Processes and Patterns of Responsiveness to the World of Work in Higher Education Institutions

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Declaration

I declare that ***Processes and Patterns of Responsiveness to the World of Work in Higher Education Institutions*** is my own work, except where indicated, and that it has not been submitted before for any degree of examination at any university.

Signed:

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Abstract

The thesis takes the general question of responsive curriculum development which meets both the needs of Work and those of the academy as its starting point.

The rationale for the topic flows out of education policy and societal pressures worldwide which are calling for an ever greater responsiveness from higher education to the workplace in the twenty-first century. Responsiveness to Work (i.e. the world of work) requires collaborative and integrative work between communities of academic and non-academic practitioners. Differences between knowledge and practices at Work and within the academy are broadly acknowledged in the literature, yet the ensuing nature and complexity of interactions between these two communities in curriculum design 'on the ground' is poorly understood. A key point is to recognize that integration as such cannot be the goal: the differences remain, but have to be turned into productive collaboration and joint development, for example, of a curriculum.

Productivity here is not used in the sense of the ratio between output achieved and inputs needed, but rather refers to the activity theorists' concept of zones of potential development between two different, interacting activity systems (their way of conceptualizing communities of practice). Productivity is then a measure of the extent to which new hybrid knowledge emerges in the interactive zone with positive outcomes for both systems. Ideally, the integrated curriculum elements look to both Work and academic knowledge. Such productivity involves the acknowledgement of pre-existing boundaries and differences between types of knowledge and the subsequent actions of actors in crossing these boundaries. After sketching the policy backdrop to the issues of responsiveness to Work "on the ground", the first part of the thesis discusses theories of curriculum development, and of boundaries, differences, boundary crossing and maintenance. Inspired by the work of Nooteboom, a model is outlined for optimal difference allowing for innovative and productive curriculum development.

The processes and patterns of responsiveness of higher education to the needs of

Work are studied empirically at two interconnected levels: The meso-level of the design of curriculum units; and the micro-level of face-to-face interactions between representatives from Work and the academy as they negotiate how to implement responsiveness. The curriculum units examined are those in which universities have attempted to design units which include aspects of Work. The face-to-face interactions are those between lecturers and Work representatives as they attempt to negotiate what sort of knowledge should be taught in the academy to meet both Work needs and those of the academics. At the meso-level, different cases (in different countries) were studied which together spanned the spectrum of differences between academic knowledge and workplace knowledge. At the micro-level, the focus was on the actual boundary work, and how it might set productive developments in motion.

The processes involved are those of the mutual presentation of knowledge difference between work and the academy followed by knowledge transformations. These transformations are in turn enabled by the representatives' actions and their mobilisation of structures to enable bridging between the different types of knowledge. Difference between work and academic knowledge matters. Firstly, difference needs to be recognised and identified, not as a stumbling block to further developments, but as a resource. Secondly, an optimal degree of initial difference, rather than no difference at all, is an enabling factor, in concert with actor strategies, in the development of hybrid work/academic curriculum objects.

The insights in micro-interactions can be combined with the analysis of meso-level curriculum development to create a model for productive work towards integration of Work and higher education. This model is supported by the literature discussed in the first part of the thesis, and can actually be used more broadly, for example for productive development and implementation of policy (in this case, for responsiveness to Work).

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List of abbreviations

ANT	Actor-network theory
AT	Activity theory
CoP	Communities of practice
CAD	Computer aided design
CATS	Credit exchange and transfer
ESKOM	South African national electricity supplier
HOD	Head of department
NCHE	National Commission on Higher Education
NQF	National Qualification Framework
OBE	Outcomes-based education
PBL	Problem-based learning
PDP	Personal development plan
SAQA	South African Qualifications Authority
SAUVCA	South African University Chancellors Association
SETA	Sector Education and Training Authority
UK	United Kingdom
WBL	Work-based learning
WEBCT	A university-wide teaching website.

