unspecifiablity of the relationship of subsidiary particulars jointly forming a whole, show how relations of order are grasped in ways that lie outside of language – as what is generally called *tacit knowledge*.

It now becomes possible to re-describe the earlier formulation of craft practice as 'performance embedded in competence' in a way that positions the 'tacit' as the basis of performance.

$$\frac{\text{Performance}}{\text{Competence}} = \frac{\text{Focal awareness}}{\text{Subsidiary awareness}}$$

In order to test the plausibility of what is still an abstract formulation of the 'tacit', we move to a consideration of the performance required in the final trade test in cabinet making.

The final trade test

Relating wholes and parts

In the final trade test in cabinet making the candidate has three days in which to interpret and realise a design, according to strict criteria of accuracy. Only those who achieve above 60% are declared competent. Candidates do not see the marking schedule, which contains detailed specifications for each part of the test and the rating 'competent/not competent' is the only test result communicated to them.

The test consists of two parts. In the first part, which counts for 25% of the final mark the candidate has to interpret the given drawings of a circular drop-leaf table, based on a design of the original Pembroke table[38]. In the second part, which counts for 75% the candidate has to construct a model of the table.

Twelve separate drawings appear on the test sheet. There are:

- Front elevation

[38] As this test is still in use it is not appropriate to include the drawings as an appendix to this study.

- Sectional end elevation
- Top view of drawer
- Plan
- Partial drawing of side rail
- Side of drawer
- Middle part of side rail
- Bracket
- End part of top rail
- End part of bottom rail
- Top part of leg
- Three versions of mould (one to be selected)

The drawings are not to scale. The plan is the central cog around which all the other drawings revolve, but not all measurements appear on the plan. They have to be derived from other drawings and that requires being able to see how these drawings relate to the plan. Two pieces are, for instance, drawn one below the other, but one is in fact a partial drawing of the side rail, while the drawing directly below is a full drawing of the drawer side. These two drawings appear to have the same dimensions but candidates have to grasp the relational difference.

The first task is to draw a layout of the top view, as derived from the plan, in order to represent the full-scale dimensions of the inside of the table (without the top). The carcass is not visible once the table is assembled, but it is the core that holds the parts together. What is particularly tricky is the positioning of the legs (which are square) in relation to a curved front rail, with a dovetail joint connecting the top rail and the top part of the leg and a double mortise and tenon connecting the bottom rail to the leg. A drawer has to fit in between the table legs on either side. Although the design originally specified drawers on both sides of the table, this was later reduced to only one drawer actually needing to be made. (The other is a dummy front.)

Once the layout has been completed the assessor decides whether the candidate may proceed.

Transcript extract (17): From interview with Assessor (identified as ASS)

[In this section the assessor is explaining how a candidate should do the lay out/setting out: JG.]

JG: 'This is given as 50. So he first draws the 30 and then the 50 and then he puts in the 22 from that side. Do they sometimes mark off the 22 from this side?'

ASS: 'Possibly, yes. Once he starts doing things like that he has got a problem, but I will pick that up when he gives me the drawing. But now you see the snag in this situation. The thing is the setting out board. Instead of putting the drawer front in the front he puts it in the back. He loses maybe 5 marks. That doesn't fail him. So I give it back to him and say all right you have passed, or whatever, carry on. I'm not going to tell him he's made a booboo. So what happens if he doesn't pick that up is that his drawer is going to be completely out.'

If the setting out board is not judged satisfactory candidates must re-interpret the drawings until they find the mistake. Candidates are not allowed to proceed with the test until they have passed this first step.

The next step is to draw up a cutting list. All components that make up the final article must be listed (e.g. 4 x legs, 2 x side rails, 4 x drawer rails), with both the rough sizes and the finished sizes stated in terms of length, width and thickness. Whereas the first step requires candidates to grasp how the parts make up a whole, the second step requires the candidate to see the whole as an assembly of parts. The sizes indicated on the cutting list must correspond to the sizes shown on the setting out board. There thus needs to be a cross-interpretation between the setting out board and the cutting list – the whole and the parts.

Everything up to this stage is done in the head and on paper. The relation between part and whole must be realised in diagrammatic form for the candidate to be able to proceed to the third step of selecting and preparing the wood. In the tests at the end of the first four stages there is a checklist that details the equipment and materials provided. Step-by-step instructions are given about where candidates should start and how they should proceed. However, in the final trade test the materials are not supplied and only brief instructions are given i.e. 'Using the attached drawing, extract size and draw up cutting list. Call the administrator when complete. Make the necessary templates. Construct model as per given drawing.' The rest of the instruction sheet details specifications that need to be interpreted in conjunction with the drawings. Candidates often do not read the instructions on the first page and they miss out on important information.

Transcript extract (18): From interview with master-trainer (identified as MT1)

[The master-trainer is explaining the trade test: JG.]

MT1: 'If you read the instructions it will tell you, recess all hinges. Some people don't even do that because they don't read this. "Taper on legs to start at 20mm below the rail and legs to be tapered on all 4 sides." If they sit down and read this before they do their drawing they will pick this up. But some of them are too ... you know the day when they say test then you come in here to do your test, then they are already nervous and shaky and then they overlook ... they don't even read that instruction, honestly. It tells you to taper, it tells you your drawing, it even tells you your compulsory tea breaks and lunch breaks.'

Selection and preparation of wood similarly requires the candidate to see the whole in terms of its constituent parts, in order to decide how much wood is needed and how many components can be cut out of one piece of wood. (Once candidates have selected their wood they are allowed one mistake only. If this happens they can fetch one more piece of wood, but thereafter they must make do with what they initially selected and prepared.)

The to and fro movement between part and whole, or what could be called a sense of three-dimensional spatiality, underpins every part of the test. The interpretation of the ordered relationships between formal elements in the design is first grasped through the drawing and then transposed from drawing to setting out board. The process continues from the setting out board to the construction of the carcass, the legs and all the other components and from there to the final assembly stage where the whole appears as a real rather than a virtual object.

It is clearly this ability to see the part-whole relation that attracted praise in an incident that occurred in the workshop just before the end of stage 5.

Extract from Field Notes (42):

[The two apprentices are referred to as AA and AB. The set piece involves the construction of a half-round table: JG.]

AA assembles his final piece and it is not square. One leg is out. He is upset and the apprentices working next to him move to his bench to have a look. AB goes back to his workbench, looks at his assembled piece (not completely glued yet) and measures here and there. I ask him where he is now and he explains that the middle part is the most important. That's where the drawer goes in so the side parts must square up exactly. Suddenly he says: I've just had an idea. I mustn't put the back part on yet because then I'm going to struggle to get the side parts in. I must first make this middle part stable.' So he takes off the back and clamps the middle section (which has been glued).

The master-trainer (MT1) notices what he's done and praises him (the first time I've heard him do this). Later he tells the slowest worker (the only one who is not an apprentice, but a trainee) to look at what AB has done and to do his like that – but he does not tell him why.

Soon AB is explaining to another apprentice and then to another. They both start doing it his way. Even AA (the one whose table was skew earlier on) comes to have a look. For the first time there is public acknowledgement of what could be called a 'best practice'.

Later I ask MT1 about it and he says ' yes' that's how they should be doing it and he's going to tell everyone to do it that way. He told them so at the beginning (but I never heard him say anything at the beginning and he does not tell everyone now either) (Field Notes, 09/09/99).

It is also the absence of this ability to see the part-whole relationship that caused the master-trainer (MT1) to react uncharacteristically by smashing a table designed and made by a stage 4-apprentice.

Extract from Field Notes (43):

The stage 4 apprentices have been working individually on the tables which they had to design and make. Each design was different – some square, some round and some triangular. Part of the task was to use more than one type of wood in an aesthetic combination. One of the apprentices made a particularly fancy table where he combined light and dark wood in both the legs and the top. The positioning of the legs was unusual because they curved outwards at an angle (like a giraffe bending down to drink water). Although I got a clear sense that MT1 disapproved of the design he said nothing.

This morning I noticed that the apprentice [identified as AH: JG] who had made this table was absent. When I asked the reply from the master-trainer was:

MT1: ' He's off. He cut his finger on the spindle yesterday. It wasn't even bleeding but now he's off for two weeks. He's such a baby. He's probably still sleeping now' (general laughter).

After tea there was a period of inactivity while they moved around and looked at the tables. Suddenly MT1 grabbed AH's table and smashed it to pieces on the ground. There was a moment of shock as we all registered what had happened. His only words were: 'This offends me. How can he make a table like that!' I realised then that AH's absence and the derogatory comments made were linked to the fact that he probably knew that his design had somehow broken an unspoken rule (Field Notes, 27/10/99).

These two instances indicate how the master-trainer is only able to refer to what is present or absent in the performance itself. He cannot say in words what it is that should underpin the performance. When I finally started making sense of what I had been watching over almost a year of intermittent periods of observation I put it to the master-trainer one day that I thought that when he looked at any part of a piece of furniture part he saw the whole piece of furniture and not just that particular part. He glanced at me as if I was stating the obvious and then said: 'Yes, I only need the front drawing. I know the height because it is standard. So I just need the depth. The trouble with the apprentices is that they don't "see"' (Field Notes, 17/08/2000). It is this 'gaze' that constitutes the essence of tacit knowledge, with drawings as the formal curriculum space in which interpretation of ordered relationships is acquired. When a particular apprentice does not seem to be coping the explanation invariably offered by the master-trainer is that the apprentice cannot do drawings. The apprentice may be shaping a table leg or using a panel saw but any flaw in performance is ascribed to the fact that 'he cannot do drawings'.

When one watches what they do in the drawing class the subordinated presence of geometry is immediately noticeable, yet geometry is not the focus of the transmission. The focus is on practical application and the practical application is the ability to 'see' proportion or order of relation. The drawing teacher does not talk or explain any more than the master-trainer in the workshop. He simply sets the task, checks the drawings done by the apprentices and points out where they have gone wrong. All drawings project a front view, a top view and a side view of the object. These views are represented separately and in the beginning apprentices study these separately and draw them separately. Strong distinctions are made between 'light' lines used to construct the drawing (and erased later); 'dotted' or hidden lines which are part of the object but depicts that which cannot be seen; and 'hard' lines that represent what is visible when the item is viewed from an angle of 30 degrees. As apprentices proceed to isometric drawing where they have to represent all three views in one (three-dimensionally) they begin to grasp height, width and depth in the same instant. Apprentices often sit for a long time, staring at the drawing and not appearing particularly interested. Then suddenly they pick up a pencil and compass and proceed with the construction.

The only time that I observed a copying practice was in a class where cabinet making and wood machining apprentices were mixed. A wood machining apprentice was seated between two cabinet making apprentices (which was unusual in terms of the seating arrangements that

separated apprentices according to their trade). He worked at the same pace as the cabinet making apprentices and he was far ahead of the other wood machining apprentices. The master-trainer (MT3) walked past and stopped next to his table. He asked him to explain the steps that he had taken to get his drawing to that stage. The apprentice could not retrace his steps and said that he had just done it and that he could not explain it. MT3 then pointed to the little pinpricks that the compass had made in the paper and told him that he could not get to the answer in that way. He took the compass and started again from the centre point, modelling the moves that had to be made. Then he walked away. Later he mentioned to me that it was clear that the apprentice had not really understood the problem; he had simply copied from the apprentices next to him (Field Notes, 20/07/2000).

A second copying practice was observed in the workshop. In the stage 5-group observed there was only one apprentice who often stopped at the workbenches of the other apprentices to watch what they were doing. He was friendly and chatty and would call the master-trainer (MT1) to his bench. He was, however, also the apprentice (identified as AG) who did not pass his trade test. In a staff room discussion the general view was that he had worked in a mass production factory for too long, without having to work with drawings. Field notes, taken during workshop observation at the time, reflect my sense that this apprentice was simply doing what he saw the others doing, but I could not yet interpret what I labelled as 'copying'.

Extract from Field Notes (44):

[Notes to myself at the time of the above conversation: JG]

Even though ... [the apprentice identified as AG: JG] practised his lay out three times he seemed to be copying from others. He felt safe in the group environment where he could 'steal with the eyes' as they say. But the test individualises and sequencing and pacing are crucial. You may not break the rules (Field Notes, 19/10/99).

In an interview one of the apprentices explained it in this way.

Transcript extract (19): From interview with an apprentice (identified as AA)

AA: 'Everything is drawing. Drawing becomes almost like a third language. English/Afrikaans/ Drawing, those are your languages. And that's why everything has drawing in it. I mean you talk to someone. If you're English and someone is Afrikaans you talk to them in a language that would mix English and Afrikaans words. Well, it's the same as me talking to another cabinet maker – we mix English and drawings. That's how it works. It just happens that way.'

Drawings are done on any surface and all the time – they are rough and crude, but not out of proportion. Throughout the observation period the master-trainer (MT1) often made rough sketches of proto-types of pieces of furniture that he had made during his time as a foreman in a factory years ago. He would point out a particular construction detail or angle and impress upon the apprentices that they 'must think'. Eventually the apprentices also started to draw and if they wanted to ask or explain something they would draw rather than speak. What cannot be put into words is put into the language of drawing.

Marking of the trade test

The trade test is marked in sections. (See Appendix G for an example of the marking schedule attached to one of the categories below.)

Table 22: The marking categories used in the final trade test

Set out	Cutting List	Carcass	Drawer	Top	Finishing	Completion of job	TOTAL
40	25	75	40	40	30	15	**265**
15%	10%	28%	15%	15%	11%	6%	**100%**

Even candidates who fail the test must pass the setting out stage before they are allowed to proceed. Most of those who fail come short in the work that needs to be done on the top: the making of the side flaps, the fitting and recessing of the hinges and the final assembly. If they take too long to do the setting out, or if they have to go back to look for mistakes, then they do not get to the last stage of the work. They still score marks for partial completion of the model but once they have lost the 15% for the top they may not lose more than 25% in all the other sections, in order to obtain the 60% pass mark.

Table 23: Summary of trade test results in cabinet making for 1999 and 2000

Summary of Trade Test Results for 1999 and 2000 (Cape Town)	
Number of candidates who undertook the test	36
Number of candidates who passed the first time	29
Number of candidates who passed the second time	3
Number of candidates who failed the first time and did not repeat	4

(Information obtained from files at the Furniture Training Board, Cape Town)

Although the trade test is marked strictly in accordance with the requirements of the detailed marking schedule, the implicit criterion of 'readiness' is also applied. Like the master-trainer the assessor judges performance and character as one. Referring to an apprentice who undertook the trade test the previous year, he for instance, said: 'He works like a bomb but he is unreliable' (Field Notes, 28/09/99). According to the assessor he can usually tell by the end of the first day whether a test candidate is going to make it or not. He gets an indication from the sequence in which they tackle the task, from their bodily stance, from the sound of the machine tools and from the way in which they make and position their jigs. Small things such as whether they wipe away the sawdust against the fence of the panel saw (which is set up to measure the size required), show their concern for accuracy.

Extract from Field Notes (45):

The assessor (ASS) called me over as I was walking past the trade test centre. He reminded me that I had asked how he knows that an apprentice will pass or fail. He pointed to the apprentice (identified as AG), who was working in the test cubicle and told me that he was not shaping. He had taken one and a half days to do his setting out, instead of half a day. He forgot to first mark off the 30mm for the overhang and he measured the full 1meter for the carcass. He said he should have sent him home at that point, but he felt sorry for him and decided to let him carry on.

ASS: 'But even if you did not know all that, have a look at what he's doing now. He's working on the table legs, but instead of making a proper jig to hold the leg under the overhead saw, he is using two pieces of masonite. That's not only an unstable jig it is also an unsafe practice. The saw has already pulled the wood out of his hand once.'

JG: 'Yes, I can see what he is doing is not right.'

ASS: 'This is an extreme example but now you know what I mean' (Field Notes, 19/10/99).

On another occasion I asked to see the test results of a woman apprentice who had failed the test. When I added up the marks I realised that the assessor had used the wrong totals and that she could not possibly have failed. I pointed this out. The assessor remarked the test and adjusted the mark from 44% to 58% so that the apprentice still failed. Although this could be interpreted as reluctance on the side of the assessor to admit that he had made a mistake, it was actually a case of him using his overall judgement to override the aggregate of marks obtained in each sub-section. The assessor went to find the trade test piece and showed it to me. He called in two of the master-trainers and asked them to look at the table and say

whether they thought this candidate should have passed. They pointed out the errors and explained that, even though some things had been well done it was clear that the apprentice was not yet ready and that the assessor's overall judgement was correct (Field Notes, 16/08/2000). The use of implicit criteria in conjunction with explicit criteria, as detailed on the marking schedule, thus seems to be an accepted practice, not only during the training period but also in the test situation.

This sense of judgement is not what is required in the evaluation of the recognition of prior learning (RPL), as the following extract shows.

Extract from Field Notes (46):

[While I was sitting in the staff room writing notes the manager of the training centre came in to talk to three of the master-trainers. I asked whether I should leave but he told me it was not necessary. Later he walked over to my desk and explained that they were talking about the new RPL process: JG.]

Mnger: 'I'm trying to explain to the guys that they are used to looking for what's not there. In RPL they must look for what is there. They must look at what the guy can do and then interpret that in relation to the elements in the unit standard. This is a very hard thing for them to do. It means that if a guy can do something he must be credited, even though he may not have been on a course. He doesn't have to wait for four years to become a cabinet maker' (Field Notes, 16/09/99).

Explicit evaluation criteria, as required in RPL assessment, weaken the performance/competence combination described in the previous chapter. Assessors should not look for evidence of a grasp of the relation between part and whole. Evaluation of progress in terms of gradual movement towards 'readiness' is eliminated and credit must be given for every partial operation that is performed. Performance becomes a discrete act that is de-linked from an internalised relational time-space competence.

Visualisation as a substitute for language

The conceptual language provided by Pye and Polanyi allows the trade test to be interpreted as a skilful performance that is crucially based on a subsidiary awareness of an order of relation between parts and whole that is 'instrumentalised' in the body. Through, what can be called *visualisation*, contact is established with what Polanyi calls 'a hidden reality' (1958: vii). Visualisation stands in the place of a non-articulable or ineffable ordering principle to act as a 'glue' that makes all the segments hang together.

Not only a spatial dimension but also a time dimension is crucially dependent on the ability to visualise the relation between part and whole. In the previous chapter it was found that an internalised connection between the different parts of the work process manifests in rhythmical work that does not equate knowledge and skill with timed physical dexterity. If these two findings are put together the 'readiness', to which reference has been made throughout the last few chapters, can be more fully described as the ability to visualise the relationship between part and whole, both in space and in time. This is the crucial competence (or subsidiary awareness) on which craft performance rests. Those who 'copy' from others have not yet acquired the visualisation principle.

Visualisation, as it emerges from the above analysis, is not the same as the process described by Zuboff (1988) - where workers in factories, which have become fully automated, need a mental image to relate the electronic symbol on the computer screen to their real-world experience of the process as it is happening in the plant. Generating an inward image to act as referent for an abstracted process is an act of substitution for that which can no longer be held in the body. Visualisation is not the bringing forth of an 'action context' that is not present. It signifies that which is present but not visible. Modelling of the 'invisible' is the purpose of the asymmetrical relationship between master and apprentice. It is through following the master that the disciplining of the body that is necessary for the acquisition of tacit time-space relations is transmitted. The master models the mutual judgements of hand and eye particular to the craft. Through continually observing the master's modelling practices, a process described by both master-trainer and apprentices as 'stealing with the eyes', apprentices learn to judge their own work and also the quality of work done by others. Once they can do this they have achieved mastery.