Introduction and experiential background to the thesis

My interest and involvement in difference and bridging differences between workplaces, academics (boundary-crossing activities) and higher education began with curriculum design work in an engineering department A in 1999. At this time the university was undertaking an often painful process of curriculum renewal in order to better align qualifications to the emerging general education National Qualifications Framework, the related system of outcomes-based education and a more Work-responsive higher education policy. This was an attempt to put all qualifications, wherever they were gained and in whatever field, together into a single system. There would be multiple sites of entry, recognition of social experience, ease of horizontal and vertical movement and the potential for the previously disenfranchised to move from unskilled work, through high skills training, to highly skilled work. The process was painful because individual subject descriptions had to be integrated and expressed in the form of outcomes, assessment criteria, ranges, levels and other associated quantities which were poorly understood by the staff. In addition, outcomes had to be correlated with the development of generic competencies such as problem solving, communications and information literacy. These were seen as essential skills for operating in modern workplaces which could be learnt in one site and transferred to other sites.

For some staff there was nothing new here as they had always taken a competency-based approach in which learners had to demonstrate mastery of itemised skills. For others the learning of key skills was irrelevant as learners in career-focused education simply needed to know how to do the job.

For many staff members and industry representatives this move to outcomes–based education was seen as ill advised, unnecessary and having symbolic rather than educational value. Furthermore the ongoing roll-out of outcomes-based education in the schools was seen by many educationalists and the public as a fiasco (see, for example Jansen and Christie, 1999; Jansen, 2001). The engineering department at my institution was taking a leading role in this redesign and was holding meetings with sister departments in other universities and with local industry in order to attempt to fashion a consensual outcomes-based curriculum document which fitted into the

National Qualifications Framework. Not surprisingly, there were frequently different interpretations of policy, differences of opinion, misunderstandings and attempts at negotiated settlements.

My attention was also drawn to the academic and local industry meetings, the advisory committee meetings, as I surmised that Work and academic representatives may approach higher education from different perspectives. The role of these bodies is to advise academic departments on curriculum content so that it better reflects current and emerging industrial practices and needs and thus, ultimately, better prepares students for the workplace. Each department has such a committee which meets once or twice a year. In the first engineering A advisory committee meeting I attended, two main issues were raised; the first was that of the change from a subject-determined to an outcomes-based qualification.

The academics presented the need for such outcomes-based qualifications by citing recent educational legislation that had driven the need for change. They then described the collegiate process they had engaged in with the other institutions. Furthermore they stressed that the new qualifications would also focus on the development of key skills such as problem solving and information management and on more integrated work-related outcomes, rather than on subject knowledge - which should enhance students performance in the workplace. The academics presented, I believed, a forceful argument to the Work representatives for the adoption of the outcomes-based qualifications. Work representatives found the general idea of such qualifications acceptable, particularly in terms of key skills which they felt were appropriate for modern workplaces.

The second item raised was that of increased weighting in the qualification for environmental studies. This was important for this department as some lecturers felt they had an ethical responsibility to teach learners about the environmental impact of their work as engineers; also, the department already offered a strong part-time course in this field to industry and had many takers. The Work representatives, however, while agreeing that environmental awareness was important, suggested that the weighting of this component be substantially (and disappointingly for the academics concerned) downscaled as there was a need for more fundamental engineering

training in the curriculum. The academics here had failed to convince the Work representatives of the need for such a major environmental component.

In both cases there were subtle acts of persuasion at work which could be examined further. In addition, at that time, the Gibbons et al. (1994) proposal of the importance of Mode 2 over Mode 1 knowledge in Work/academic higher education research was gaining ascendancy. The advisory committees were becoming increasingly interesting sites of study, both in terms of curriculum knowledge as examples of hybrid forums with representatives from different interest groups.

Shortly thereafter I became involved with the development of integrated projects. These were interdisciplinary in nature and were planned at each level of study. The purpose was to engage students in making models or developing working artefacts which reflected real engineering Work which would also stimulate the development of generic skills such as group work, information literacy, oral and written communications and problem solving was also encouraged. In addition, the integrated project was an attempt to persuade staff to work co-operatively across their subject boundaries. Integrated projects were a direct response to higher education policy directives to teach to and assess against 'outcomes' rather than individual subject achievements.

Thus there were two main instances of difference emerging in my curriculum work. Firstly there was the design of curricula which attempted to integrate the needs of the worlds of Work and the academy (for example in integrated projects). Then there was the arena of Work/academic curriculum meetings.

The inherent tensions between Work and academic knowledge, which came to light as academics attempted to be more responsive to work needs, presented me with an interesting research area. My curriculum departmental work put me in a good position to examine responsiveness at the grounded levels of curriculum design and interaction. There was also an opportunity to empirically study interactive events between Work and academic representatives.

It was the combination of my wondering (the first step towards insight) about what was happening and my commitment to find out how to work towards improvements which started my research journey. Gradually, my bits and pieces of reading and empirical work converged (see, for example, my analysis of qualification development in the water and sanitation sector and of the integration of Work into academic practices)[1]. At some moment, I made the transition towards research for a PhD. This thesis is the outcome of my research journey, so far.

[1] Garraway, J. (2005) The codification of local knowledge into learnerships, ***Journal of Education*** 36: 93-110.
3. Garraway, J. (2005) Recontextualizing work into academic practices. ***South African Journal of Education*** 25 (4): 217-223.

Chapter 1: The challenge of responsiveness

1.1 The challenge of responsiveness to Work

For the modern university the exhortation towards greater responsiveness to the world of work, and to society more generally, in policy statements and in ongoing practices, involves their confronting and attempting to deal with difference between the world of Work and more esoteric academic knowledge and practices.

Even though the caveat of Muller (2000), Bernstein (2000) and Dowling (1997) is that we cross boundaries between academic and everyday knowledge at our peril, social transformation and development in South Africa seems to require the erosion of boundaries between Work and academic knowledge (Breier, 2001). There is thus a need to examine how Work responsiveness may be operationalised at the level of grounded academic practices, and this is the challenge taken up by the thesis.

Thus the question I pose is, if we are going to be responsive, how are we to understand the processes of boundary crossing between current disciplinary knowledge and academic ways of doing, and knowledge and ways of doing outside of the university? I seek to understand where this is being done and how it may be done more appropriately and productively. I do this through proposing an analytical framework for examining hybrid events between universities and institutions outside of them, and exploring the value of this framework in terms of academic/Work hybrid forums.

The general research question that forms the starting point for the study can thus be formulated as:

> *What processes within hybrid Work/academic forums lead to the bridging of difference between Work and academic knowledge and what is the nature of the outcomes of these bridging processes?*

The question will be progressively addressed as argument about the effects of responsiveness and the nature of Work/academic interaction is developed.

The way this question is phrased may suggest that I uncritically accept that universities should be responsive and thus my only concern is with the success of such responsiveness. Though I do support some level of responsiveness within the university my interest is not so much in responsiveness per se, but in grounded academic practices in which interactions about responsiveness are played out and hybridisations may occur.

1.2 The nature of responsiveness

As responsiveness becomes increasingly important in higher education worldwide, universities will have to become different places which will need to design and deliver different sorts of curricula than was the case in the past (Gibbons, 2005; Moll, 2004; Barnett, R., 2004; Stromquist and Monkman, 2000; Gibbons. 1999). This, in turn, is reflected in higher education policy documents in South Africa, for example:

> 'In essence, increased responsiveness and accountability express the greater impact of the market and civil society on higher education … (it) will require new forms of management and assessment of knowledge production and dissemination. It has implications for the content, form and delivery of the curriculum.' (NCHE, 1996b: 6)

The development of responsive higher education policy has been a pre-occupation with educational analysts post 1990 in South Africa. So too, as various authors have shown (for example de Clerq, 1997; Chisolm, 1992), is the implementation of such policy. The design and implementation of responsive policy has its own difficulties and dynamics, but to only examine these processes would be to miss an important opportunity to examine the actual interactive processes between different communities and types of knowledge on the ground.

The field of university responsiveness to Work in South Africa at the level of curriculum has not been well explored in the literature. There is a significant lack in knowledge about curriculum development, though the basic problem of difference between Work and academic knowledge is widely recognised in the literature.

1.3 Responsiveness, hybridity and knowledge differences

Hybridisation of traditional knowledge forms with the needs of society is not new. For example, in the field of the public understanding of science, Layton et al. (1993) describe how ordinary citizens routinely deconstruct received scientific knowledge from the scientific community and reconstruct it through hybridising it with other, more local and contextual knowledge.