Although visualisation has been given a very specific denotation in the above analysis, it is by no means an original term. In a paper that reports on selected aspects of a much larger study that examines the spatial abilities of secondary school biology students, Sanders (2001) refers to various research studies regarding the ability to think in three dimensions as it relates to work in science-related careers, mathematics and engineering. She argues that the construct known as *spatial ability* comprises three distinct and separate skills.

- *Spatial perception* is the ability to look at visual clues and be able to interpret them in the way the artist intended (whether in two dimensions, 2-D, or in three, 3-D). Where visual aids used in the classroom are, for instance, in two dimensions, learners are expected to imagine how the structures depicted would appear in 3-D. Spatial perception is measured by tests of 'Flexibility of Closure', which check the ability to pick out specific images from distracting visual backgrounds.
- *Spatial orientation* involves the ability to imagine moving or turning images in the mind. One is expected not only to be able to 'picture' diagrams in 3-D, but to imagine turning them and viewing them from other angles. An instance of this would be where fresh micro-organisms that are viewed under the microscope are not positioned as they would be in a textbook diagram. Learners need to be able to identify what they are looking at.
- *Spatial visualisation* refers to the ability to perform mental operations on the images, as well as mentally rotate them. The viewer has to be able to imagine doing something to the 3-D image. An engineer may, for instance, need to imagine what the bridge would look like if a strut is moved to a different position (summarised from Sanders, 2001: 211-212).

Lomas (2002) explores the use of visualisation tools in mathematics in relation to a question about the role that visual perception plays in mathematical reasoning. He argues that, in order to reason about abstract geometric objects, we need a way to represent them. Abstract objects cannot be perceived, so it is through perception of a concrete object that conscious information about the shape properties of the abstract object is supplied. Diagrams mimic these shape properties in a significant way. What is perceived is, however, not a type of abstract object, but a concrete object as *an instance of a type* of abstract object. Perception thus acts as 'a surrogate for conscious awareness of shape properties of abstract geometric objects' (2002: 217). This kind of reasoning takes place within the context of having acquired the concept 'abstract geometric object' in the first place, so that the distinction between, for instance, a particular triangle and the universal concept of triangularity is a conscious distinction (Lomas, 2002: 210).

Using the term 'visualisation', which is also used with regard to scientific and mathematical reasoning, in relation to craft is not intended to signify that the master-trainer or the

apprentices reason or work in a way that is analogous to abstract scientific reasoning. This is not what they do. Their reasoning relies on an internalised sense of part and whole that determines what they do with their hands and how they organise their time. Although it is thus possible to establish a surface degree of semblance between what craft workers 'know' through visualisation and the way in which visualisation is used in mathematical and scientific reasoning, there is a crucial difference. The craftsperson has access to the action itself but not to the rules of action that lie in language. The mathematician or scientist, on the other hand, has access to a representation of an instance of an abstract type, but simultaneously also has access to a universal concept, denoted by the type and able to be rendered in symbolic form through words or numbers.

It would be misleading to interpret practical reasoning that relies on tacit knowledge as a restricted form of abstract reasoning. The two are wholly different. From the vantage point of cognitive anthropology Bloch explains the non-linguistic nature of practical knowledge in its own terms, rather than as a 'deficit' modality of the way in which language represents reasoning (1998: 23). Citing various research studies Bloch argues that knowledge organised for efficiency in day-to-day practice is not only non-linguistic but also non-language like, in that it does not take a sentential logical form (1998: 11). When one draws on the realm of bodily experience for heuristic purposes one relies on non-linguistic 'clumped networks of signification' (1998: 23) or 'multiple parallel processing' (1998: 12), which are accessed at a speed not possible in sentential lineal models.

> The core of the approach usually known as connectionism, is the idea that most knowledge, especially the knowledge involved in everyday practice, does not take a linear, logic-sentential from, but rather is organized into highly complex and integrated networks or mental models most elements of which are connected to each other in a great variety of ways (1998: 24).

Bloch stresses the point that language is an inappropriate medium for evoking the multi-stranded organisation of everyday cognition. When we ask people to explain their actions they reinvent 'a hypothetical quasi-linguistic lineal, rational thought process which appears to lead satisfactorily to the conclusions reached' (1998: 23), but it is a *post hoc* rationalisation. What should be considered, he argues, is 'the problem of rendering into a text something which is not a text' (1998: 24) but which is partly visual; partly analytical, although not

necessarily in a way that follows sentential logic; and, partly linked to a set of procedures about what one should do in practice (1998: 8).

The relation between perception and skilful action is of course a major theme in Merleau-Ponty's phenomenology of embodiment, a conceptual language used to frame accounts of skill development such as Hubert and Stuart Dreyfus's (1986) account of the five stages of skill acquisition, from novice to expert; or, Dant and Bowles's (2002) account of how human beings interact with artefacts or objects. As this study employs a predominantly sociological framework the phenomenological tradition is acknowledged, but not explored further.

Implications of tacit knowledge for craft pedagogy

If relations of order between parts and whole, which reside in every diagram or design, are interpreted and realised through visualisation, then it becomes clear why external performance is embedded in a tacit relational understanding of space and time. It is this *tacit knowledge* that is held in the body as an internal competence to provide the basis for the judgement, care and dexterity that characterise workmanship of the better kind.

From this vantage point certain features of craft pedagogy, which have been described in previous chapters, take on a new salience. It stands to reason that a relation between part and whole can only be transmitted if both part and whole is present. Although the trade school was introduced as a substitute for disjointed and fragmented factory practices where novices no longer experienced the full cycle of production activities, a disjunction arose when the trade school curriculum took on a modular competence-based form. The logic of a programme design that divides the curriculum into discrete tasks and elements of tasks following a sequential order is antithetical to the logic of an internally held coherence of which the order of relation is unspecifiable. The master-trainer's modelling of this logic is no longer possible under the pedagogic conditions created by competency-based modular training. Subversion of the formal curriculum is not an act of intentional sabotage, it is simply that master-trainers pass on their craft in the only way they can.

In the trade school workshop apprentices always work on a project or set piece. They need to experience the backward and forward decision-making that characterises labour under the control of the craft worker. This is not conveyed through practising isolated procedures timed according to pre-determined criteria. Although learner guides (a kind of procedural textbook)

are issued for each module, neither master-trainer nor apprentices recognise the procedural instructions that are contained therein, as a representation of the kind of knowledge that constitutes craft. Learning guides are in evidence as an act of genuflecting to the formal curriculum, but they play no substantial part in the instructional process. The stage tests associated with the CBMT process are used, since they are important in terms of the various rates of pay attached to stages of the formal apprenticeship curriculum. They are also considered important milestones in the external progress assessment process, but the evaluation of 'readiness' is not dependent on a test. It is through efflux of time (a term used previously in association with the traditional apprenticeship system as controlled by the craft unions prior to increased state regulation) that 'readiness' or the transition from novice to adept is gradually effected. Master-trainers are able to give a report on the state of readiness of each apprentice under their care at any time, with the test regarded as an important formalising mechanism rather than as the sole determinant of achievement and progress.

Noting these divergences from the formal modular competence-based curriculum is not to imply that master-trainers are intentionally subversive and that the certificates issued at the end of each stage, which reflect the sequence of modules covered in that particular stage, are bogus. Observation showed that formal curriculum aims for each stage are achieved, but not in the manner or sequence prescribed. The crux of the matter is that it is simply not possible to transmit and acquire a tacit knowledge base through a highly specified and procedural curriculum mode.

Summary

This chapter has acted as a bridge between the preceding characterisation of craft pedagogy in terms of the Bernsteinian concepts of classification and framing and a consideration of the knowledge structure of craft in relation to other knowledge forms. The metaphor of 'bridge' is perhaps misleading as, in a certain sense, the chapter occupies a central position in the dissertation as a whole. Whereas the first set of findings related to curriculum structure and the nature of the social order transmitted through a particular set of social relations, the work of this chapter has been to understand the knowledge base of craft in its own terms. The principle of visualisation was formulated as the way in which a subsidiary awareness of an order of relation between parts and whole in both space and time operates in craft practice. This explains why it is that craft knowledge lies outside of language and is often described as a mystery.

An understanding of the internal logic of craft knowledge sheds light on both transmission practice and evaluation practice, thus forging a link between pedagogy and knowledge that makes the metaphor of a 'bridge' an appropriate one to use. Retaining an empirical focus on evaluation practices in cabinet making, the chapter was able to move to a higher level of generality through the theoretical inferences drawn from the work of Pye and Polanyi. What now remains is to establish the relation between the structure of craft knowledge and other forms of knowledge. For this craft needs to be reinserted into its historical position within the social division of labour. This is the task of the next chapter.

Chapter 8: The structure of craft knowledge

Introduction

In this chapter the focus shifts from the empirical site of trade school pedagogy in cabinet making to a higher level of generality. The aim of the chapter is to develop an external language of description or conceptual model that positions craft in relation to other knowledge forms. The data has shown that craft is neither scientific knowledge nor site-specific factory knowledge, although it contains explicit and/or subordinated elements of both. The question that directs the chapter is how to conceptualise the relationship between craft knowledge and other forms of knowledge, while at the same time taking into account the understanding of the tacit nature of craft knowledge developed in the preceding chapter. It is only when craft knowledge can be placed in relation to other specialised forms of knowledge that its pedagogy can be compared to and interpreted in relation to pedagogies that are connected to other knowledge forms.

The chapter starts with a consideration of the conceptual vocabulary (or internal language of description) introduced in Bernstein's later work on vertical and horizontal discourses and knowledge structures. Despite craft knowledge not enjoying significant attention in his work Bernstein is one of the few theorists who positions craft in relation to other knowledge forms. At the same time his positioning of craft poses a puzzle. Craft displays all the features of what Bernstein terms a 'horizontal discourse', yet is positioned in 'vertical discourse'. The model developed in the chapter confirms this positioning but employs a conceptual language more directly connected to the findings of the previous chapters. The model also shows how it is possible for practices that are context-bound to generate a restricted form of context-independent meaning.

Bernstein on knowledge structure

The pedagogic discourse of craft as a manual practice, understandably, does not feature centrally in Bernstein's work. In the last note on the last page of *Class, Codes and Control, Volume 4* he refers to manual pedagogic discourse as a way of testing whether the rules of the pedagogic device can be applied to pedagogic discourses that fall outside what he calls 'official pedagogic discourse of the European modality' (1990:217-218). Referring to

medieval guild-regulated acquisition of manual skill he notes how, in the university and guild of the medieval period, the distributive rules select those who produce the discourse and who regulate the 'unthinkable'. Those who produce the discourse are also the recontextualisers who control the pedagogic discourse of transmission and regulate the content and stages of apprenticeship. They also regulate the evaluative rules of the pedagogic practice.

In his later work Bernstein (1996, 1999, 2000)[39] distinguishes between two forms of discourse from which meanings derive. He argues that these two forms are generally seen as oppositional rather than complementary and are usually ideologically positioned, receiving different evaluations. One form is seen as a destruction of the other, or one form is 'romanticised as a medium celebrating what the other form has lost' (1999: 157-158). This occurs when an oral form of knowledge is contrasted with a written form; or, in the educational context, when everyday common-sense knowledge is contrasted with school(ed) knowledge; or, when 'local' knowledge is contrasted with 'official' knowledge. Bernstein is critical of such stereotypical oppositional depictions but, rather than moving towards complementarity or 'equivalence', he moves to greater differentiation by strengthening the differences between opposing discursive forms, which he names horizontal and vertical discourse. Central to this reasoning is a structural distinction between meanings generated through every-day experience and specialised meanings only available to those who have mastered the principles that organise such symbolic meaning.

[39] The page numbers used here cite the 1996 and 1999 texts. Although the 2000 text encompasses both these publications the earlier texts are used as they contain 'Notes' that pertain particularly to craft.

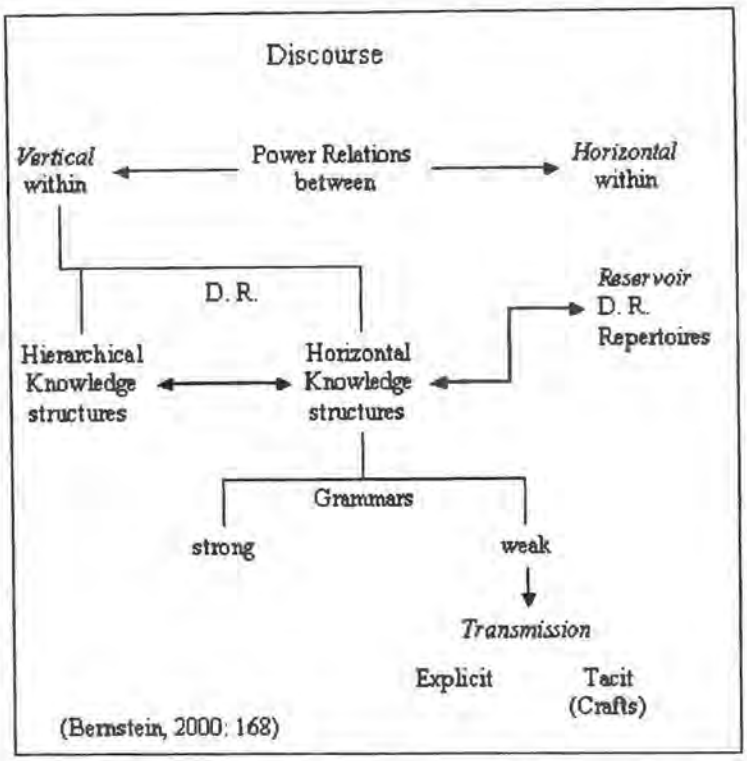

Figure 5: Bernstein's representation of the distinction between horizontal and vertical discourse

Horizontal discourse is described as follows:

> We are all aware and use a form of knowledge, usually typified as everyday or 'common sense' knowledge. Common because all, potentially or actually, have access to it, common because it applies to all, and common because it has a common history in the sense of arising out of common problems of living and dying. This form has a group of well-known features: it is likely to be oral, local, context dependent and specific, tacit, multi-layered and contradictory across but not within contexts. However, from the point of view taken here, the crucial feature is that it is segmentally organised (1999: 159)

When knowledge is distributed *segmentally*, each segment of meaning relates to a particular context. The meaning of one segment is not dependent on the meaning of another segment (e.g. learning to tie one's shoe laces bears no necessary relation to learning to use the telephone). Meaning is wholly dependent on the evoking context in which culture specialises and differentiates activities and practices.

Vertical discourse, by contrast, requires systematic ordering principles for the generation of meaning. When knowledge moves from the place where it was originally produced (in the laboratory or workshop) to an abstracted context (the textbook or learning manual) it takes on

a context-independent meaning. The 'bits' fit together in a time and space not given by a specific context. School science is, for instance, very different to the work that takes place in a science laboratory.

So how is context-independent meaning produced? One way is through what Bernstein calls a vertical knowledge structure, where general propositions and theories integrate knowledge at lower levels into a higher level in the hierarchy (as in the natural sciences). Acquirers (those who are learning to speak and 'do' physics, for instance) do not experience the passage from one theory to another as a break, but simply as an extension of the explanatory or descriptive powers of physics (Bernstein, 1999: 164).

A second way is where knowledge structure is horizontal, taking the form of a series of specialised languages that lie next to one another (as in the social sciences and humanities). Here one may think, for instance, of the specialised languages of sociology (Bernstein, 1999: 162). These languages are organised through a 'grammar', which can be either strong or weak. If we interpret 'grammar' as the structure of relationships between words in a language it becomes clear that the idea of a grammar signifies the existence of a set of rules or principles which regulate the relationship between different 'bits' in a meaning structure. Where the grammar is strong the rules of combination are explicit; conversely, where the grammar is weak the rules of combination are implicit or even tacit.

In all forms of vertical discourse there is always a principle for the ordering of meaning. Bernstein (1999: 164) calls this a *principle of recontextualisation*. Without a systematic way of relating the 'bits', which carry different time-space relations, it is not possible to produce coherent meaning. Muller explains this in a slightly different way when he says that 'competent members [of vertical discourse] can give an explicit account of the way in which they have arrived at a specific position; they can re-trace their steps and show how they have made the recontextualised objects "hang together"'(Muller, 2000: 84).

Whether through a hierarchical principle of integration or through a grammar, which regulates how meanings combine, vertical discourse (specialised knowledge) always requires a sequencing and coherence not given by the context in which the knowledge operates. The diagram below, which depicts how horizontal and vertical discourses are differently

organised, is an adaptation of Bernstein's diagram (2000: 168) reproduced earlier in the chapter.

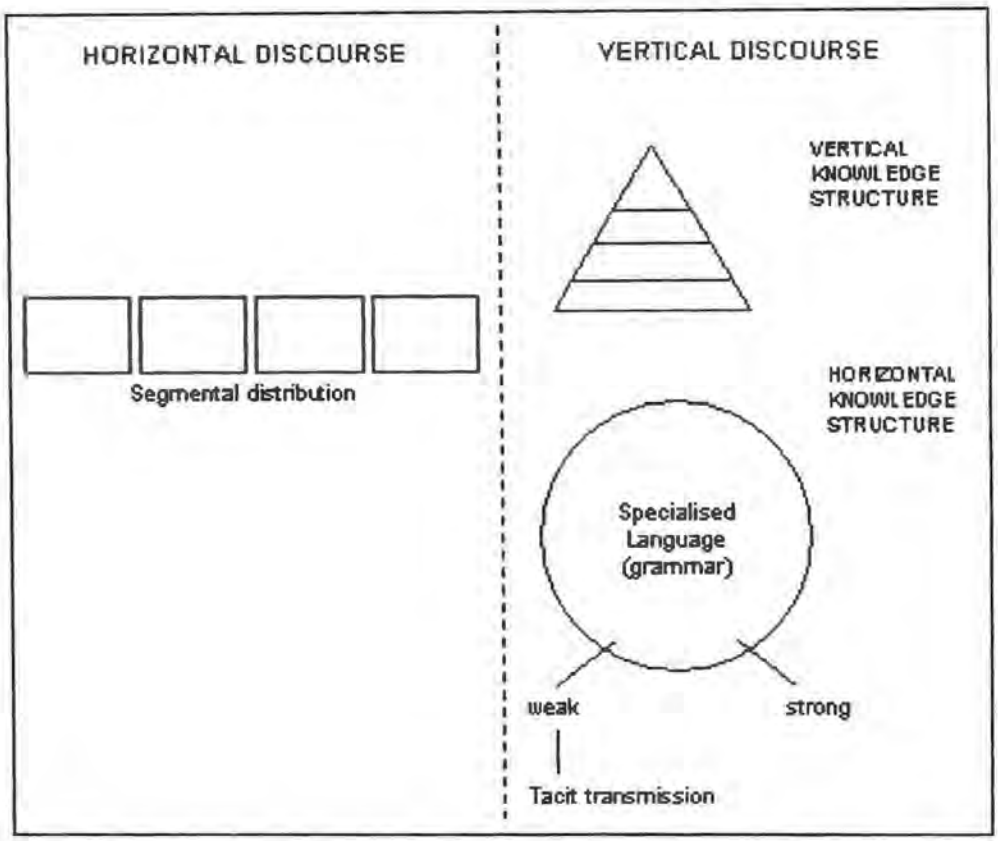

Figure 6: A graphic representation of ways in which horizontal and vertical discourses are differently organised (an adaptation of Bernstein, 2000: 168)

Bernstein positions craft as a modality of *vertical discourse*, characterised by a horizontal knowledge structure with a weak grammar and tacit transmission. Tacit transmission is described as one where showing or modelling precedes 'doing'. He places craft *'as a horizontal knowledge structure nearest to horizontal discourse, emerging as a specialised practice to satisfy the material requirements of its segments'* (1999: 168, italics added).