Scholars such as Young (2003c), Bernstein (2000) and Muller (2000) have critiqued notions of hybridity as assuming that all boundaries are permeable and thus anything can be put with anything else. This suggests that disciplinary knowledge based on ways of thinking that have been developed over the past 150 years or so can be simply broken up and reformed at will. Furthermore, hybrid approaches are defended by 'hybridisers' through their being something inevitable and unavoidable, tied up with changing modern economies and the erosion of previously 'hard' boundaries (Muller, 2000: 57).

Broadly, one can position these authors as predominantly concerned with boundary maintenance. Those who support boundaries between different discourses across disciplines and between disciplinary and social knowledge as a given are most likely to adhere to a broadly structuralist paradigm; structures are seen as anterior to, and to some extent determining of, social action (Carter and New, 2004).

When, in contrast, all disciplinary knowledge can and should be integrated and hybridised with social knowledge, authors may well take the epistemological position that all knowledges are relative and of equal value. In this version it should be possible to substitute social phenomena within disciplines with no ill effect on either the social or the disciplinary world. Here, structural constraints and enabling factors are muted or absent (Muller, 2000) and authors favouring this approach would tend towards more socially constructivist approaches within a broadly postmodern paradigm.

For Muller (2000) the hybridisation of school knowledge with everyday knowledge is driven by self-styled (though ultimately deluded) 'progressive' educational thinkers.

Here, the assumption is that more universal access to schooled knowledge is facilitated through the erosion of boundaries between school and everyday knowledge. Boundaries are seen as an impediment to learning. Citing Dowling (1997), Muller (2000) demonstrates that hybridising mathematical and everyday knowledge serves to prevent learners from acquiring the overall logic of school mathematics and hence becoming mathematical thinkers. Some learners, usually from lower socio-economic backgrounds, are thus deprived access to 'full' mathematics.

The duality of 'maintainers versus hybridisers' or 'structuralists versus constructivists' does not, however, hold in practice; some maintainers also support hybridisation of more academic and local knowledge, though only under certain conditions. For example, Muller and Taylor (2000) argue for the possibility of hybridisation of mathematics and the social world using the work of Walkerdine (1998). Here mathematical and everyday knowledge are 'prised apart from their set of relations of signification' (Ibid.: 69) and rearticulated through a succession of recontextualising events. In addition, Muller and Subotzky (2001: 177), in discussing community outreach at universities, conclude that university subjects and practical community issues should only be brought together where it is 'operationally and epistemologically appropriate'. The point raised by Muller and his co-authors is not that disciplinary/social knowledge hybridisations are bad, but that they should be systematically performed within the confines of what knowledge is appropriate to hybridise at an appropriate level of disciplinary expertise, and with recognition of boundary. Without boundary there can be no meaningful knowledge development or conditions for hybridity (Muller, 2000: 76). Thus to describe Muller crudely as a boundary-maintainer, as Michelson (2004) does, ignores his qualified contribution to hybrid developments *through* boundary recognition.

Furthermore, as Muller (2000) points out, exclusive adherence to one or other ontological position (agency or structure) can be shown to be absurd when attempts are made to explain social phenomena.

A productive position on hybridity can be derived from activity theory researchers (such as Engestrom, 2000 and van Oers, 1998a, b) and from the sociology of science (for example, Rip et al. 2004a). They argue for a boundary-crossing, hybridising

notion of knowledge development within interacting systems in which structural or other differences in knowledge are recognised rather than ignored. It is the *tensions* (though not necessarily disciplinary ones) which are set up around difference which serve to fuel the development of new, hybrid knowledge forms. This is particularly important when trying to understand interaction between knowledge in the university and knowledge in the world of Work.

Knowledge and ways of doing in workplaces and universities are different in nature. Generally, workplace knowledge and ways of doing are rooted in contexts of action and are flexible, in that they are responsive to new technologies or the vagaries of the market. Workplace knowledge, furthermore, tends to be additive in that workers acquire a basket or repertoire of Work skills and knowledge from different contexts. Workplace knowledge tends, therefore, not to be generalisable across contexts. In contrast to this, academic practices are more firmly rooted in codified subject knowledge which is sequentially structured around increasingly abstract pedagogies rather than being flexible and separately arrayed. I will return to this topic in Chapter 3.

Responsive policy and issues around the nature of knowledge at Work and in the university indicate why difference and bridging between differences (boundary-crossing) are important concepts in this study. My interest is not so much with communication problems, which can be addressed by creating the right atmosphere, but rather with how interactions may occur through the mobilisation of difference as a resource. By this I mean that differences raised between people can often spur them into interacting with one another whether this is in the form of challenge, argument or self reflection.

A widely held view in cross cultural studies is that difference between different social groupings acts as a barrier to solving common social issues, as solutions may be seen to favour one social group over another (Muller, 2001); differences should thus be softened or flattened in order that consensus may be reached. In this way whatever issue was raised may be dealt with. In contrast, my argument is that the raising of difference is a necessary step in bridging work between different social groupings. The verbalisation of what one social group does first of all provides the other with

something concrete to work with; what is tacit must now become explicit and open to examination (Wenger, 1998). Secondly, explicitly describing difference sets up perturbations in the knowledge of the other which may result in a number of dynamics, namely: the other is made to make explicit counter differences; both groups are brought, through making knowledge explicit, into a reflective space where firmly held convictions may be examined; and new forms consisting of elements of knowledge from both groups may emerge (Engestrom, 2001). New forms are the beginnings of hybrid knowledge objects. This will be a way of specifying productivity in Chapter 4.

1.5 Transformations of knowledge between the worlds of Work and higher education

Figure 1 is an exploration of the various knowledge movements and change between Work and higher education. Figure 1 arose from this researcher's attempts to conceptualize general interactivity between Work and academic knowledge movement then to zoom in on the opportunities for grounded Work/academic interactions in hybrid processes. In this way the meso- and micro levels of boundary-crossing analysis examined in the later chapters are positioned within a larger whole, including the role played by policy.

Referring to Figure 1, the green ovals and the 'T's' represent points of knowledge transformation as knowledge moves from one context to another. The gray boxes represent hybrid forums where representatives of different communities interact with one another. Two of these, the meso- and micro-level forums which are of interest in this thesis can be immediately recognized. The thick lines represent chains of transformation of knowledge between contexts.

The left hand picture box 'Work' indicates knowledge, T0, in workplaces. Work knowledge, it is suggested, is transformed and re-represented in T1 by spokespeople for Work (managers, trainers etc). This transformation may involve the 'decontextualisation' of this Work knowledge to prepare it for movement into other communities or levels. Transformed knowledge at T1 may now move and be

transformed along transformation chains into policy (T4, 5) or academic practice (T2, 3).

In policy development the Work knowledge would again be transformed (T4) as it enters the arena of social, political and economic needs of the country. T4 knowledge would further be expected to be transformed as it interacts with academic knowledge and ways of doing (T5). Before policy is enacted in academic practices (T3) there would again be transformations as it is interpreted by predominantly academic actors (T2), involved in transforming Work (T1), in discussion forums with Work representatives or in the design of responsive curriculum units. This transformation chain from T0 to T2 via T1, 4 and 5 can be read as the development of macro-level policy and its nested linkages with the meso- and micro-levels of Work/academic practices.

Within this transformation chain two elements are particularly important for the study of grounded practices; the design of responsive curriculum units and interactions between Work and academic representatives in curriculum discussions; the two are related and cross over one another and can be crudely distinguished at this stage as product (meso-level curriculum design) and process (micro-level interactions).

In meso-level Work/academic hybrid forums, Work knowledge is transformed and interpreted by academics to produce a further transformation, T2, according to the structures of academic disciplines and programmes, into a responsive curriculum unit. The transformations are never completely uni-directional, and involve some sort of to-and-fro between academic and Work representatives and their artefacts. Design is also influenced by an interpretation of policy from T5 which may drive, open up or limit the transformation of Work knowledge into the curriculum at T3.

In micro-level Work/academic forums, represented by workplace advisory committees in this study, the transformation of Work knowledge at T1 into the academy at T2 is again mostly an interactive process of face-to-face negotiation. Furthermore, the processes and products arising are likely to be influenced by policy interpretations (T5).