This positioning of craft has to be understood in relation to both horizontal discourse and vertical discourse. In horizontal discourse there is no relation of necessity between one segment and the next. There is no particular order of meaning (no recontextualising principle). No further elaboration is necessary or indeed possible.

> These meanings are so embedded in the context that they have no reference outside that context. These meanings are not simply context dependent, they are necessarily context

> bound: and meanings which are context bound cannot unite anything other than themselves. They lack the power of relation outside a context because they are totally consumed by that context (Bernstein, 1996: 44).

In vertical discourse there is an indirect relation between meanings and a specific material base. The meanings in vertical discourse relate two worlds: a material world and an immaterial world to create specialisation of meaning.

> In this sense, the meanings which create and unite two worlds must always be meanings where there is an indirect relation between these meanings and a specific material base: there is a specific social division of labour and a specific set of social relationships within that division of labour.
>
> If these meanings have an indirect relation to a specific material base, the meanings themselves create a gap or space. If meanings are consumed by the context and wholly embedded in the context, there is no space. But if these meanings have an indirect relation to a specific material base, because they are indirect, there must be a gap. Intrinsic to these meanings is the potential of a gap (a space), which I will term a potential discursive gap. It is not a dislocation of meaning, it is a gap (1996: 44, original emphasis).

For Bernstein the discursive gap is the 'crucial site of the *yet to be thought*' (1996: 44, original emphasis). The discursive gap always allows more than current hegemonic realisations or what Bernstein calls 'the possibility of the impossible' (1996: 43). Further elaboration is always possible: more work can be done; inferences can be drawn because there is a forward projection towards an order more 'ideal' than the one at hand.

The notion of the 'ideal' can perhaps be better understood if we follow Muller back to Durkheim, a major theoretical resource for Bernstein. Durkheim finds the principle, for the ordering of social representations in non-empirical, formal ways, in the faculty of 'idealisation'.

> Durkheim means at least two things with this faculty of idealisation. The first is clearly the purely cognitive or speculative sense of being able 'to connect things with each other, to establish internal relations between them, to classify them and to systematise them'. The second is that of forward projection towards an order and a world more desirable, more felicitous, more powerful - in a word, better - than the one we have in hand at any specific point in history.

> Durkheim thus plays upon the double sense of ideal: ideal first as the facility to manipulate objects and relations in non-empirical space - in thought, as he says; ideal secondly as the projection into and towards that which is more desirable. Both together allow us to break with empirical facticity and to imagine an ordering of objects that is 'logical' and 'hierarchical'. This is a key feature of virtual connections that allows, as Foucault says in a related idiom when discussing disciplinarity, 'the possibility of formulating new propositions, ad infinitum' or as Hacking says when discussing styles of reasoning to 'generate new classes of possibilities' (Muller, 2000: 78, references to other authors that appear in the cited text have been omitted).

What Muller calls the 'faculty of verticality' (2000: 88), a term deduced from Bernstein and explained elsewhere by Muller as 'the cognitive ability to manipulate knowledge objects in virtual space', or 'the ability to move between subordinate and super ordinate levels of classificatory abstraction' (Muller, 2002: 182), is thus the essential characteristic of vertical discourse, whether the knowledge structure is hierarchical or horizontal. By positioning craft knowledge within vertical discourse, Bernstein is, by definition, according craft the capacity of realising context-independent meanings, even though craft is described as lying very close to horizontal discourse.

In his 1996 discussion of horizontal and vertical discourse Bernstein elaborates on craft as a horizontal knowledge structure.

> 'Crafts' are clearly specialized knowledges with their own mode of transmission. I would regard any one craft as horizontal in structure. The various styles could be regarded as analogous to the set of languages within any one academic horizontal knowledge structure. 'Craft' knowledge is a practical mastery over materials according to a functional concept or image entailing shaping or carving some form of skilled manipulation. Clearly the label given to such an activity depends upon the classificatory procedures of a given culture. 'Crafts' are often acquired through apprenticeships where mastery is more a tacit achievement than a consequence of an explicit pedagogy. This suggests from the point of view of this paper that 'crafts' could be regarded as *tacit* horizontal knowledge structures (1996: 181, *Note 5*, original emphasis).

Bernstein is quoted at length on tacit knowledge structure, as well as on tacit transmission, as it is necessary to establish a clear distinction between these two phenomena. Dowling's depiction of craft, displaying what he calls 'low discursive saturation' (1998:30), explains

why craft is transmitted through modelling rather than through explicit teaching but not why craft is attributed with having a knowledge structure. Craft seems to belong in horizontal discourse. Even though it is a specialised practice craft is clearly context-bound in both its transmission and its realisation. One cannot acquire a craft other than by 'doing'. However, Bernstein's positioning of craft in vertical discourse signals the presence of a recontextualising principle that comes from outside a specific object or context. In this sense craft meanings must, by implication, be context-independent, although bound to the context constituted by the specialised relationship between work process, materials and tools discussed in chapter 4. When Bernstein argues that transmission through modelling leads to the acquisition of a restricted code, albeit one where 'the ultimate display is a part of the discourse of an elaborated code modality' (1996: 191), he is clearly referring to this apparent anomaly.

This anomaly can only be understood by a more detailed exploration of the internal structure of tacit knowledge, thereby establishing a finer distinction between 'context-bound' and 'context-dependent'. In order to do so it is necessary to move away from Bernstein's language of description. Specialised academic languages in sociology, his main example of a horizontal knowledge structure, are too far removed from the labour of the hand to enable easy transposition or 'analogy'. Craft needs be removed from the realm of 'words' where it clearly does not belong and placed it in its own setting, on the manual side of the structural divide between the labour of the head and the labour of the hand that extends throughout the history of society.

The problem with locating the 'tacit' in 'discourse'

Bernstein's language of description is premised on a structural distinction between the empirical and the non-empirical, or context-dependent and context-independent meanings. In this he expresses Durkheim's fundamental distinction between worlds sacred and profane (Durkheim, 1995; Muller, 2000; Young, 2002).

> Emile Durkheim is the exemplary sociologist of the boundary. Taking as his focus 'primitive culture', systems of classification in premodern society, Durkheim set out to construct a way of grasping the fundamentals of cultural classification – the why and the how of boundary instantiation. In *The Elementary Forms of Religious Life*, he famously draws a distinction between two orders of existence which relate thought and practice in two fundamentally different ways. The first order is the everyday world of 'sensual representation', the world of

> matter and sense, where meanings arises directly out of bodily encounters with the world, with other people, with reality. It is a world of flux and particulars, and it is driven by the most practical and direct wisdom: proverbs, prudence, street lore, on-the-job knowledge, the rhythmic language and wisdom of the domestic community. Schutz would characterise this as the world of the 'natural attitude', Geertz as common sense as cultural system. For Durkheim this was the profane world.
>
> The second order is the religious world, one of prescriptions and interdicts that are not pragmatically modifiable but are 'fixed and crystallised', 'immutable'. This sacred world is an order of verities not originating in bodily hexis and it is therefore arbitrary, in Pierce's sense of the unmotivated: taboos, explains Durkheim can be attached to any object. The religious world is thus a world of arbitrary conceptual relations, a symbolic order constructed by an accretion of 'collective representations' that are a collective accomplishment, the 'work of the community' in contrast to the 'sensual representations' of the everyday world that are the work of continually changing experiential particulars (Muller, 2000: 77-78), references to other authors that appear in the cited text have been omitted).

For Durkheim both religion and science are sacred modes of cognition, with disciplinary specialisation 'a defining instance of the division of labour' (Muller, 2000: 79).

Durkheim's 'sacred' and 'profane' become vertical and horizontal discourse in Bernstein's language. Discourse is a contested term in academic literature and the theoretical antecedents upon which Bernstein draws in his use of the term do not emerge clearly in his writing. He acknowledges the influence of Foucault but emphasises that his focus is very different (Bernstein, 1990: 165); also that of Vygotksy and Luria (Bernstein, 2000: 145, 177). Luria's distinction between 'graphic-functional knowledge' and 'theoretical knowledge', as the forms of cognition associated with the social relations (either individualised or collectivised labour) and cultural practices (either non-literate or literate) of primitive and advanced societies (as summarised in Brown and Dowling, 1998: 22) seems particularly pertinent. Durkheim's own distinction between relations of 'similar to' and 'different from' that emanate from the different social bases of mechanical and organic solidarity in a simple and complex division of labour in society, is similarly present, as it is indeed throughout Bernstein's work[40].

[40] See for instance Bernstein's explanation of the origins of the concepts of instructional and regulative discourse (Bernstein, 1990: 210 – 212).

In non-specialist terms 'discourse' is defined as 'the process or faculty of reasoning; an exchange of words; conversational power; an account; a narrative; a formal discussion of a topic in speech or writing; a connected series of utterances' (The New Shorter Oxford English Dictionary, Fourth Edition, 1993: 688). With language as the central thread that runs through both specialised and non-specialised interpretations of discourse, a distinction between 'context-dependent' and 'context-independent' meanings that is expressed in discursive terms is inextricably imbued with language. Knowledge that lies outside of language cannot but occupy a deficit position, nor can it avoid an association with a state of being non-literate and unable to express what is known in symbolic form.

The above discussion, while not extensive, nevertheless signals the paradox that is inherent in Bernstein's positioning of craft within a framework that aims to establish a strong boundary between what Bernstein calls the 'uncommonsense knowledge' transmitted in educational institutions (vertical discourse) and the common sense knowledge of the everyday (horizontal discourse).

> In a sense educational knowledge is uncommonsense knowledge. It is knowledge freed from the particular, the local, through the various languages of the sciences or forms of reflexiveness of the arts which make possible the creation or the discovery of new realities (Bernstein, 1975: 99).

Even though differently specialised consciousness (or subjects) is reproduced by horizontal and vertical discourse, the link between thought and language is clearly present in both. It is, however, precisely this link that is problematic for the representation of tacit knowledge. For this reason the framework that is developed in this chapter takes Sohn-Rethel's historical-materialist distinction between intellectual and manual labour as the conceptual basis of reasoning. The intention is to develop a conceptual model, or external language of description, that allows the empirical findings of the research study to be translated into a theoretical object. A resolution to the apparent paradox of craft's position in vertical discourse is a key aim.

Methodological approach

The conceptual model developed in this chapter employs a form of network analysis (Bernstein, 1996; Brown and Dowling 1998) to establish a relation between concept

variables. The logic applied derives from Abbott's argument that cultural and social structures in general have what he calls 'a peculiar property' in common, namely that of self-similarity. Abbott argues that self-similarity is a 'fundamental modality of structure in human affairs' and 'no matter at what level we inspect them we find the same pattern repeated' (2001: xv) so that 'the relation of the general terms is recapitulated in the specific ones' (2000: 9).

In accordance with Abbott's logic of self-similarity, historical-empirical data is used to establish a structural distinction between empirical and non-empirical meaning generation and to set up the second level of fractal elaboration that recapitulates this distinction. A third level at which the initial fractal repeats itself is introduced by using theoretical material drawn from Pye's (1978) consideration of the nature of invention and design. It is at the third level of elaboration that the findings presented in the previous chapters find their connecting point.

A conceptual model for understanding craft as knowledge form

First fractal

When Sohn-Rethel (1978) traces, in historical materialist terms, the emergence of abstract thought and the conceptual foundations of science, or what he calls the division between intellectual and manual labour, he, too, sets the everyday and the esoteric apart as being fundamentally different in kind. His major premise is that 'intellectual [labour] in separation from manual labour arises as a means of the appropriation of products of labour by non-labourers – not originally as an aid to production' (Sohn-Rethel, 1978: 90).

Sohn-Rethel's larger intellectual project is not explored here. What is of importance is the supporting historical evidence he presents to express the distinction between manual (context-bound) and intellectual (context-independent) labour in epistemological terms. In Sohn-Rethel's account the manual operation of measurement as approximation was present in the Bronze Ages. At this time the 'harpedonapts', the field measurers of Pharaoh's tax officials, used a rope to measure out the re-partitioning of the soil when the river Nile subsided after the yearly floods, in order to determine the peasants' tributes for the coming year. This exercise in 'geometry' produced highly accurate approximations, but approximations never the less. The manual 'skill' of measurement could be carried out only

by 'those apprenticed to do it and practised in it and only at the particular spot where the need for measurement arose (1978: 101).

> Divorced from this it had no point. Neither did it leave behind any detachable demonstration of its geometric content. After each action of measurement, each 'measure', the rope was moved on from one position to another so that such a thing as a direct 'geometrical demonstration' never came into question. The geometry inherent in the task at hand extinguished itself in the practical result, which was only ever applicable to the case in point (Sohn-Rethel, 1978: 101-102).

It was the Greeks[41] who, in the sixth century B.C, subordinated manual operations of measurement to an act of pure thought, 'which was directed solely towards grasping quantitative laws of number or of abstract space', with their conceptual content 'independent not only from this or that particular purpose but from any practical task' (Sohn-Rethel, 1978: 102). The geometry of measurement became something quite different from measurement itself. Geometry was 'a deductive thought structure ... committed to nothing but itself' (1978: 103).

> What defines the character of intellectual labour in its full-fledged division from all manual labour is the use of non-empirical form abstractions, which may be represented by nothing other than non-empirical 'pure' concepts (Sohn-Rethel, 1978: 66)

For Sohn-Rethel 'pure mathematics' constitutes the unbridgeable dividing line between 'a context of thought and human action' (1978: 112); thus setting in place a fundamental structural distinction between forms of knowledge. To illustrate the impermeability of this divide Sohn-Rethel refers to Albrecht Dürer's failed attempts in the sixteenth century to combine workmen's practice with Euclidean geometry in order to make available to artisans mathematics as a means of preserving the unity of hand and head. Despite all Dürer's efforts the mathematical understanding demanded from the apprentices and craftspeople of his time fell too far outside their ways of comprehending and doing (1978: 113-116).

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[41] Durkheim's examination of the organisation of knowledge in the medieval university concerns the later recontextualising of Greek thought by the Christian Church (discussed in Bernstein, 1990: 50-151; 2000: 81-86).

This account conceptualises the fundamental distinction between different knowledge forms as the distinction between the 'general', or that which is deduced through non-empirical reasoning and the 'particular', or that which is bound to a material interchange with nature.

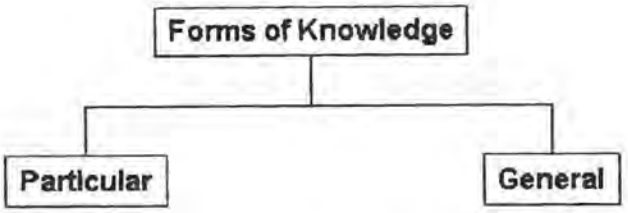

Figure 7: The first fractal distinction in a conceptual model of forms of knowledge

Craft's position on the 'particular' side of this divide is unambiguous and presupposes a unity of head and hand that constitutes human labour as a purposeful activity. In this Sohn-Rethel follows Marx, whose famous passage he cites to make the point.

> We presuppose labour in a form in which it is an exclusively human characteristic. A spider conducts operations which resemble those of a weaver, and a bee would put many a human architect to shame by the construction of its honeycomb cells. But what distinguishes the worst architect from the best of bees is that the architect builds the cell in his mind before he constructs it in wax. At the end of every labour process, a result emerges which had already been conceived by the worker at the beginning, hence already existed ideally (Marx 1976: 283-284, also cited in Sohn-Rethel, 1978: 84-85).

What is particularly important in Sohn-Rethel's argument is that the later technical division of labour between what he calls the 'technical and organisational intelligentsia and the manual work-force' (1978: 157), a social development which established managerial authority over the monopolistic labour process, is not to be confused or assumed identical with the fundamental epistemological division between intellectual and manual labour dating from classical antiquity.

Second fractal

The empirical/non-empirical dichotomy is repeated in Zilsel's (2000) study of the later genesis of science as a sociological phenomenon. Zilsel argues that comparison of analogous

phenomena is virtually the only way to investigate complex intellectual constructs both sociologically and causally[42].

Referring to the period 1300 to 1600 and the emergence of early capitalism in Europe, Zilsel distinguishes three strata of intellectual activity, namely: university scholars, humanists and artisans. At this time a social barrier separated the two components of scientific methods. Logical training was reserved for upper-class scholars (professors and humanistic literati) while experimentation, causal interest and quantitative method were left to lower-class artisans. Science was born when, with the progress of technology, the social prejudice against manual labour was eventually overcome and the experimental method was adopted by rationally trained scholars. Deductive and inductive methods of investigation became positioned in a collateral relationship to constitute modern science, as we know it today.

This historical exposition allows the introduction of the next fractal distinction on the side of the general. Instead of talking about knowledge produced through deductive and inductive investigation the terms 'principled' and 'procedural' are used to describe collateral knowledge relations.

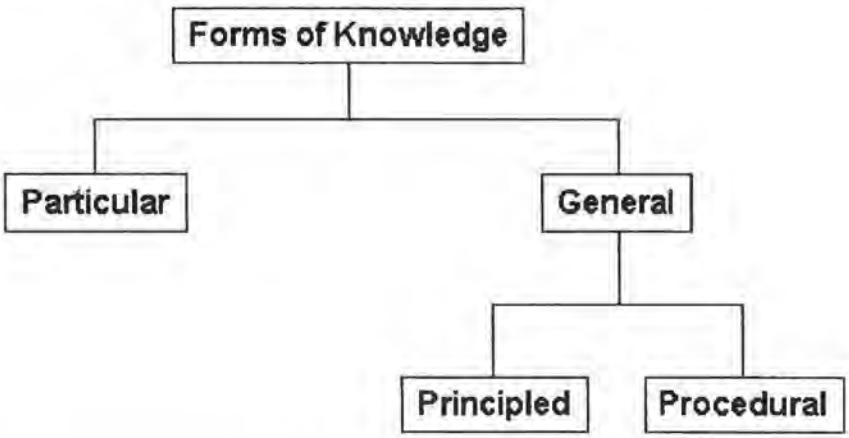

Figure 8: A partial representation of the second fractal distinction in a conceptual model of forms of knowledge

[42] Zilsel's aim is not to establish Western civilization as the natural peak of human evolution. He makes continual reference to the development of certain stages of the scientific spirit in various other civilizations to point out how amazing it is that fully developed science appears once only, in a certain period and under special sociological conditions.

There is a relation between the way in which the terms 'principled' and 'procedural ' are used here and the way in which Dowling (1998) uses the terms 'principling' and 'proceduralizing', as instances of abstracting and particularising distributing strategies in school mathematics. In the production of scientific knowledge itself principles and procedures are in a complementary relation. They become oppositional, as Dowling shows, when they are split to evoke different distributing strategies.

Abbott's principle of self-similarity should now logically allow a repeat of the same fractal distinction on the 'particular' side of the first fractal. Evidence that corroborates this move is found in the separation of the personal unity of head and hand, as a *leitmotif* in labour process literature, first developed by Marx and later renewed by Braverman (1974). It is, however, Lucie-Smith (1981: 138) who shows *how* it became possible for the nature of craft to be irrevocably changed. Two inventions brought about a reordering of the time-space relations within craft. After the invention of the mechanical clock, craft activities began to be costed according to the precise amount of time they consumed. When the introduction of movable type revolutionised printing, printed books and plans enabled conception to be separated from execution, thereby allowing craft to be inserted into commoditised market relations of industrial modes of production.

> In a broad sense printing was important because it tended to standardize ideas – to provide a focus for the way in which reality was perceived as well as immensely speeding up the communication of those perceptions. In the craft field, the introduction of printed pattern-books, something which belongs to the sixteenth rather than the fifteenth century, had the effect of removing the craftsman's full independence, his freedom to invent his own forms and impose his own solutions on his chosen material (Lucie-Smith, 1981: 138–139).

The personal unity of head and hand, had always been 'knowledge of how one *does*', conveyed by demonstration, modelling and repetition. Now a knowledge of 'how one *explains* things' (Sohn-Rethel, 1978: 112) could circulate easily, allowing work of the hand to be set out in procedural terms, a process accelerated by a new consciousness of time and its value. The internal habit of order was replaced by an external synchronisation of human actions, later taken to drastic extremes in the time and motion studies conducted by Frank Gilbreth, a prominent follower of F. W Taylor. Braverman argues that Gilbreth's classification of body motions into 'therblig charts' (his own name spelled backwards) abstracted labour from its concrete qualities and reduced it to standardised motion patterns so

that it could be used as interchangeable parts in the production process. (Braverman, 1974: 181-182. In this way labour could become standardised and therefore universal.

We are now in a position to complete both sides of the second fractal.

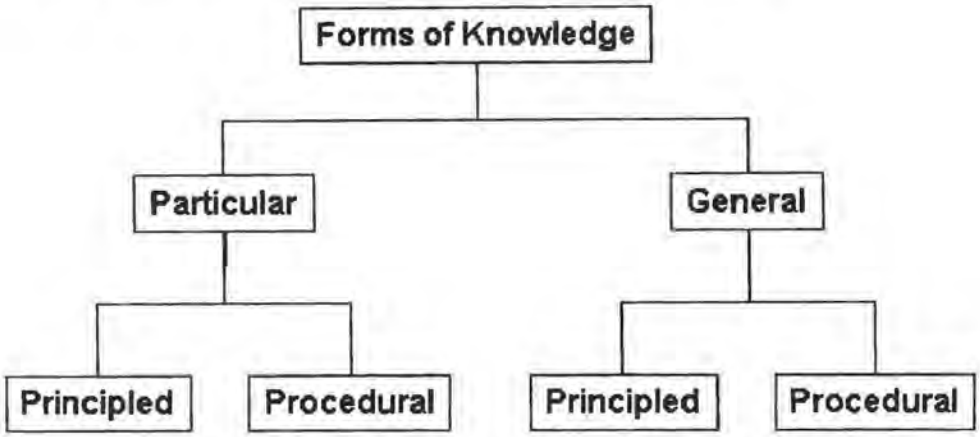

Figure 9: A representation of forms of knowledge elaborated to two levels

Third fractal on the 'particular' side

The notion of 'particular principled knowledge' appears self-contradictory. Principles, by their very nature, refer to reasoning at the level of a class of systems, or at the level of abstract generalisation not tied to the empirical. How is it then possible to talk about a particular principle? It is David Pye's (1978) conceptualisation of design and making as specialised human activities, informed by both art and science, that provides the explanation. Pye is concerned with the design of things for use, or what he calls 'devices ... intended to get some result that was not there before' (1978: 15). For the purposes of his argument buildings, ships, vehicles, tools, furniture, clothes and so forth fall into this category, but things designed solely for contemplation, such as paintings and statues, are excluded.

Pye's examination of what he calls the 'essential principle of arrangement' that is embodied in every invention, design and making of a device, is based on a view of workmanship as an extension of design. Pye argues that 'it is never easy to say where workmanship begins and design ends, for the simple reason that workmanship is design' (1978: 79). In his view 'to achieve anything worthy to be called quality you will have to do a good deal more than following a drawing or specification, whoever made them and however carefully' (1978: 80). This does not, however, mean that Pye is denying the structural difference between

intellectual and manual labour. From his perspective it is the 'prepared mind' (1978: 65) that is able to abstract a class of result from particular objects and to see the analogies between results (1978: 60) that is required for invention.

> Although in many fields designers quite frequently make inventions, designing and inventing are different in kind. Invention is the process of discovering a principle. Design is the process of applying that principle. The inventor discovers a class of system – a generalisation – and the designer prescribes a particular embodiment of it to suit the particular result, objects, and source of energy he is concerned with.
>
> The facts which inventors discover are facts about the nature of the world just as much as the fact that gold amalgamates with mercury. Every useful invention is a discovery about the way that things and energy can behave. The inventor does not make them behave as they do.
>
> 'A system of this kind' means 'this way of arranging things'. There is a principle of arrangement underlying each class of device (Pye, 1978: 21).

An 'embodied principle of arrangement' manifests in two forms: in discursive form and in diagrammatic or visual form. Pye offers an illustration of how an inventor might describe a principle of arrangement.

> If you have a wheel, and if at any place except the centre you fix to it a pin standing at right angles to the plane of the wheel, then (provided always that a system is properly designed) the wheel can be turned by the piston rod of a reciprocating engine. It must be linked to the piston rod by a connecting rod, which is longer than the distance from the wheel to the crank pin. One end of the connecting rod must be hinged to the piston rod so that it is free to swing, and the other end must be pivoted on the pin so that the pin can rotate freely in it (Pye, 1978: 21).

The point to be illustrated is that such a description of an invention, for converting reciprocating motion into rotary motion, covers almost every conceivable instance of the device and it does so by describing the essential principle of the device as a generalisation. A diagram, on the other hand, represents one particular embodiment of the invention.

> It is really rather remarkable that, while anyone can tell whether a thing is a pocket-knife, because, presumably anyone can recognise the principle of arrangement which constitutes the similarity between all pocket-knives, no one can visually abstract that arrangement. We recognise it when we see it embodied, we can describe it disembodied, but we cannot visualise it disembodied (1978:22).

An essential principle of arrangement, whether generally described in words or visualised in the particular, constitutes similarity at the level of 'class of device' and not at the level of 'token' or 'instance'. While the designer prescribes a particular embodiment of that principle in relation to particular results, materials and sources of energy and the maker gives realisation to the principle in the construction of the particular item or device, the interpretation required is nevertheless at the level of generalised 'class' or 'type'. Given that the maker grasps the principle in visual form, the abstract nature of the principle is not manifest. For Pye this is not 'seeing' in the ordinary sense of the word, it is an act of interpretation that is wholly different from what he calls 'the utilitarian perception of everyday life' (1978: 117). What is 'seen' is not only the features of an object but also the relations between them, in other words, the *principle* of arrangement.

It is this same principle of arrangement to which Polanyi refers in the following extract:

> The medical student first learns a list of bones, arteries, nerves and viscera, which constitutes systematic anatomy. This is hard on the memory, but mostly presents no difficulty to the understanding, for the characteristic parts of the body can usually be clearly identified by diagrams. The major difficulty in the understanding, and hence in the teaching of anatomy, arises in respect to the intricate three-dimensional network of organs closely packed inside the body, of which no diagram can give an adequate representation. Even dissection, which lays bare a region and its organs by removing the parts overlaying it, does not demonstrate more than one aspect of that region. It is left to the imagination to reconstruct from such experience the three-dimensional picture of the exposed area as it existed in the unopened body, and to explore mentally its connections with adjoining unexposed areas around it and below it ... [Once this topographic understanding is achieved, the medical student] could derive an indefinite amount of further and new significant information from his understanding, just as one reads itineraries from a map. Such processes of inference, which may involve sustained efforts of intelligence, are ineffable thoughts (1958: 88-89).

The notion of 'embodied principles of arrangement', which manifest in either discursive (general) or diagrammatic (particular) form, allows the fractal logic to be recapitulated at a third level on the 'particular' side of the network.

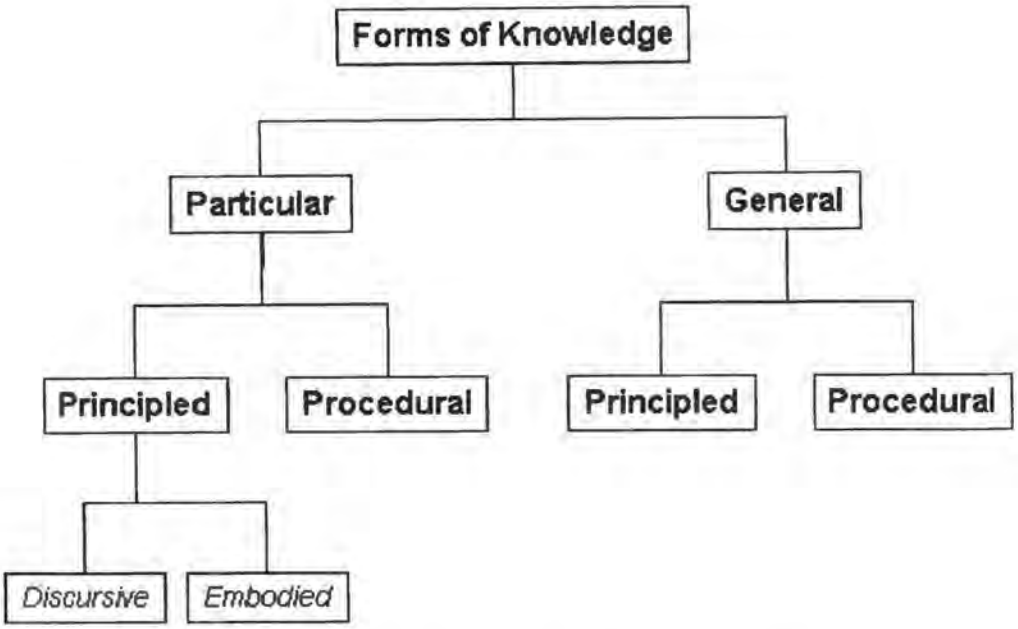

Figure 10: A conceptual model of general and particular forms of knowledge

This logic positions craft as *a particular form of embodied, principled knowledge*, thus allocating to craft a feature that is shared with other kinds of principled knowledge, namely that its procedures can only be understood if 'interpreted' through a principle. Just as procedures on their own turn into algorithms in mathematics (Dowling, 1998) and science (Hodson, 1992), principled knowledge is destroyed when craft becomes diluted and fragmented into discrete operations, performed by separate workers in mass production processes. This is what has happened to much of the knowledge derived from job and task analysis as basis for the specification of performance standards in countries where standards-based approaches to curriculum have been adopted. The result has been over-specification at the procedural level of 'underpinning knowledge' (in Britain), or what is called 'essential embedded knowledge' (in South Africa). Young, for instance, argues that 'underpinning knowledge'

> often takes the form of lists of topics which either amount to little more than what anyone would know after a few weeks in a workplace (as in the case of sectors like retail and distribution), or include a combination of everyday workplace knowledge (what tools are needed or where to find a file) together with some scientific or highly technical topics such as lenses or transistors with little idea as to what depth they should be studied (Young, 2001: 9).

Alternatively, the assumption is made that the only knowledge that counts is that which can be seen in performance (Barnett, 2002), or that 'manual skill' relates to dexterity only and not to knowledge or mental activity. What is missing from such assumptions is the personal unity of hand and head exemplified in craft.

Relation between the model and the empirical findings

The conceptual model developed in this chapter constitutes an external language of description arrived at through a deductive logic that took Abbot's principle of self-similarity of social structures as the basis of reasoning. The puzzle that had to be solved was the apparent paradox of Bernstein's positioning of a clearly context-bound practice, such as craft, in vertical discourse. Choosing a different yet homologous starting point and employing a range of theoretical resources, a model elaborated to three self-similar fractal levels was developed. This model introduces a conceptual vocabulary that describes craft knowledge as a particular form of embodied, principled knowledge and shows how a restricted form of context-independent meaning can be generated through a context-bound practice.

The findings of the previous chapter can now be 'read' in this vocabulary, so that the part-whole relation, which is grasped through the act of visualisation, becomes a principle of arrangement, which manifests in particular rather than in abstract form. It is the interpretation of this principle that requires more than procedural expertise. Performance needs to be embedded in an internally held time-space relation that represents personal unity of head and hand. From this vantage point it is not surprising that historical documents depict craft knowledge as knowledge held collectively but acquired as the property of an individual and lodged within a specific occupational identity.

> ... when a man has spent years in acquiring a perfect knowledge of his trade, such acquisition becomes his personal capital as much as the gold and silver he carries in his pocket (Extract from a document of the Boilermaker's Society when its members were contemplating the influx of unapprenticed labour in the early 1870s, in McClelland, 1987: 191).

Bernstein's positioning of craft reconsidered

Apart from providing an explanation for the findings of the study the model is able to show why Bernstein positions craft in vertical discourse. The particular mode of recognising and

realising, or the 'gaze' embedded in the tacit acquisition of one of the specialised languages of a horizontal knowledge structure with a weak grammar (Bernstein, 2000: 165), is also present in craft, albeit in restricted form. Visualisation, as it has been used in this study, is analogous to 'gaze', but more specialised than the 'way' of realising cultural realities which Bernstein attributes to horizontal discourse. Referring to the resemblance between horizontal knowledge structures and horizontal discourse, Bernstein argues:

> Acquisition of *Horizontal discourse* is a tacit acquisition of a particular view of cultural realities, or rather of a way of realising these realities. The 'way' itself is embedded in the unity latent in the contextual segmentation of this discourse. The 'way' may be likened to the 'gaze' as it becomes active in the experience and ongoing practices of the speakers. This is similar to the 'gaze' embedded in the acquisition of the specialised languages of a *Horizontal Knowledge Structure* with a weak grammar (Bernstein, 2000: 165).

The position put forward by this study is that the reason why Bernstein places craft at the cusp between horizontal knowledge structure and horizontal discourse is because its segmental distribution is not unconnected. The segments are connected, not in the sequenced strings of F. W. Taylor's time and motion studies, but by an embodied principle of arrangement. This form of connection is shown diagrammatically on the next page.

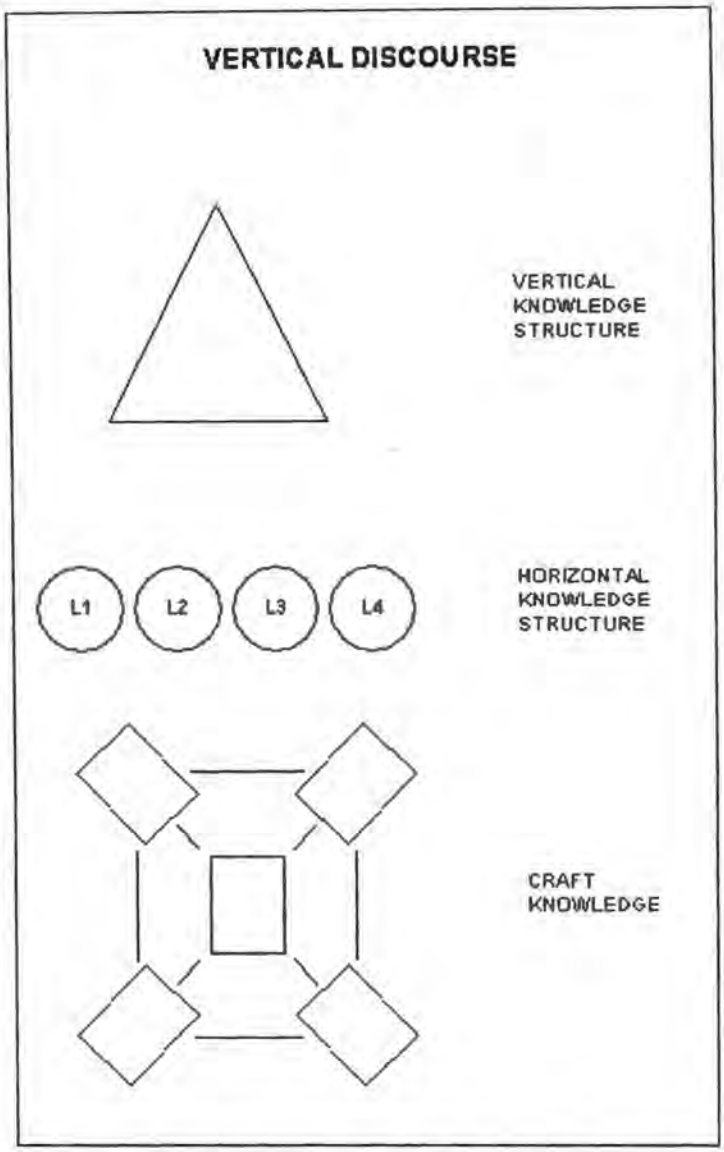

Figure 11: Craft as horizontal knowledge structure in vertical discourse

When Bernstein speaks of a horizontal knowledge structure with a strong or weak grammar he is referring to a conceptual syntax of relations and procedures articulated either formally and explicitly, or less formally and implicitly (1996: 174). In craft we cannot really speak of a grammar because the relation between subsidiary segments cannot be articulated. The relational whole is constituted through and by the ability to visualise - as a kind of non-articulable compensation for the lack of a clear syntax. Such *embodied coherence* extends the notion of verticality by allocating to it a form of conceptual coherence that can only be recognised and realised in contexts where parts and whole are kept together and not fragmented into part-procedures taken out of context. While there is no relation of necessity between one segment and the next in horizontal discourse there is a relation of necessity

between part and whole in craft. It is for that reason that all stages of the trade school curriculum involve the making of a whole item (a set project). Procedures are never practiced discreetly but as relating to the construction of a whole item. It is always *procedure through principle* that is transmitted.

The converse relation, namely p*rinciple through procedure* could be said to be applicable on the 'general' side of the model where the purpose of transmission–acquisition is the acquisition of a high degree of conceptual knowledge. Where practical work is included it is for the purpose of building strong cumulative conceptual frameworks that develop with experience and represent growing expertise (Hodson, 1992).

If craft, like other horizontal knowledge structures, is depicted as a series of specialised languages then these 'languages' should be seen as various crafts or trades, rather than as 'various styles' (Bernstein, 1996: 181, as cited previously). Pye asserts that crafts or trades vary widely in terms of their practices; yet, they have one thing in common, namely the element of risk (1968: 13). Crafts or trades are specialised in different ways, each with their own criteria for what counts as a legitimate text and thus not translatable; yet, each craft or trade has its own version of a particular embodied principle of arrangement, which precludes predetermination of end-result and requires an act of interpretation or visualisation.