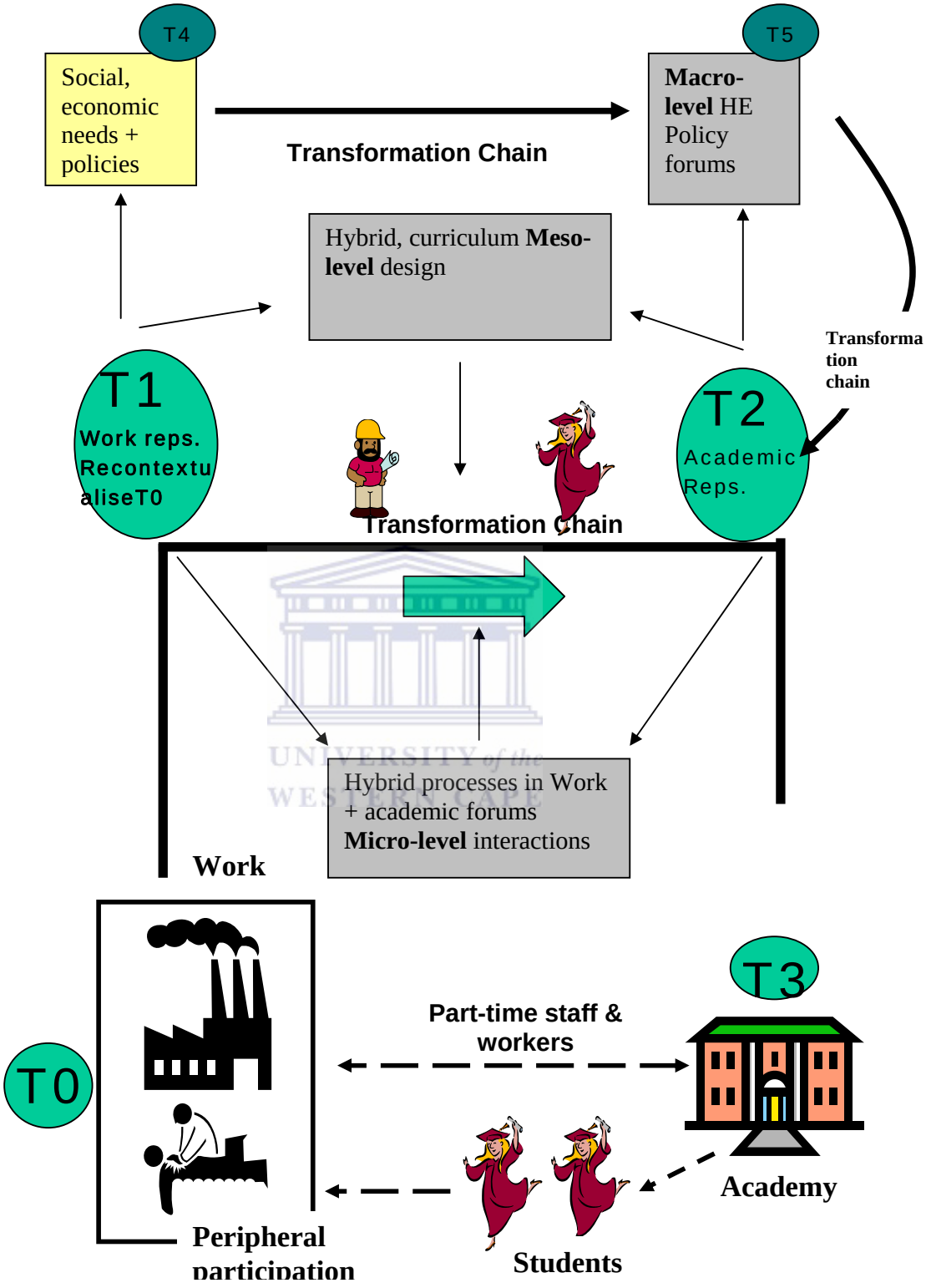


Figure 1: An exploration of processes and products of responsiveness to Work in the academy

Policy is selectively examined in the thesis in Chapter 2 as a backdrop to issues further down the line.

Advisory committees (at the micro-level) consist of an assortment of field-relevant Work representatives and the academic staff of a department. They meet once or twice a year. The role of the committee is to decide upon curriculum issues so that the academic courses are more closely aligned to what Work wants, and to changes which are occurring in industry. There is no fixed way that the committees operate and they may have different protocols.