The value of the model in methodological terms

The model also allows a methodological issue to be addressed, namely the capacity to generalise from the findings of a single case study. In realist terms generalisation is achieved when findings speak to an objective external reality that provides the means for attaching general social meaning to a culturally specialised empirical case that would otherwise be restricted to the time-space realities of a specific context. By providing a reading device for the data findings in previous chapters, the model allows the findings to be reinterpreted in relation to knowledge forms at a general level. The pedagogic practice of the trade school in cabinet making thus makes a transition from 'token' to 'type'.

Conclusion

When one reviews the classification and framing values that emerged from the exploration of the pedagogic and evaluative practices of the trade school in cabinet making one cannot but

ask: Why these particular classificatory and framing relations and why not others? The answer seems to lie in Bernstein's argument that the internal structuring of a particular content creates specific classifications and framings of consciousness, identity and relations (1996: 175). In research studies where researchers intuitively or consciously understand the form or internal structure of the pedagogised knowledge when they undertake a characterisation of the pedagogy, this causal relationship is perhaps assumed or taken for granted rather than theorised explicitly. Such understanding was not available to the researcher at the outset and a relational understanding could not have been achieved in this study without the conceptual model developed in this chapter. The rationale for the model evolved from an exploration of the form that tacit knowledge takes, which in its turn became necessary in order to fully understand the embedded modality of trade school pedagogy. While the model explains what kind of knowledge craft knowledge is, it simultaneously explains what it is not. The data showed that craft is neither scientific knowledge nor site-specific factory knowledge, but it is only at this point that such distinctions can be stated in explicit theoretical terms.

In the concluding chapter the conceptual model developed in this chapter is linked to the outcome of craft pedagogy, as depicted at the end of chapter 6. The relationship between craft as knowledge structure and craft as pedagogy is discussed more fully in terms of possible implications for the vocational curriculum, as well as for education and training policy more generally.

Chapter 9: Implications of the relationship between tacit craft knowledge and its transmission practices

Introduction

The final chapter provides an overview of the thesis and reviews its limitations before moving to a discussion of the implications of the relationship between tacit craft knowledge and its transmission practices that constitutes the main findings of the thesis.

The final part of the chapter returns to the points of origin of the thesis, which related to a renewed interest in tacit knowledge and competence evident in literature on knowledge innovation, as well as to the way in which tacit knowledge and its pedagogy are treated in outcomes-based or standards-based curriculum prescriptions. The findings and conclusions of the thesis allow a number of implications to be drawn out with regard to both points of origin.

The chapter is intended to assist the thesis to realise its general aims of contributing to a sociological understanding of craft knowledge and pedagogy that centres around a master-apprentice relation, as well as to an understanding of knowledge and pedagogy more generally.

Overview of the thesis

This thesis explored the relationship between tacit craft knowledge and its transmission practices. Evidence from a single qualitative case study on craft transmission practices in the institutional training centre of the Furniture Industry Training Board (known as the 'trade school') in Cape Town was presented and analysed in accordance with a conceptual scheme that derives from the earlier work of Basil Bernstein. Against the background of the analysis of craft pedagogy, the nature of the 'tacit' was explored through a detailed analysis of the evaluative requirements of the final trade test. A conceptual model was developed to provide a theoretical explanation for the form that tacit craft knowledge takes.

The puzzle of tacit knowledge

Finding or choosing a puzzle that needs to be solved is the generative moment of a research study. The puzzle that triggered this study was the way in which apprenticeships, based on a

master-apprentice relationship, have become almost an anachronism. While generally recognised as the basis of the formal vocational curriculum as we know it today apprenticeships have changed their form and shape significantly since the time when they related solely to the acquisition of a craft or trade on the one hand and to the acquisition of a profession on the other. They have been re-invented as Modern Apprenticeships in Britain and learnerships in South Africa and are promoted at an ideological level as a transformation of the 'old' into the 'new'. Contemporary versions are deemed more suitable to the need for a flexibly specialised work force that can cope with the demands of continuous advances in technology and with changes in work itself.

In reality the new style of apprenticeship refers to a very different pedagogic regime. The curriculum prescriptions on which they are based resemble the procedural manuals found in any bureaucratised workplace. Required competences are specified in great detail and successful achievement of the specified outcomes are dependent on being able to show evidence of the ability to perform work in the step-by-step manner that is characteristic of a procedural logic.

This, in itself, was not the puzzle. What was of interest was that there was little description available of that which had been displaced by new forms of apprenticeship. It was as if referring to a master-apprentice relation was sufficient. Where descriptions were found they came no closer than describing the kind of knowledge transmitted as a 'mystery', or a 'secret'. Indeed, the term 'knowledge' is seldom used when referring to craft. The terms 'skill' or 'manual dexterity' or 'workmanship' come to mind more readily. The reason for this clearly lies in the tacit nature of craft knowledge. It is not a knowledge that is spoken in words and its transmission is usually denoted by reference to 'modelling' or 'demonstration' or 'imitation'.

The vocational curriculum thus has a long history, but not a history that is tied to 'knowledge'. For this reason it is impossible for vocational education and general education to be described in the same terms. While lack of parity of status is a common lament from the vocational side, there can be no parity when one form of provision is fundamentally premised on formal knowledge that is codified and communicable in words and the other is based on skill of the 'how to' variety. This is not to say that an argument for parity of status is the aim of the thesis, but simply to signal that the problem of the divide between vocational and

general education goes much deeper than social, institutional and labour market prejudices against the vocational.

Almost paradoxically, there is currently a strong renewal of interest in the 'tacit', which derives from a recognition by the innovation theorists that the 'tacit' plays a crucial role in the ability to discover or invent the 'new' or discover the 'unknown'. Yet, when one enquires deeper into how such tacit knowledge may be acquired the answer always comes back to some kind of an apprenticing relation. Whether it is the promising scientist that is apprenticed to the Nobel Laureate (Kvale, 1997), or the Japanese folkcraft pottery apprentice (Singleton, 1989), it is through an apprenticing relation that the 'tacit' is transmitted.

Although tacit knowledge and tacit forms of pedagogy are contemporary topics, the current renewed theoretical interest in apprenticeship, as represented by the acclaimed work of Lave and Wenger (1991), does not explain the nature of the 'tacit'. The focus of this work is on apprenticeship, but on apprenticeship as 'legitimate peripheral participation' in a 'community of practice'. The master-apprentice relation is decentered in favour of a situated activity approach that poses all knowledge as specific to a particular context. Tacit knowledge is context specific knowledge, just as knowledge of supermarket shopping is context specific, just as formal mathematical knowledge is context specific. How such tacit knowledge is able to transcend the boundaries of a specific context to jump to a new level of synthesis, not given by the specific context, is not made clear. There is no explanation for the basis of the new or the innovative.

We thus have two versions of the 'tacit'. In contemporary forms of apprenticeship there is no tacit knowledge. All work activities can be made explicit and described in procedural terms. In social practice theory the 'tacit' is linked to a local context and not recognised as the kind of knowledge that can make the jump from one context to another. The seminal work of Michael Polanyi (1958) on tacit knowledge as a form of what he calls 'personal knowledge' and the later work of Basil Bernstein (1996, 1999, 2000) on the distinction between what he calls 'horizontal discourse' as context specific knowledge and 'vertical discourse' as context independent knowledge offered a way out of the conundrum. Both theorists depict craft or skill as something that has the capacity to 'establish contact with reality beyond the clues on which it relies' (Polanyi, 1958: 64).

Taking a lead from the clues provided by these theorists the research focus of the study could thus be formulated as an enquiry about the 'tacit' in craft and its pedagogy. Equally important, in the light of the earlier discussion about the disjuncture between vocational education and general education would be to understand craft knowledge and pedagogy in the same terms as knowledge and transmission practices are understood in conventional education. If this could be achieved it would be possible to explain similarities and differences between the two types of education from the same epistemological base.

Situating the study

The task of selecting a case that would illuminate the enquiry into tacit craft knowledge and its transmission practice was not as straightforward as it might seem. The historical review of the development of the apprenticeship system in South Africa, which was undertaken in the second chapter, had two purposes. The first was to show changes in the shape and form of the apprenticeship system since the advent of formal trade apprenticeships that coincided with patterns of industrial development. The influence of policies of racial segregation also needed to be noted as they had a lot to do with the way in which state regulation moulded the system. The second purpose was to describe the current status of the apprenticeship system against the background of what had come before. This background situated the case as both significant and critical in terms of what can only be described as an unusual continuation of an old craft mode of transmission within a system of competency-based modular training (CBMT) that had become the dominant training model in many industry sectors.

In the second part of the chapter the curriculum and pedagogic practices of the trade school of the Furniture Industry Training Board in Cape Town were briefly described to provide an introduction to the empirical setting.

Methodological considerations

A case that focuses on tacit knowledge must of necessity rely primarily on extended direct and indirect observation. The main obstacle created by this choice of method was not the recourse taken to qualitative methodology; but rather the tendency of qualitative researchers in general and ethnographers in particular to examine phenomena under study from the point of view of research subjects, with no way of moving beyond context specific descriptions to more general levels of analysis and interpretation. In chapter 3 some of the debates around

the relationship between relativist and realist methodologies were considered. While using methods drawn from both qualitative and quantitative approaches is no longer deemed contentious, the relation that the researcher establishes between the general theoretical field and the empirical field, both prior to and during the research process, is crucial if statistical evidence is not to be used to generalise from a single case to a larger population. Given the study's realist ontological position that was linked to a use of qualitative methods, external validity or generalisability was treated as a key issue that had to be resolved. An explicit analytical framework needed to be developed to enable information gathered to be 'read' as data that could serve as a basis for generalisation. For the characterisation of craft pedagogy a series of taxonomies were developed to operationalise the concept variables of 'classification' and 'framing'. These concepts were drawn from Basil Bernstein's earlier work (1975, 1990, 1996), which took the structure and social relations of pedagogy as the units of analysis. Indicator variables were also informed by the empirical setting, which required a very particular interpretation of what specialisation of context (external and internal classification values) might mean in relation to a craft or trade.

The benefits of using Bernstein's conceptual schema were two-fold. His categories were exceptionally well suited to a research topic that could not rely on word representations provided by participants. The way in which information recorded in field notes, obtained from interview transcripts and gleaned from a study of course documentation and material could be related to preconceived categories gave a coherence to empirical evidence that would not easily have been achieved had the conceptual categories not been clearly and unambiguously described. The second benefit related to the fact that the conceptual schema employed were not unique to the empirical setting, as often happens in a grounded theory approach. They have been used extensively by a number of researchers (as cited in the main body of the thesis). This increased their analytical value in the sense that generalisability could be achieved in relation to an existing body of research, if not in terms of a comparative study of other similarly conceptualised cases of craft pedagogy.

It stands to reason that the nature of tacit knowledge is such that it is understood through inference rather than through explication in words. The characterisation of craft pedagogy therefore illuminated the pedagogic relation between master-trainer and apprentices, but it also provided the vehicle through which the 'tacit' gradually took on meaning.

Interpretation of the 'tacit' was made possible by linking theoretical concepts provided by Michael Polanyi to the work of David Pye. Pye is directly concerned with workmanship in craft and Polanyi is concerned with that which occupies a subsidiary relationship to an external performance. It was the recourse to Pye's work that enabled Polanyi's more abstract categories to be interpreted in a way that shed light on the performance ultimately required by the trade test in cabinet making.

Once an understanding of the tacit nature of craft knowledge had been achieved the task that remained was to develop a language of description that enabled craft knowledge to be positioned in relation to other knowledge forms. This was the level of theoretical generalisation that would ultimately allow the vocational to be understood in the same epistemological terms as conventional education. The model that was developed was prompted by Bernstein's distinction between horizontal and vertical discourse (Bernstein, 1996, 1999, 2000). While Bernstein attributed craft with having a knowledge structure and therefore as having the capacity to generate context independent meanings, craft was so obviously bound to the specialised relationship between work organisation, materials and tool usage (as depicted in chapter 4) which constitutes any trade, that this positioning required further explanation. The logic provided by Abbott's (2001) principle of self-similarity in the fractal division of social and cultural structures linked to Sohn-Rethel's (1978) epistemological distinction between manual and intellectual labour, with pure mathematics as the unbridgeable dividing line between what Sohn-Rethel calls a 'context of thought' and a 'context of human action', became the basis for a model that could be elaborated downwards to a level where the empirical findings and the conceptual categories could connect. The model positioned craft knowledge on the manual side of Sohn-Rethel's epistemological divide, while showing that craft is a principled knowledge form of a restricted modality. The model therefore allows us to talk about craft as knowledge and not only as skill.

Characterisation of craft pedagogy in terms of classification and framing values

Chapters 4, 5 and 6 depicted the classification and framing relations of craft pedagogy, as realised in the trade school of the furniture industry. Bernstein's distinctions between internal and external classification and framing of different modalities, that range from very strong to very weak, allowed for a precise description of the structure and social relations of craft pedagogy.

It was found that external classification and framing relations created strong or very strong boundaries between the trade school and external contexts. These boundaries provided temporary insulation against the disconnected operations that characterise mass production practices in the majority of furniture factories. They also delegitimised the everyday workplace experience that apprentices brought from such factories. It was a particular relation between work organisation, tool and materials usage, that constituted the traditional craft or trade of cabinet making as the 'voice' or 'identity' (Bernstein, 2000: 12, 204) recognised as legitimate in the trade school. The 'voice' or 'identity' of cabinet making was also insulated from other furniture trades taught in the trade school, with an equally strong boundary drawn between cabinet making and school woodwork.

In this curricular space science-based knowledge had no place. Although, in terms of the competency-based modular system that officially regulated the curriculum, low-level procedural knowledge codified in a learner's guide replaced formal scientific knowledge, this content was ignored. What counted as 'content' instead was a 'privileged repertoire' that related to the master-trainer's own expertise and experience as a cabinet maker.

The individualising nature of the pedagogy was indicated through the very strong internal classification of the spaces between apprentices from different trades. Even in the workshop apprentices from the same trade worked at separate work benches, with very little communication between them. The master-trainer did not occupy a special space. He moved around between the work benches and watched what the apprentices were doing. He intervened immediately when an unsafe practice occurred. At other times he would move an apprentice out of the way to demonstrate a particular movement of the body related to, for instance, sawing or planing.

Although the modular partitioning and sequential activity prescribed by the competency-based modular training (CBMT) format required strong boundaries between different modules this classification was overridden and replaced by weak internal curricular classification. Each stage of the apprenticeship curriculum, revolved around the construction of a complete item of furniture, which apprentices had to construct individually and without any direct instructions from the master-trainer. The level of complexity of the prescribed set pieces increased in each of the five stages.

While the trade school context was thus characterised by strong or very strong external and internal classification and framing relations, the two exceptions that were noted both related to workshop practice. The workshop was very weakly classified in terms of the physical space occupied by master-trainer and apprentices. The boundaries established by modular curricular organisation were also ignored. Coherence was created through the construction of an item of furniture that required the integrated employment of all the different procedures specified in the modules. Procedures were introduced in relation to their use in the full cycle of production, rather than as discrete operations that were separately acquired and then put to use.

Internal framing over selection, pacing and sequencing displayed two modalities. While strong macro pacing that resembled the daily routine in a factory was maintained throughout, very weak initial framing over selection, sequencing and micro pacing allowed apprentices to develop their own rhythms of work and to make their own decisions about task realisation. However, just before the end of the final stage and before apprentices took their final trade test framing over selection sequencing and pacing was strengthened and made explicit. This provided a marker for apprentices to judge their own performances in relation to what was required for successful completion of the final test.

Evaluation criteria in relation to use of tools and material criteria of accuracy and precision were always strongly or very strongly framed. As these criteria displayed themselves unambiguously when a mistake was made, they did not need to be stated in words. When instances of error occurred the master-trainer modelled the movement of hand and eye that was required Apprentices would also realise where they had gone wrong and they would correct their own mistakes.

There was one strongly framed criterion, which was depicted as the criterion of 'readiness', that was different from the others. It was continually brought to the apprentices' attention that the master-trainer would know when they were 'ready'. What 'readiness' meant was not explained. This criterion featured strongly in the instructional discourse, but also featured particularly strongly in the regulative discourse that referred to relations of hierarchy, character and conduct. In hierarchical terms the master-apprentice relation was undoubtedly an asymmetrical relation that was mediated through a surrogate kinship role taken on by the

master-trainer to exercise a form of positional control. Qualities of character and conduct that were in keeping with those of the autonomous artisan representing a collective craft tradition were a strong feature of 'readiness'. In this sense the instructional and the regulative were truly one discourse.

The conclusion that could be drawn from the findings of the investigation into the classification and framing values of the trade school pedagogy characterised in chapter 4, 5 and 6, was that the outcome of a craft pedagogy that centres round a strong master-apprentice relationship is a performance that is grounded or embedded in an internally held competence, which was represented as:

$$\frac{\text{Externally visible performance}}{\text{Internally held competence}}$$

Craft as tacit knowledge

Evaluation criteria are at their most visible in a test situation. An analysis of the requirements of the trade test in cabinet making, which was presented in chapter 7, showed that the internally held competence found to be a crucial outcome of craft pedagogy referred to the ability to visualise the relation between 'parts' and 'whole' in both time and space. It was through visualisation that the ordered spatial relationship between parts and whole inherent in any artefact (in this case an item of furniture) was recognised and realised. This relation of order between the formal elements of a design provided the underlying logic on which decisions of what to do first and what to do next were based, with visualisation as the 'glue' that bound discrete operations visible in the external performance into a coherent whole.

The conclusion that was drawn was that this part-whole relationship that can only be recognised through visualisation constitutes the 'tacit' that cannot be articulated or codified. Its transmission is dependent on having both parts and whole present. In order to relay this part-whole relation master-trainers must of necessity ignore modular curricular arrangements in favour of a project-centred pedagogy where parts and whole are always present in both spatial and temporal terms in the sense that apprentices are always confronted by the whole process of production.

This conclusion explained why the only way in which evaluation criteria that refer to relations of order held in the body can be transmitted is through modelling. The master models the performance even though as Polanyi (1958: 49) explains, the principle that establishes the order realised in skilful performance is not available to the master in a way that can be put into words. It is through being exposed to a modelling practice that apprentices internalise a tacit relational understanding of space and time that provides the basis for the judgement, care and dexterity, held by Pye (1968: 7) to be characteristic of good workmanship. Successful completion of the trade test, deemed to be symbolic of having earned the right to call oneself a cabinet maker, calls for the combination of internalised competence and external performance transmitted in craft pedagogy that centres around a master-apprentice relationship. The identity of cabinet maker rests crucially on this combination.

Given this understanding of craft it became possible to describe craft as a restricted form of context independent 'knowledge' rather than merely as 'skill'. Craft has a knowledge structure by virtue of a particular principle of arrangement that is embodied in every invention, design and making of what Pye (1978:15) calls a 'device', intended to get some result that was not there before. Craft knowledge thus refers to knowledge that requires interpretation at the level of generalised 'class' or 'type' even though the abstract nature of the principle that generates the 'class' or 'type' can only be visualised in embodied form. It is this feature of craft knowledge that constitutes its capacity to generate specialised meanings which, although context-bound in terms of referring to the relationship between work organisation, tools and materials that characterises any specific craft or trade, are independent of context in the sense that all craft knowledge realises an order of relation between the features of the object being made that is given by a particular embodied principle of arrangement.