These committees were heterogeneous, purposeful curriculum design meetings and fulfilled the following criteria: they involved interaction between Work and academic representatives in some sort of formal, purposeful manner; they involved negotiation of procedures and knowledge; and they were concerned with developing some aspect of the curriculum. As such they were ideal sites to examine the processes of boundary-crossing activity.

The design of curriculum units would involve some measure of micro-level face to face interaction. However, curriculum unit design and the face-to- face discussions in advisory committees differ temporarily and in terms of structure and overall purpose; the brief of the advisory committees was usually broader than just unit design. Thus they can be examined separately.

In both meso- and micro-level hybrid forums, difference and insulation between types of knowledge make re-representation and crossing over between the Work and academic worlds complex and problematic. The analysis in this thesis focuses on trends emerging as attempts are made to cross these differences at the level of responsive practices, and how approaches differ according to the level at which engagement happens and the constraints operating within these different levels.

1.6 Chapter outlines

In Chapter 1 the broad rationale for analyzing responsiveness is outlined. The chapter provides a short background to the field of university curriculum responsiveness, followed by attention to the challenge of responsiveness in general, as this is a contentious issue in higher education. The particular types of Work responsiveness examined in the thesis, their relationship to one another and to the broader field of Work responsiveness are also shown. Chapter 2 expands on the policy backdrop through examining some of the processes which led to Work-responsive policy, and some of the tensions inherent in such policy. The importance of understanding grounded practices of Work responsiveness is also underlined, if policy is going to be effective. The following chapter, Chapter 3, firstly reviews current theory of boundary and boundary-crossing activity between different communities, predominantly within constructivist frameworks. But mention is also made of the more structuralist theories of Basil Bernstein (2000, 1999) as these provide a theory of boundary as well as how disciplinary structure may act on and change knowledge imported into it. Thirdly, the chapter explores the nature of knowledge difference between Work and academic institutions and sets up an argument for the need to acknowledge and deal with such differences in practice. Chapter 4 synthesizes the theory reviewed in Chapter 3, and additional theory on the role of difference in innovation studies, into a conceptual framework for exploring boundary crossing between Work and academic institutions. It is this synthesis which is used as an analytical tool in the empirical chapters (6, 7).

Chapter 5 mobilises the conceptual framework from Chapter 4 into a methodology for analyzing interactions between Work and academic knowledge, which is initially operationalised in Chapter 6, the first empirical chapter.

Chapter 6 performs a retrospective analysis of responsive curriculum units in terms of the relative influence of Work and academic knowledge within the unit, and suggests how these differing influences may have arisen. The kinds of ‘units’ analysed are those which have been designed in order to respond to new Work needs, for example Work-integrated tasks and problem-based learning. In Chapter 7 the focus is again on analyzing Work/academic knowledge integration but now the focus is on the actual

processes occurring as academics and Work representatives attempt to negotiate a curriculum which can be taught academically but is still ‘responsive’ to the needs of Work. In Chapter 8 the overall findings of the thesis are discussed. Based on these findings, an idealized model for the sorts of interactions which have the potential to produce new knowledge forms somewhere between Work and academic knowledge is put forward, and further suggestions about interactions at the level of policy are made.

Chapter 2: Responsiveness and the higher education landscape

2.1 Introduction

This chapter can be read as a background chapter for the concept of responsiveness in general, and for the nature of hybrid curriculum developments analysed in later chapters. This background will enable the research question from Chapter 1 to be more grounded so that a more detailed rationale for the study can be given.

The starting point of the chapter is an outline the forces which have been responsible for the recently more strongly articulated move towards responsiveness of the university to society; thus texts which refer to the influences of Mode 2 society and globalisation on the work of universities are referred to here (for example Gibbons et al. 1994). This is followed by a brief review of selected aspects of research and curriculum responsiveness in order to accentuate the role of boundary and boundary crossing in such initiatives.

Boundary crossing between Work and the academy in higher education is nested within educational policy and broader social change. Thus the second section looks at the often contradictory nature of higher education policy in South Africa, both in terms of the larger picture of equity versus economic development and the disciplinarity/integration divide, and issues concerned with educational policy implementation.