The above interpretation of craft knowledge allowed it to be positioned alongside the kind of knowledge that is structured through principles arrived at through deductive or inductive reasoning. Although the latter form of principle can be explicated and codified and the former cannot, the two knowledge forms were found to be homologous in terms of the way in which their structures correspond (both are structured by a relationship between principle and procedure). The model developed in chapter 9 thus depicts a systematic taxonomy of

knowledge forms, which, although functioning at a fairly high level of abstraction, nevertheless, is consistent with the empirical findings of the study.

Limitations of the thesis

In chapter 3 the methodological limitations of the study were discussed. It was explained how the ontological position taken by the study and the analytical tools used moved the study away from interpretative or grounded theory traditions often associated with qualitative research and with case study research in particular. Although using methods and techniques that are traditional to a qualitative approach, the study would not seek to introduce quantitative measures of populations to strengthen the generalisability of the findings. The time-consuming nature of close direct and indirect observation also precluded a second case study from being introduced for comparative purposes. The study would thus run the risk of having limited external validity or capacity for generalisation.

The study's claim to theoretical generalisability relied entirely on the logical consistency of the taxonomies and the model developed to analyse and interpret the data. A second source of generalisation derived from the use of theoretical concepts, drawn from Bernstein's earlier work, to characterise craft pedagogy in the same terms as schooling pedagogies have been characterised by other researchers working in this theoretical tradition. In the part of the study that was concerned with depicting the structure of tacit craft knowledge, Bernstein's later work provided a point of reference that allowed the model or language of description, which was developed to explain craft as knowledge structure, to elaborate Bernstein's positioning of craft as a horizontal knowledge structure in vertical discourse, thereby giving the model more general salience than would otherwise have been possible.

In the light of the findings and conclusions presented above, it seems reasonable to assert that the thesis has successfully answered the initial research questions, which were:

> *What makes craft knowledge tacit and how is tacit craft knowledge transmitted or passed on?*

It also seems reasonable to assert that, in doing so, the aim of contributing to a sociological understanding of craft knowledge and pedagogy that centres round a master-apprentice

relationship has been achieved. In making these claims the limitations of the study, however, have to be acknowledged.

The main limitation is imposed by the unspecifiable nature of the 'tacit'. By its own definition the 'tacit' is not representable in words. Its nature and particular features had to be inferred in two ways: firstly, from a study of its transmission and evaluation practices and, secondly, through deductive reasoning based on socio-historical literature that was linked to literature about workmanship and design, as well as to literature that indirectly refers to the 'tacit' in craft rather than dealing with it directly. Triangulation of inductive and deductive approaches increases both the internal and external validity of the findings, but it does not take away the fact that conclusions were reached through inference rather than through reference to observable actions that related directly to the phenomenon under study. The limitation of this way of making a truth claim is that it cannot be checked through recourse to direct empirical data. A second limitation, which is connected to the first, is that no comparative study was done to provide an alternative way of interpreting empirical data from which inferences were drawn.

The tacit nature of knowledge begs its own question. What the thesis has done is to construct a knowledge position about tacit knowledge but, as Polanyi so aptly states, 'the rules of an art can be useful, but they do not determine the practice of an art; they are maxims, which can serve as a guide to an art only if they can be integrated into the practical knowledge of the art. They cannot replace this knowledge' (Polanyi, 1958: 50). To put it in my own words, I can now talk about the nature of the 'tacit' in cabinet making, but I cannot make a cabinet! Practical knowledge cannot be equated to word presentations of such knowledge.

There can thus be no remedy for the limitation that is imposed on a study of tacit knowledge by the unique class of phenomenon that the 'tacit' represents. Ultimately the validity of the study has to be judged by the Schutzian criterion of 'logical consistency' and not by the criterion of 'adequacy', or the extent to which the social actors themselves understand the constructs used (as discussed in chapter 3).

Implications of the research findings for an understanding of knowledge and pedagogy more generally

Given that the study also wants to make a contribution to an understanding of knowledge and pedagogy more generally it is appropriate to return to the points of origin of the thesis. In chapter 1 these were depicted as deriving from a renewed interest in tacit knowledge and competence evident in literature on knowledge innovation, as well as from the way in which tacit knowledge is treated in outcomes-based or standards-based curriculum prescriptions. The findings of the study allow a number of implications to be drawn out with regard to both points of origin.

The relation between tacit competence and technological innovation

When the conclusion reached by the thesis, namely that the 'tacit' in craft knowledge refers to a part-whole relationship that is recognised through visualisation, is interpreted in relation to arguments about the nature of technology itself then the more general relevance of this conclusion becomes evident. Layton (1993) has the following to say about the 're-working' that scientific knowledge has to undergo if it is to become usable in specific design and technological tasks.

> What is needed for solving a technological problem may have to be drawn from diverse areas of academic science at different levels of abstraction and then re-worked into an effective instrumentality for the purposes in hand.
>
> Aikenhead (1989) gives the example of the design and construction of a breathalyser, a socially useful and important artefact to assist the reduction of road accidents due to drivers drinking alcohol. The knowledge 'chests' that need to be raided for this task include human respiratory mechanisms, chemical changes, mixtures, concentration, Henry's Law governing the pressure dependence of solubility of gases in liquids, possibly – depending on the design solution being explored – photometry, electric circuitry, equilibrium, to say nothing of legal, ergonomic and psychological considerations and familiarity with police practices. The required combination does not exist, ready-made. It has to be searched out and worked into a fruitful relationship before it can be brought to bear on the specific task (Layton, 1993: 11)

The process described by Layton is that of synthesising a number of discrete 'parts' into a new 'whole'. Although he is clearly referring to knowledge-driven innovation the process is

analogous to the part-whole relationship found in craft, as described in this thesis. A similar connection can be made to Medway's work on technology education and the design process.

> In seeking to bring into being an artefact or state of affairs which does not yet exist, the designer typically proceeds by envisaging the as yet unrealized future in 'the mind's eye'... Visualizing is, in fact, of pervasive importance in technology, not only for the envisaging of the future product, but also because of the necessity to conceive of wholes, even when information about parts is incomplete ... (Medway, 1993: 22-23).

Medway is also referring to innovation through engineering design and not to innovation through 'inspired tinkering' but the process of synthesising different parts into a whole through visualisation is again strikingly similar to one of the conclusions of this thesis. It can thus be argued that while knowledge-driven innovation and social practice-driven innovation proceed from different ends of the knowledge spectrum they are two sides of the same coin in terms of how the jump to a new level of synthesis becomes possible. The 'tacit', as Muller argued (cited in chapter 1), features prominently in both scientific knowledge and practical knowledge.

In making this connection it has to be remembered that researchers and skilled workers do not automatically have recourse to tacit knowledge. With regard to scientific knowledge as the basis of technological innovation, Medway goes on to argue that:

> Technologists are frequently dependent in the first place on the knowledge they carry in their heads, which enables them to 'feel' whether a projected solution will work, what will happen if an object is modified in a certain way, whether a bridge is safe to continue using in the short term, or whether it is time to stop development of the V2 rocket and go into production (Medway, 1993: 24)

Kvale (1997) provides an example of how this 'feel' is developed when he cites Kanigel's interview study on the mentors, pupils and colleagues of Axelrod, who received a Nobel Prize for his work in pharmacology, as well as Zuckerman's investigation of 92 American Nobel laureates in physics, chemistry and medicine. The argument presented is that the main reason why promising scientists enter into apprenticeships with Nobel laureates is to acquire a way of seeing scientific problems, so that they come away with 'an approach, a style, a taste in the mouth or a feel in the gut for just what makes "good science"' (Kanigel, cited in Kvale, 1997: 188).

If we link arguments about how tacit knowledge and competence in science are acquired to the thesis argument about how tacit knowledge and competence in craft are acquired we come up with the same formula: tacit knowledge and competence are transmitted and acquired through an apprenticing relationship. Those working at the forefront of scientific achievement no longer need to acquire substantive knowledge and techniques as these 'parts' have been already been acquired through years of undergraduate and post-graduate study. What they learn from working closely beside the master is the 'feel' for how to put parts together that lies at the heart of scientific innovation. It is for this reason that the studies cited in Kvale are adamant that science remains a field in which something akin to the traditional master-apprentice relation still prevails, with the master's own performance providing the model to be emulated (Kvale, 1997: 188-189).

What we know from the thesis findings is that, in the acquisition of tacit, practical knowledge, it is not only the master-apprentice relationship that is crucial, it is also the requirement that both parts and whole should be present in the pedagogic environment. In this regard I am reminded of an informal conversation with the master trainer during one of our visits to a furniture factory. The particular factory was entirely mass production orientated, with each worker doing one and only one task on the continuous production line. The manager who took us around was adamant that they no longer needed to send people for apprenticeship training at the trade school, as the production process did not require workers who could perform all the tasks. Later, when we were alone, the master-trainer took me to a section of the factory known as 'proto-type'. He introduced me to the artisans who made, tested and adapted the pieces of furniture that ultimately served as proto-types for the mass production process in the factory. Every artisan in this unit had been apprenticed to him at the trade school. The master-trainer pointed out that the manager had perhaps forgotten that production relied on the knowledge of what he called 'proper artisans'. 'What will happen in ten years time when these artisans have retired?' he asked.

This anecdote illustrates vividly how the social practice end of technological innovation is impoverished when the centrality of the master-apprentice relation and its relation to the transmission and acquisition of practical tacit knowledge that has been the main focus of this thesis, are no longer recognised or valued. Knowledge of 'parts' without a relationship to

'wholes' does not generate tacit practical competence of the kind required by technological 'adapters' on the shop floor.

Outcomes-based or standards-based approaches to curriculum

The focus on what is explicit and measurable, which currently dominates curriculum practices in a number of countries, was discussed in chapter 1. The vantage point provided by the findings and conclusions of this thesis, shows that there are both epistemological and pedagogic reasons for concern about the current trend to divide the curriculum into discrete modules that are 'mixed and matched' according to a credit accumulation formula.

At the epistemological level the positioning of craft in relation to other forms of context independent knowledge showed that, although craft belongs on the 'particular' side of the general/particular divide, it displays a knowledge structure by virtue of operating at the level of 'type' rather than 'token'. It was noted that like other forms of context independent knowledge, craft knowledge is constituted by a relationship between principle and procedure. What differentiates craft from other forms of principled knowledge is the directionality of this relationship. Practical or vocational knowledge starts from what Sohn-Rethel (as cited previously) calls a 'context of human action'. It is ultimately procedural knowledge that is required but it is procedure interpreted through a particular principle of arrangement. In this regard craft trainers know the value of repetition. They may not be able to put forward a pedagogically referenced explanation for its importance, but they will have no hesitation in claiming that practical knowledge is only acquired through demonstration and a considerable amount of practice or repetition.

While this way of proceeding is generally considered acceptable on the vocational side, the same can no be longer said of the general education side. From the point of view taken by this thesis this is a problem. If one accepts that abstract knowledge starts from a 'context of thought', in Sohn-Rethel's terms, then it is ultimately principled knowledge that is (or should be) transmitted by general education that has no direct relationship to the economy or to work particular practices. Principles are often acquired through procedures. One need only think of the repetition and drilling exercises common in most school subjects, before progressivist understandings of teaching and learning ruled such methods a pedagogic 'evil', to agree that there is some relevance in this assertion. The argument is not that repetition is intrinsically a

sound pedagogic method. However, when it is undertaken as a necessary step towards understanding, *through use*, an abstract concept such as, for instance, the concept of 'percentage', which makes little sense when introduced in words, then it is pedagogically irresponsible to deprive students of the opportunity to acquire principles through procedures. The same can be said about the now much maligned 'talk and chalk' method of teaching. Teachers often work out numerous examples on the black board. Students copy down those examples, they ponder over them and gradually they are able to extract the conceptual logic that underlies a range of related problems. At best they may grasp the general principle but, even if they only grasp the general procedure that derives from such a principle, they find some form of conceptual coherence that enables them to make sense of what they initially considered to be unrelated examples.

A counter argument could be that many teachers do not have sufficient grasp of the ultimate aim of their teaching to know why repetition and 'chalk and talk' may be important. Teachers, it is argued, resort to such methods because they are an easy way of keeping students occupied and they do not demand a great deal of preparation. This argument may have some validity but one needs to bear in mind that what 'makes the penny drop' for students need not be that which is consciously intended by the teacher. I shall not pursue this train of argument further. Its inclusion here simply serves to illustrate how superficial some of our curriculum practices are, if we do not have a solid epistemological basis for commending one method and condemning another.

The findings and conclusions of this thesis are, however, taken further in relation to standards-based or outcomes-based (OBE) curriculum approaches more generally. OBE, which is used here as a short hand for curriculum approaches that foreground the observable and the measurable, made explicit in words or directly observed in practice, negates the findings of this thesis in two ways. The first is the argument presented for the crucial importance of the teacher (or 'master') as the holder of evaluative criteria that cannot be stated in words but that are, nevertheless, central to grasping the relationship between parts and whole on which new synthetic thinking depends. When the only evaluative criteria that count are those that can be put into words or directly observed (and here the extract from a unit standard presented in chapter 1 is a useful example) there is no place for the 'tacit'. By assuming that the 'tacit' does not exist or does not matter, OBE does not require teachers, only facilitators of learning.

In the vocational domain assessors no longer need to know much about the topic or activity which they are assessing. The procedural outcomes that they carry around on their assessment sheets are all that is required for assessment of 'competence'. Scores of college-based lecturers and workplace trainers are currently undergoing training in assessment and moderation, in preparation for their 'on the road' roles as assessors. In contrast, an examination of the trade test in cabinet making, undertaken in chapter 7, showed how the test requires an understanding of the relationship between parts and wholes, as well as wholes and parts. The test was considered the crucial culmination of an indentured apprenticeship. It signalled not only 'mastery' but also admission to artisan status and the right to call oneself a 'tradesman'. The crucial role that the regulative discourse plays in bringing apprentices to a state of 'readiness' was emphasised. This dimension is notably absent in current discourses about vocational preparation. Although it may not be quite as marked an absence in general education and in preparation for the professions, the same tendency is nevertheless potentially present.

Secondly, by assuming that a modular curricular arrangement that follows the logic of discreet unit standards or outcome statements is the most efficient way of organising a curriculum, the relationship between parts and whole that has been shown in this thesis to be crucial to a capacity for both practice-driven and scientifically driven innovation, is no longer recognised or valued. In relation to craft, the thesis showed that there is an ordered relationship between parts that is given by the 'whole' being continually present. This relationship is not represented or grasped in words but it is constitutive of what 'craft' means. The literature cited has shown that science-based technological competence also depends on a relation between parts and wholes, even though the 'parts' refer to scientific laws and to diverse areas of science at different levels of abstraction and no longer to procedures of work. By not recognising that there is a 'whole', whether known or unknown, which draws different 'parts' into a relationship of order OBE inhibits rather than promotes the development of the kind of competence that is sought after in relation to 'flexible specialisation'.

Conclusion

The implications of the thesis findings and conclusions have been drawn out in a rather forceful way in this final section. It cannot, however, be done in a muted way. By pretending that tacit knowledge does not exist, or alternatively that it does not matter, outcomes-based

and standards-based approaches to curriculum do violence to the centrality of the master-apprentice (or teacher-student) relationship in pedagogy, as well as to forms of knowledge transmitted through this relationship. The effect is as damaging to the vocational curriculum as it is to the general education curriculum.

If this thesis has gone some way towards developing a vantage point from which outcomes-based and standards-based approaches to curriculum can be reconsidered and alternative approaches can be conceptualised, then it has achieved its aims.

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED UNIT STANDARD:

Demonstrate understanding of influence of wood structure and properties, and certain production factors on wood quality

Field and sub-field description: Agriculture and Nature Conservation Forestry and Wood Technology
NQF level: 4 Credits: 15

PURPOSE OF THE UNIT STANDARD

The qualifying learner is capable of describing the influence of wood structure and properties, and certain production factors on its quality.

The successful achievement of this unit standard will enable the learner to effectively and efficiently perform his/her task in the relevant workplace, in the lumber mill, and to enroll for subsequent higher levels of training in this field.

The lumber milling industry urgently requires appropriately trained persons.

The achievement of this unit standard will contribute towards a situation where all persons involved in the lumber milling process are correctly trained and qualified to perform their tasks according to industry accepted norms.

The achievement of this unit standard is a building block in the learner's development along a structured career path, and will open up new opportunities for improving him/her-self both socially and economically.

LEARNING ASSUMED TO BE IN PLACE

It is assumed that a Learner who wishes to enter a learning programme for this Unit Standard will be able to demonstrate:

a) competence in mathematical and communication skills equivalent to the NQF Level 3 requirements.

b) an understanding of the structure of wood and its relationship to its strength and appearance, and how it holds water.

UNIT STANDARD RANGE

a) The typical scope that this Unit Standard covers the "Range" as described in the specific outcomes of this unit standard.

b) The typical context of this unit standard is the training of a Learner at NQF Level 4 in the effect of wood growth and production factors on its quality.

c) The level assigned to this unit standard, i.e. NQF Level 4, is appropriate because:

i) for foundational competence the learner has to demonstrate possession of wide- ranging technical skills,

a broad knowledge base incorporating some basic theoretical concepts, and the ability to access, analyse and evaluate information independently.

ii) For practical competence the learner has to show the ability to operate in a variety of familiar and unfamiliar contexts under broad guidance and evaluation, and select from a considerable choice of procedures.

iii) For reflexive competence the learner has to demonstrate the ability to handle complete responsibility for quantity and quality of own output, and possibly for those of others.

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Explain the wood quality requirements generally specified by the main users of wood products.

OUTCOME RANGE

All relevant appearance specifications and strength specifications.

ASSESSMENT CRITERIA:

1. The explanation of the wood quality requirements usually specified by the main users of wood, confirms that the learner knows and understands the needs of the end users regarding wood quality.
2. The explanation is given in the correct timber trade and wood technological terminology.
3. The specifications of the end users of wood are correctly explained.
4. The explanation is given within the prescribed time limits.
5. Knowledge of the quality specifications of the main end users of wood is a prerequisite for the successful achievement of this unit standard.

SPECIFIC OUTCOME 2

Describe the effect of wood growth properties on these quality requirements.

OUTCOME RANGE

Structure, knots, spiral grain, juvenile wood, reaction wood, annual rings, heartwood and sapwood.

ASSESSMENT CRITERIA

1. The description of the effect of wood growth properties on quality requirements is evidence that the learner knows and understands the details of wood growth properties and how these affect quality.
2. The relevant growth properties and their effect on quality are described in the correct wood technological terminology.
3. The growth properties and their effect on quality are correctly described.
4. This description is given within the prescribed time limits.
5. Knowledge of the relevant growth properties of wood and their effect on its quality is a condition for the successful achievement of this unit standard.

SPECIFIC OUTCOME 3

Describe the effect of machined wood properties on these quality requirements.

OUTCOME RANGE

All the production equipment, dimensional accuracy, surface quality.

ASSESSMENT CRITERIA

1. The description of the machined wood properties that affect the quality of wood proves that the learner knows and understands the details of machining defects that can occur on wood products.
2. The description is given in the correct wood machining terminology.
3. The machining defects that affect wood quality are correctly described.
4. The description is given within the prescribed time limits.
5. Knowledge of the details of machined wood properties that affect wood quality is a requirement for the successful achievement of this unit standard.

SPECIFIC OUTCOME 4

Describe the effect of the drying out process of wood on these quality requirements.

OUTCOME RANGE

Different types of distortion, checking--surface and internal, collapse, discolouration, average moisture content, moisture content distribution, drying stresses.

ASSESSMENT CRITERIA

1. The description of the effect of the wood drying out process on its quality, confirms that the learner knows and understands the details of how wood dries out.
2. The description is given in the correct wood technological terminology.
3. The correct details of all the factors that play a role in the wood drying process are described.
4. This description is given within the prescribed time limits.
5. Knowledge of the details of the factors in the wood drying out process, which affects its quality, is a prerequisite for the successful achievement of this unit standard.

OUTCOME NOTES[43]

The outcomes that learners achieve will be judged subject to these being achieved while

a) the relevant activity is performed according to prescribed workplace procedures,

b) strictly adhering to the prescribed safety and health measures, and

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[43]In the unit standard 'Outcome Notes' and 'Assessment Criterion Notes' are repeated for each outcome. They are only presented once here.

c) observing the relevant environmental management principles.

ASSESSMENT CRITERION NOTES

The above assessment criteria will include assessment of the relevant crossfield outcomes, i.e

a) communicate effectively with all relevant persons in the relevant workplace.

b) train persons in this workplace

c) ability to solve problems and make decisions regarding production activities in this workplace

d) lead the workers in this area.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Learners can understand, explain and perform:

i) the effect of wood growth and production factors on the quality specifications generally required by the main users of wood.

ii) the NQF Level 4 learner's responsibilities regarding the safety and health stipulations, the workplace procedures and the environmental management principles relevant to the specific workplace.

iii) mathematical and communication skills equivalent to NQF Level 4 requirements.

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO: IDENTIFYING

Formulate production plans and evaluate outcomes and adjust plans when necessary.

UNIT STANDARD CCFO: WORKING

Check on and ratify decisions of other workers in the relevant workplace.

UNIT STANDARD CCFO: ORGANIZING

Manage the provision of tools and instruments used in this work area.

UNIT STANDARD CCFO: COLLECTING

Research options for improvements.

UNIT STANDARD CCFO DEMONSTRATING

Train and coach workers in this workplace and generally develop their skills.

UNIT STANDARD NOTES

Values: The procedures outlined in this unit standard must promote the values of affirmation and non-discrimination as outlined in the Bill of Rights and the Employment Equity Act.

(http://regqs.saqa.org.za/index.php)

APPRENTICESHIP CONTRACT

Know all men by these presents that on ..... in the year of our Lord one thousand eight hundred and fifty seven before me Thomas Stringfellow Civil Commissioner of the District of Fort Beaufort in the Colony of the Cape of Good Hope and in the presence of the subscribed witnesses personally came and appeared Edward Henry James a minor of the age of fifteen years and eleven months duly assisted by his mother Hannah Sims both residing at the Winterberg in the District of Fort Beaufort of the one part and Arthur Charles Gardiner of Fort Beaufort aforesaid Wheelwright of the other part.

And the said appearers declared that they had agreed to make and enter into as by these presents they do make and enter into the following Contract or Indenture.

The said Hannah Sims agreed to place her son the said Edward Henry James with his own free will approbation and consent as an Apprentice to him the said Arthur Charles Gardiner and the latter agrees and accepts the said Edward Henry James as such Apprentice to learn the art or trade of a Wheelwright. Generally with him after the manner of an Apprentice to serve for a term or period of five years from the day of the date hereof to be fully completed and ended.

And the said Edward Henry James covenants that he will during the whole of the said term his Master faithfully serve his secrets keep his lawful commands obey. That he will not waste the goods of his said Master nor lend them unlawfully to anyone. That he will not depart or absent himself from the service of his said Master without his leave having been first obtained but in all things as a good and faithful Apprentice shall demean and behave himself towards his said Master during the said term.

And the said Arthur Charles Gardiner covenants to and with the said Edward Henry James that he will teach and instruct or cause to be instructed and taught the said Edward Henry James in the said Trade of a

Wheelwright in all its branches in the best manner that he can and will also during the said term find the said Apprentice in suitable and sufficient diet food or daily sustenance lodging and washing and all other things usual and necessary. And in lieu of clothing pay unto him the following wages. That is to say the sum of nine shillings Sterling per month during the first twelve months of the said term. The sum of twelve shillings and sixpence Sterling per month during the second year. The sum of thirteen shillings and sixpence Sterling per month during the third year. The sum of fifteen shillings Sterling per month during the fourth year and a sum of eighteen shillings Sterling per month during the fifth and last year of the said term of his apprenticeship the said allowance payable monthly. And it is further agreed between the said parties that the said Edward Henry James shall accompany his said Master or go to any place to which the said Arthur Charles Gardiner may remove his residence or place of trade within this Colony during the continuance of this Indenture. And the said Edward Henry James in consideration of the Covenants of the said Arthur Charles Gardiner and of the instruction of the said Apprentice and of the board lodging and wages to be found and paid by him covenants with the said Arthur Charles Gardiner that the said Edward Henry James shall and will serve him the said Arthur Charles Gardiner for the term and in the manner aforesaid.

For the due and punctual performance of the Covenants herein contained the said parties hereby bind themselves each to the other according to Law.

H Sims
Edward Henry James
Arthur Charles Gardiner

This done and passed before me this eighteenth day of August 1857.

T Stringfellow

I hereby certify that Edward Henry James has served the term of his apprenticeship that he is a good tradesman and bears a good character.

A C Gardiner

Form of Contract of Apprenticeship.

THIS CONTRACT OF APPRENTICESHIP made and entered into the 25th day of September 1928 between R. B. Bell of Bell, Webb & Bell Ltd. Observatory, C/T (hereinafter called the Employer), of the one part, and Rufus Wepener a minor, of the age of 14 years as a 24/3/2 (hereinafter called the Apprentice), assisted herein by his or her parent or guardian David Wepener of the other part.

WITNESSETH:

1. THAT the Apprentice, having been found medically fit

* (and having served ~~as apprentice~~ with the Employer for one (25/8/28 – 25/9/28) months)

* [~~and having produced satisfactory certificates of attendance and proficiency from the~~ ~~(school or institution)~~ ~~covering a period~~ of ~~months~~, which is to be taken to be equivalent to one months of apprenticeship]

* (~~any other reason~~)

does of his own free will and with the consent of his father or guardian by these presents agree—

(*a*) to bind himself as an Apprentice to the said Employer in the trade or occupation of Cabinet Making for a period of 4 years 11 months commencing on the 25th day of September 1928

(*b*) to serve faithfully, honestly, and diligently the Employer and to obey all lawful and reasonable commands and requirements of the Employer or those duly placed in authority over him;

(*c*) not to disclose or communicate to any person whomsoever any information relating to the business of the Employer;

(*d*) not to be interested directly or indirectly, either as a paid agent or servant, in any business or undertaking other than that of the Employer, and not to absent himself from his employment without the sanction of the Inspector;

(*e*) to attend, in accordance with the requirements of the Minister, such classes as may be decided upon by him for the purpose of receiving technical or other education.

at the Cape Technical College

2. THAT the Employer does by these presents agree—

(*a*) to bind himself to receive the said Apprentice for the period stated and to teach efficiently or cause to be taught efficiently the said Apprentice in the trade or occupation specified;

(*b*) to refund to the said Apprentice the reasonable class fees expended on technical instruction, where free instruction is not available, provided that the Apprentice has made not less than 75 per cent. of the full number of attendances at the technical course, and provided that the Principal of the technical institution has reported that satisfactory diligence has been shown by the Apprentice;

(c) to pay to the said Apprentice wages at the following rates, viz. :— one month of the having been co

For the first year the sum of 12/- per week
remaining 11 months of the

For the second year the sum of 20/- „

For the third year the sum of 25/- „

For the fourth year the sum of 32/6 „

For the fifth ~~or any subsequent~~ year the sum of 42/6 „

..... „

..... „

or at such other rates as may be decided upon from time to time by the Minister ;

(d) to furnish annually a report on the progress and conduct of the Apprenticeship to the Apprenticeship Committee ;

(e) to endorse and sign this contract on completion of the period of apprenticeship and to hand it over to the Apprentice as his property.

3. THAT it is further agreed between all the parties to the contract that—

(a) any military service which the Apprentice who is bound for five years or longer may be called upon to perform at any time during the period of this Apprenticeship shall be held to be part of the term of the Apprenticeship, provided that the total period of such military service shall not in the aggregate amount to over 12 months, and any period which shall have exceeded 12 months shall entail such extra period being served by the Apprentice before the terms of this contract shall have been complied with. Where the duration of the contract is for less than five years the period of military service as allowed shall be equal to one-fifth of the duration of the contract. The Employer shall not be required to pay wages to the Apprentice whilst he is absent from work on such military service ;

(b) this contract may with the mutual consent of all parties be transferred to another Employer in the same trade, provided that the Employer or the Apprentice shows cause why he should not complete the contract, and provided that the Inspector assents to such transfer, and such transfer shall be effected by endorsement thereof on this contract signed by the parties thereto and endorsed on the copy of this contract filed in the office of registration, and upon such transfer taking place all parties thereto shall be bound by all the terms of this contract for the unexpired portion thereof ;

(c) if the Employer has good grounds for belief that the Apprentice has committed a serious breach of the terms of this contract or that the Apprentice has or is conducting himself in an unseemly manner and contrary to good discipline, he may forthwith suspend the Apprentice and shall immediately report the matter to the Minister to be dealt with under the Act ;

(d) if the Employer shall commit any serious breach of the terms of this contract the Apprentice may with the consent of his parent or guardian report the matter to the Minister to be dealt with under the Act ;

(e) the Minister shall be notified by both parties to this contract in the event of any alteration to the contract such as provided for in the last four preceding paragraphs.

4. THAT the Apprentice shall not be deemed to have completed any particular year of his service unless he shall have actually given service to the Employer upon not less than the ordinary working days customary in the industry. Provided that time spent in attending at any school by permission of the Employer or in accordance with regulations applicable to the case shall be regarded as time actually given to the service of the Employer.

That the Apprentice at the end of any year in which he has actually given service to the master upon less than the ordinary working days customary in the industry without the master's consent, shall for every day of such absence, if the Committee shall so order, serve one day, and the succeeding year of his service shall not be deemed to begin until the said additional day or days have been served.

That sick leave in excess of..... days during any calendar year shall not be considered as time served, except with the consent of the Committee.

IN WITNESS WHEREOF the contracting parties hereto have hereunder set their hands the day and year aforewritten.

AS WITNESSES

1. J. K. Morton

2. W. D. Armstead

.....
Employer.

1. G. McCann

2. T. Callaghan

David Wepener
Parent or Guardian.

1. C. Henry Medcalf

2. S. Fredericks

Rufus Wepener
Apprentice.

With the consent of all the parties to this contract the services of the Apprentice and the responsibilities of the Employer are hereby transferred to .....

this.....day of.....19.....

AS WITNESSES:

1.....

2.....

.....
Employer.

1.....

2.....

.....
Employer.

1.....

2.....

.....
Parent or Guardian.

1.....

2.....

.....
Apprentice.

REGISTERED at the Office of the Inspector of Apprenticeship, this.....

day of.....19.....

.....
Inspector of Apprenticeship.

TO BE FILLED IN ON COMPLETION OF THE TERM OF APPRENTICESHIP UNDER THIS CONTRACT.

THIS IS TO CERTIFY THAT the within-named Rufus Wepener.

..... has completed his apprenticeship under this contract,

this 30th day of October 19 33.

having had to make up lost time

Termination Noted

.....
Employer.

Furniture. APPRENTICESHIP COMMITTEE:
Barrack Street, CAPE TOWN.

P.O.Box No:872
Telephone No:5988

14—11—1933...

Mr. R. Mackenzie...
...Cape Town...

...

Dear Sir,

Herewith contract of apprenticeship between yourself and Messrs Bell, Lurk & Bell Ltd

The termination of your contract period has been noted by the Inspector of Apprenticeship and the contract now becomes your property.

Yours faithfully,

P. Venter
SECRETARY:

FV:PR

Furniture Industry Training Board

Opleidingsraad vir die Meubelnywerheid

CONTRACT No. 14/6/272.

Revenue stamp. To be cancelled by a contracting party with his initials and date of signature.

APPENDIX D

CONTRACT OF APPRENTICESHIP IN TERMS OF THE CONDITIONS OF APPRENTICESHIP FOR THE FURNITURE MANUFACTURING INDUSTRY

THIS CONTRACT OF APPRENTICESHIP made and entered into between E. E. Meyer Cabinetmakers (Pty) Ltd

of (address) Box 357 Parow, 7499

(hereinafter referred to as the Employer), of the one part, and Janap Meniers

identity number 7308210360087

born on the 21st day of August (month) 19 73 (hereinafter referred to as the Apprentice), assisted herein by his guardian (if applicable)

of (address) Bloemendallaan 50 Belhar

of the other part.

WITNESSETH:

1. THAT the Apprentice, having been found physically fit, having attained the educational qualification STD 7 and having complied with the selection criteria as prescribed from time to time by the Furniture Industry Training Board (hereinafter referred to as the F.I.T.B.), and having been granted remission of Nil modular credits by the F.I.T.B. in respect of demonstrated competencies, of his own free will and where required, with the consent of his guardian agree –

   (a) to bind himself as an Apprentice to the Employer in the trade of Cabinet making in respect of the Furniture Manufacturing Industry as defined in Government Notice R1963 dated 17/08/90 for a minimum period of 104 weeks commencing on the 01st day of July 19 98 and for such further period as he may be required to achieve a total of 100 modular credits. Should this not be achieved in a maximum period of 208 weeks, this contract shall be terminated;

   (b) to, should he FAIL any stage test or second attempt at any of the tests prescribed in the relevant Conditions of Apprenticeship and be deemed by the F.I.T.B. to be incapable of further training, leave this system with a certificate of his competencies at the highest stage achieved and with this contract being terminated;

   (c) to serve the Employer faithfully, honestly and diligently and to obey all lawful and reasonable commands and satisfy the requirements of the Employer or of those duly placed in authority over him;

(d) not to disclose or communicate to any person whomsoever any information relating to the business of the Employer;

(e) not to be interested directly or indirectly, whether as a paid agent or employee, in any business or undertaking other than that of the Employer and not to absent himself from his employment without the sanction of the Employer;

(f) to achieve the competence to enable him to accrue 100 modular credits and to demonstrate these competencies to an accredited test panel at the completion of a stage of training as defined by the F.I.T.B. from time to time;

(g) to attend, in accordance with the requirements of the Conditions of Apprenticeship applicable to him, such practical training courses or take such correspondence courses or portions thereof as may be applicable for the purpose of receiving technical or other instruction and to take such examinations as may, from time to time, be conducted by the relevant examining body in connection with such courses and to conduct himself at such courses or examinations in a seemly manner and in accordance with good discipline;

(h) to record in his logbook such particulars, as may be prescribed by the F.I.T.B., of the training which he has received and to furnish the F.I.T.B. as required, of a true copy of the recordings made in the logbook;

(i) .....

.....

.....

.....

.....

.....

.....

.....

2. THAT the Employer agrees –

(a) to bind himself to receive the Apprentice for the period stated and to teach efficiently or cause to be taught efficiently the Apprentice in the trade and industry specified in paragraph 1(a);

(b) to remunerate the said Apprentice at a wage not less than the rate prescribed in the Conditions of Apprenticeship in respect of the trade and industry mentioned in paragraph 1(a);

(c) to endorse and sign this contract on completion of the period of apprenticeship and transmit it through the Secretary of the Artisan Training Committee for noting of termination by the F.I.T.B. before handing it over to the Apprentice as his property;

(d) to pay any fees for the instruction and/or testing as laid down by the F.I.T.B. from time to time.

3. THAT it is further agreed between all the parties to the contract that –

(a) if the Employer is satisfied that the Apprentice has committed a serious breach of the terms of his contract or that the Apprentice has conducted or is conducting himself in an unseemly manner and contrary to good discipline, and such conduct is not conducive to his training or the Employer's business, whether during or outside his working hours or when attending classes or courses or taking tests in accordance with the Conditions of Apprenticeship or during his stay in a hostel, if such stay relates to his apprenticeship, the Employer may, subject to the disciplinary procedures as determined by the F.I.T.B. from time to time, suspend the Apprentice for a period not exceeding the number of days which the Apprentice ordinarily works in a week and shall report the matter in writing to the F.I.T.B. within three days of the date on which he suspends the Apprentice;

(b) where, owing to slackness of work or any exigency in the industry specified in paragraph 1(a), short time is being worked by the Employer, he may with the written approval of the F.I.T.B., given after consultation with the committee or sub-committee, employ the Apprentice on short time for such period or periods and under such conditions as may be stipulated by the F.I.T.B.;

(c) the Apprentice will undergo the stages of practical training prescribed in the Conditions of Apprenticeship applicable to his trade by means of the following options in terms of Clause 4(3) of the said Conditions of Apprenticeship:

Stage 1 — options 4(3) (FITB)

Stage 2 — options 4(3) (FITB)

Stage 3 — options 4(3) (FITB)

Stage 4 — options 4(3) (FITB)

Stage 5 — options 4(3) (FITB)

(d) they will comply with any other relevant Conditions of Apprenticeship or modifications thereof or exemption therefrom or relevant requirements of the F.I.T.B. not specifically mentioned herein.

IN WITNESS WHEREOF the contracting parties hereto have hereunder set their hands

this 5th day of AUGUST 1998

AS WITNESSES:

1. .....

2 L Jacobs. .....

Employer

1 .....

2 .....

Guardian

1 .....

2 L Jacobs .....

Apprentice

REGISTERED at the office of the ARTISAN TRAINING COMMITTEE OF THE Western Cape REGION

FOR THE FURNITURE MANUFACTURING INDUSTRY this 1st day of July 1998.

P Sweeney

ARTISAN TRAINING COMMITTEE

Revenue stamp here

TRANSFER

(Not to be completed until the approval of the F.I.T.B. has been obtained and transmitted to the Employer via the Artisan Training Committee).

With the consent of all the parties to this contract the services of the Apprentice and the rights and obligations of the

Employer are hereby transferred to.....

with effect from the date of registration hereof. In witness whereof the contracting parties hereto have hereunder set

their hands this .....day of .....19.....

1. _____

2 _____ .....
Employer

1 _____

2 _____ .....
New Employer

1 _____

2 _____ .....
Guardian

1 _____

2 _____ .....
Apprentice

REGISTERED at the office of the ARTISAN TRAINING COMMITTEE OF THE .....REGION

FOR THE FURNITURE MANUFACTURING INDUSTRY this.....day of.....19.....

.....
ARTISAN TRAINING COMMITTEE

TERMINATION

(To be filled in on approval of cancellation of contract by Artisan Training Committee)

THIS IS TO CERTIFY THAT the Apprentice .....has been exempt from the terms and conditions of his contract by the duly authorised Artisan Training Committee.

This termination of the contract and all its obligations comes into effect on this .....day

of .....19.....

1. _____ 2. ....
Witness Employer

1. _____ 2. ....
Witness Apprentice

.....
ARTISAN TRAINING COMMITTEE

CANCELLATION

Note: No contract of apprenticeship shall be rescinded except —

(a) with the consent of the Artisan Training Committee, by agreement of the parties thereto; or

(b) by the Artisan Training Committee on its own initiative or at the insistance of any party thereto, if it is satisfied that it is expedient to do so; or

(c) on expiry of the 4 year period; or

(d) at the exit of the Apprentice at a specific grade due to inability to progress further as assessed by the F.I.T.B.

LEARNERSHIP AGREEMENT

LEARNER DETAILS

PLEASE ENTER THE BELOW DETAILS CLEARLY:

SURNAME : **Mnweba**

FIRST NAME(S) : **Bongani Phillip**

HOME ADDRESS : **NY-50-131**
Gugulethu
7750

POSTAL ADDRESS: **Same as above**

TELEPHONE NUMBERS:

(HOME) **021- 633 7970** **(WORK)** **021 – 691 8589**

DATE OF BIRTH : **27.06.75** **MALE** ✓ **FEMALE** ☐

If you are under 18 years, please provide information about your parent / guardian:

SURNAME : **N/A**

FIRST NAME(S) : **N/A**

HOME ADDRESS : **N/A**

TELEPHONE NUMBERS:

(HOME) **N/A** **(WORK)** **N/A**

HIGHEST SCHOOL QUALIFICATION: **Standard 9 or N3**

NAME OF SECTOR EDUCATION AND TRAINING AUTHORITY: **W/P & Westlake Technical**

HAVE YOU COMPLETED ANY OF THE FOLLOWING QUALIFICATIONS:

If Yes, tick applicable box/es and specify qualifications:

YES ☐ **NO** ☐

TRADE CERTIFICATE	☐	DIPLOMA	☐
TECH. CERTIFICATE	☐	FIRST DEGREE	☐
POST GRADUATE	☐	OTHER DIPLOMA	☐

TITLE OF QUALIFICATION/S: _____

HAVE YOU PREVIOUSLY UNDERTAKEN A LEARNERSHIP?

YES ☐ **NO** ✓ *If yes, which province?* _____

WERE YOU BORN IN SOUTH AFRICA?

YES ✓ **NO** ☐ *If No, which country?* _____

ARE YOU A SOUTH AFRICAN CITIZEN?

YES ✓ **NO** ☐ *If No, which country?* _____

WHAT IS YOUR HOME LANGUAGE: **Xhosa**

DO YOU HAVE A SERIOUS AND PERMANENT DISABILITY?

YES ☐ **NO** ✓

If Yes, please specify:

SIGHT	☐	LEARNING	☐
HEARING	☐	CHRONIC ILLNESS	☐
PHYSICAL	☐	OTHER DISABILITY	☐

DATE YOU FIRST STARTED WORK WITH THE EMPLOYER WHO IS SIGNING THIS AGREEMENT:

12.04.99

EMPLOYMENT STATUS:

FULL TIME ✓ PART TIME ☐

LEARNING CONTRACT ATTACHED:

YES ✓ **NO** ☐

EMPLOYER DETAILS

LEGAL NAME OF EMPLOYER / PARTNER: **Pierre Cronje**

TRADING NAME (*If different from above):* **Pierre Cronje**

HOST EMPLOYER (*when additional training is required):* **N/A**

BUSINESS ADDRESS: **36 Flamingo Crescent**
Lansdowne, 7780

POSTAL ADDRESS: **P.O. Box 24542**
Lansdowne, 7779

ADDRESS OF HOST EMPLOYER: **N/A**

NAME OF CONTACT PERSON: **Amy Seherie**

TELEPHONE NUMBER: **021 – 691 8589** FAX NUMBER: **021 – 691 7161**

WHAT IS THE INDUSTRY OR PRINCIPAL ACTIVITY OF YOUR BUSINESS?

Furniture Manufacturing

HAVE YOU PREVIOUSLY EMPLOYED A LEARNERSHIP EMPLOYEE:

YES ☐ **NO** ✓

IF YES, HAVE CIRCUMSTANCES ALTERED YOUR CAPACITY TO TRAIN IN ANY WAY? PLEASE PROVIDE DETAILS:

NUMBER OF PEOPLE EMPLOYED BY THE COMPANY: **± 133**

REGISTERED TRAINING PROVIDER (RTP) DETAILS

NAME OF RTP: **Furniture Industry Training Board / Performance Training Technologies**

TITLE OF QUALIFICATION LEVEL: **Furniture Production** NQF: **2**

NAME OF LEARNERSHIP: **Cabinet Making**

NATURE OF EMPLOYMENT: FULL TIME ☐ NOT FULL-TIME ☐

IF NOT FULL-TIME EMPLOYED, STATE MINIMUM HOURS OF PAID EMPLOYMENT / WEEK (INCLUDES OFF-THE-JOB TRAINING): _____ hrs / WEEK

DATE OF LEARNERSHIP COMMENCES: **01.01.2000**

IS THERE A PROBATIONARY PERIOD? **YES** ☐ **NO** ✓ *If Yes, how long?* _____ *Months*

The RTP will provide off-the-job training as per the Learning Contract, and has negotiated the issues referred to in the regulations with the learner and employer(s).

AGREEMENT DECLARATION

We understand that this Learnership Agreement is legally binding and agree to be bound by the conditions and obligations detailed within the regulations. We understand it is an offence to provide false and misleading information.

LEARNER SIGNATURE: 28-02-00 **DATE:**

WITNESS SIGNATURE: **DATE:**

PARENT/ GUARDIAN SIGNATURE: **DATE:**

WITNESS SIGNATURE: **DATE:**

EMPLOYER SIGNATURE: 28/02/00 **DATE:**

WITNESS SIGNATURE: **DATE:**

RTP SIGNATURE: **DATE:**

WITNESS SIGNATURE: **DATE:**

LEARNERSHIP CONTRACT FOR LEARNERSHIPS

(To be attached to the Learnership Agreement)

LEARNER NAME: **B.P. Mweba**			**LEARNER NUMBER:**
Unit Standard(s) endorsed by SAQA:			**NQF Level:**
FP.CM.001.01	FP.CM.002.01	FP.CM.003.01	
FP.CM.001.02	FP.CM.002.02	FP.CM.003.02	
FP.CM.001.03	FP.CM.002.03	FP.CM.003.03	
FP.CM.001.04	FP.CM.002.04	FP.CM.003.04	**Two**
FP.CM.001.05	FP.CM.002.05	FP.CM.003.05	
Title of the Qualification to which the Unit Standard(s) contribute:			**NQF Level:**
Cabinet Making Level II			**Two**
Name of the Employer: **Pierre Cronje (Pty) Ltd**			
Name of Registered Training Provider: **F.I.T.B. / Performance Training Technologies**			**Accreditation Number:**

Please list all the Unit Standard to be achieved by the learner at the specific outcome level. Where Unit Standards have not yet been endorsed, identify all of the agreed accredited training modules.

Unit Code	Specific Outcomes (or Accredited Training Module where Specific Outcomes are not available)

Dates for off the job training:

Level II

21 to 24 February 2000
3 to 6 April 2000
10 to 13 April 2000
19 to 20 June 2000
3 to 6 July 2000
10 to 13 July 2000

ACKNOWLEDGEMENT OF PARTIES

The Learnership Agreement together with the Learning Contract must be agreed to and signed by the employer, the training provider and the learner. The parties involved in this relationship must agree beforehand on the following aspects:

- ✓ Selection, content, quantity and sequencing of specific outcomes.
- ✓ Timing, location and mode of delivery.

AGREEMENT DECLARATION

We, the undersigned, have discussed, understand and are satisfied with the above Learning Contract.

LEARNER/GUARDIAN SIGNATURE: 29-07-08 **DATE:**

EMPLOYER SIGNATURE: 28/02/08 **DATE:**

RTP SIGNATURE: **DATE:**

FURNITURE DESIGN

271 AFB

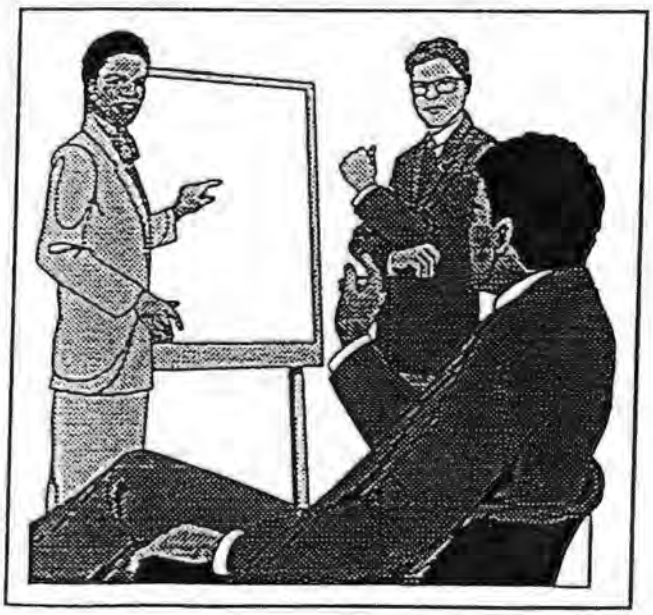
28 HOURS

Furniture Industry Training Board

FITB - OVDM

Opleidingsraad vir die Meubelnywerheid

DELEGATE'S WORKBOOK



2 APPEARANCE

For the furniture user, appearance is the most important requirement after functionality. This can vary, however, because furniture used in different places inside and outside the house which require varying shapes and appearances. In the workshop, for instance, functionality is perhaps more important than the appearance. In the lounge the appearance is just as important as the functionality.

■ Unity

The parts of a design should be aesthetically satisfying in their appearance as well as in their proportions to each other. A good looking grandfather clock with a badly designed base does not have a pleasing appearance.

■ Simplicity

The modern trend is to stress simplicity and avoid uneccessary accessories. This gives a more economical product that can be made with the aid of a machine.

■ Proportions

The proportions in furniture design are very important because they help to determine dimensions, shape and general appearance. A few of the elements of relationships are briefly reviewed.

Proportion in furniture design is the relationship of one dimension to another. Either the outline of a piece is in pleasing proportion or not. Examine Fig. 16.3 (A - F) and decide which of the rectangles would be most satisfactorily for the top view of a linen cupboard.

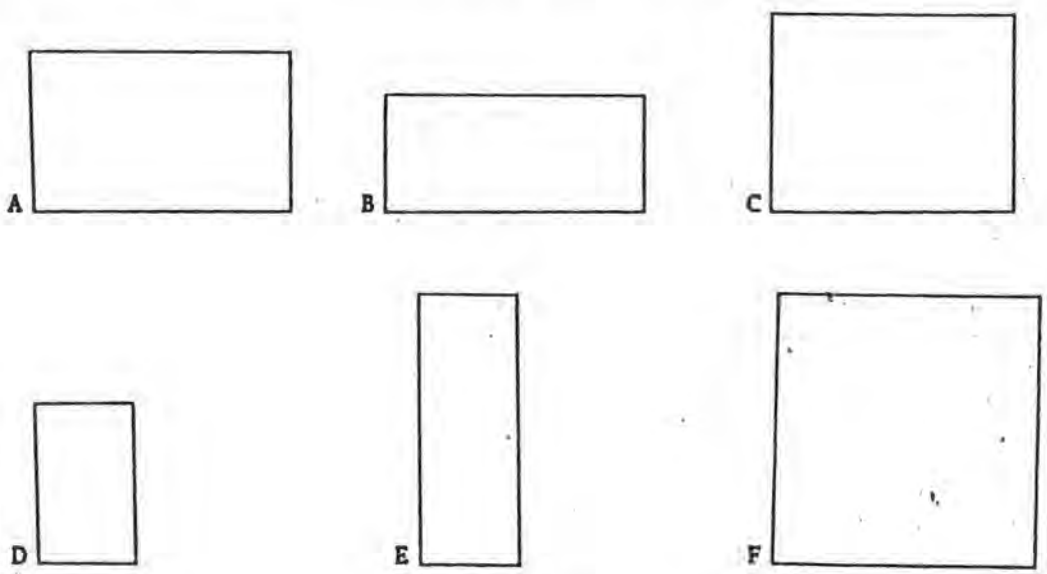


Fig. 16.3

Fig. 16.3A and D are possibly the best answers because both of them were drawn according to a "golden proportion" which is 1: 1,618. The Greeks tried to find the ideal proportion mathematically and based it on the proportions found in animals, plants and humans. This "ideal proportion" of 1:1,618 is regarded as a good one because it is visually pleasing. The Greeks applied it religously to the building of bridges and buildings. Mathematically this ideal proportion can be constructed as follows (Fig. 16.4):

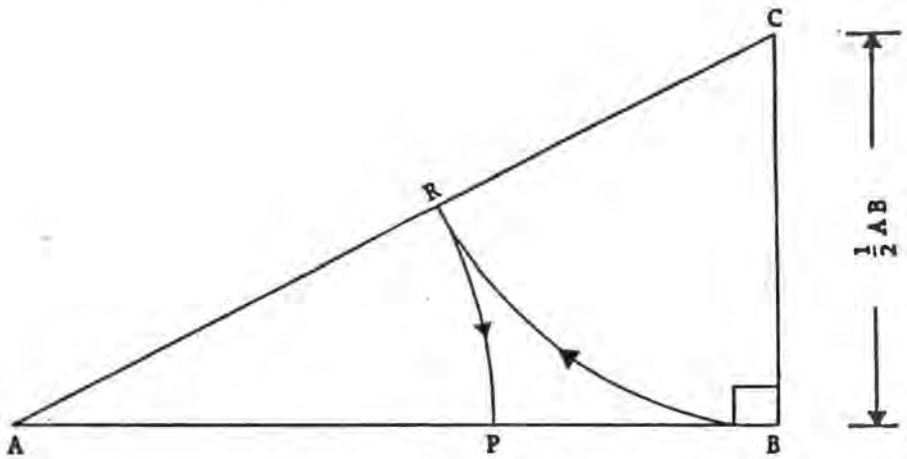


Fig. 16.4

Construct the right-angled triangle ABC with BC equal to half of AB. With C as the centre and BC as radius an arc can be constructed from B to the line AC. Using A as centre and AR as radius an arc can be constructed to the line AB. The "golden proportion" is PB:AP. A rectangle with the short sides equal to PB and the long sides equal to AP is called a "golden rectangle". This proportion is AP = 62 and PB = 38,3 which is equivalent to 1 to 1,618.

An Italian mathematician Fibionacci determined a series of numbers with which good proportions can be determined. The order of these is 1.1.2.3.5.8.13.21.34. etc., written in such a way that the sum of the previous two is equal to the next one. The proportion is then: 1:2, 2:3, 3:5, 5:8, 8:13, 13:21, 21:34, etc. The proportion of 5:8 and 21:34 is 1.6 and 1.619 when simplified and therefore very close to the "golden proportion" already mentioned.

The proportion of a piece of furniture should be such that it fits into the space or room where it is placed. If the required piece has a light rather than heavy appearance, then a proportion less than the "golden proportion" will create this (Fig. 16.3E).

Depending on whether the proportion is greater or less than the "golden proprotion" it can make the piece of furniture appear lighter and solid or less so.

The correct proportion creates harmony between surfaces, mass, shape and lines, creating a pleasing visual appearance. A line sketch of a book shelf with two doors is illustrated in Fig. 16.5. See if you can discover rectangles with the golden proportion.

Also note that rectangles A and B appear bigger. The observation point of the viewer must be kept in mind. For the viewer the rectangles lower than his own observation point appear smaller, therefore it is enlarged to appear bigger. The general distance between the viewer and the piece must also be kept in mind.

FURNITURE INDUSTRY TRAINING BOARD

CABINET MAKING - TRADE TEST
DROPLEAF TABLE

INSTRUCTION TO TEST ADMINISTRATOR

THE TEST

****

1. OBJECTIVE

To assess the Candidate's competence as a Cabinetmaker in the South African Furniture Manufacturing Industry. The test covers the full range of skills and knowledge of the Cabinetmaking Trade, as contained in the Training Schedules (from Stage 1 to Stage 5).

2. DURATION

20 Hours

3. FORMAT

The test is a practical one where the Candidate will produce the test item (Dropleaf Table) from the attached drawing. The test item will be marked strictly according to the attached "Checklist for Test Administrator".

The Regional Training Panel will mark the test item according to the "Checklist for Testing Panel" before the Candidate can be assessed as either "competent" or "not yet competent".

4. TEST TASKS

a) Setting out the frame on top.
b) Extracting all the relevant information from the drawing supplied and drawing up a cutting list.
c) Making all the necessary templates.
d) Assembling the top.
e) Constructing the Carcase.
f) Constructing and fitting the drawer.
g) finishing off of the test piece (Including the fitting of the top to the drawer rails with 4 screws).

COMPETENT

12 Pages

SENTRALE ORGANISASIE VIR VAKTOETSE
CENTRAL ORGANISATION OF TRADE TESTING

F.I.T.B. O.V.D.M

FINAL TRADE TEST FOR FURNITURE INDUSTRY TRAINING BOARD

60 – 100 ACCEPTABLE

TEST TASK K3 DROPLEAF TABLE **GO** **NO GO**
Supa wood top **0 – 59 UNACCEPTABLE**

60-69 = C / 70-79 = B / 80-100 = A * **59-50 = D / 49-40 = E/ 39-30 = F / 29-0 = G**

NAME: _____ **DATE:** _____

CONTRACT NO: APP _____ **SERIAL NO:** _____

	SET OUT	GO	NO GO
1.	Measurements length of side rail 736mm. Tol 1mm	2	0 2
2.	Measurements width of carcass 476mm. Tol 1mm...	1	0 1
3.	Diam top 1000mm tol 1mm	1	0 1
4.	Measurement top of leg (drawer) 51mm No Tol.....	4-2	0 3
5.	Measurement top of leg (front) 48mm No Tol.....	4-3	0 3
6.	Measurement top of leg side 31mm..... No Tol	4-3	0 3
7.	Measurement top of leg (rail) 26mm..... No Tol.....	4-3	0 3
8.	Position of top and bottom rails – width x 4.....	4-3	0 3
9.	Position of bearers Tol 1mm ..... 174 apart.....	1	0 1
10.	Overhang 30mm.....No Tol.....	1	0 –
11.	Drawer circle radius 470mm ..... Tol 1mm.....	1	0 1
12.	Drawer circle radius 448..... Tol 1mm.....	1	0 1
13.	Inside width of drawer – 396mm ..... Tol 1mm.....	1	0 1
14.	Inside length of drawer 258mm Tol 1mm.....	1	0 1
15.	Top and bottom rails –curve 470mm front 420mm ins	4	0 4
16.	Position of brackets (centre) ..... Tol 1mm.....	2	0 1
17.	Template for top and bottom rail "R".470 "R" 420	2	0 2
18.	Template drawer from curve "R"470 "R" 418.....	2	0 2

33

TOTAL: 40