The overall point made is that policy developments in South Africa encourage Work/academic hybridity in often confusing and relativist ways that do not take into account the complexity of hybridisation in grounded, curriculum practices. It is these grounded practices involving the concepts of boundary and boundary crossing which are examined in the empirical chapters, Chapter 6 and 7.

2.2 Higher education responsiveness

Developed society is in a process of changing and the changes are reflected in the institutions, including universities, which make up that society. Post modern society has a tendency towards pluralism, diversity, volatility, uncertainty of outcomes and transgressivity. Previously separate institutions such as science, politics, culture and industry now more readily interpenetrate one another and even the notion of the nation state is being eroded both from the top (for example in the formation of blocs such as the European Union) and from the bottom through diversity (Nowotny et al., 2001). There are also transfer of knowledge and practices about techniques across geographical boundaries; the interdependence of financial markets; the rise of transnational corporations as complex networked units; and systems of networking between large and small businesses (Castells, 2001). In terms of labour there is a greater demand for flexible workforces which can be 'self-programmable' and hence responsive to fast knowledge influx and change (Castells, 2001).

In 1994 and again in 2001 Nowotny, Gibbons, Scott et al. coined the now familiar term 'Mode 2' and Mode 2 society in an attempt to pin down a move from a more regulated society of separate entities, a Mode 1 society, to one in which boundaries were continually being crossed and new knowledge, Mode 2 knowledge, was being produced in the context of application (Nowotny et al., 2001; Gibbons et al., 1994).

> 'In Mode 1 problems are set and solved in a context governed by the largely academic interests of a specific community. By contrast, Mode 2 knowledge is carried out in the context of application. Mode 1 is disciplinary while Mode 2 is transdisciplinary … Mode 1 is hierarchical and tends to preserve its form, while Mode 2 is more heterarchial and transient … Mode 2 is more socially accountable and reflexive. It includes a wider, more temporary and heterogeneous set of practitioners, collaborating on a problem defined in a specific and localized context.' (Gibbons et al., 1994: 3)

As Stromquist and Monkman (2000) and Gibbons (1998) outline, universities will have to become different sorts of places in response to globalising influences; we can also add here in response to emerging Mode 2 knowledge development in research

and in society. Firstly, there is an imperative to form alliances with industry in research projects so as to better serve the need of knowledge development for economic advantage. Then there are changes in undergraduate courses which begin to reflect the sorts of integrated knowledge and qualities needed in new, highly competitive workplaces. '(higher) Education is being set up as a critical element in economic well-being and competitiveness' (Stromquist and Monkman, 2000).

The caveat of Wolpe (1991), writing within the South African context, is that economic responsiveness needs to be critically examined lest it serves to reproduce, rather than challenge, inequality in the workplace. Wolpe acknowledges the need for economically orientated skills education to meet immediate needs but that this should be a short term project nested within a larger social goal of equity.

The equity movement advocates that educational transformation would need to enable people to understand the roots of oppression, to participate in the creation of a non-racial and democratic state and to resist the previous disparities (both economic and political) through critique, debate and collective action (Wolpe, 1991). If this is the focus then curriculum designers would be hard pressed to indicate how such understandings could promote the networking, flexibly skilled and self-regulating individual often described as necessary in the globalised new work order (Castells, 2001). Equity and economic responsiveness in South Africa remain to this day in a state of dynamic tension, the one often being seen as incompatible with the other (Cloete and Maasen, 2002).

My interest in difference and boundary crossing suggests that there is more to changes in higher education than just being 'a critical element in the economy'; there are also changes which will need to occur at the level of academic practices as academics are required to work with different constituencies as they attempt to act to meet calls for respsoniveness.

Higher education responsiveness refers to dealing with issues that have not traditionally been important considerations in university work (Moll, 2004). Responsiveness may take a number of forms; it can, for example, take the form of responsiveness to industrial research needs or to a curriculum which better reflects the

needs of the modern workplace, the community, or new students' needs. The focus in this thesis is on Work responsiveness, though the other forms are briefly discussed below with an emphasis on South Africa.

Research responsiveness, according to Gibbons et al. (1994), involves a shift to more Mode 2 style research, in which extra-university actors collaborate with university researchers. Such research would be guided by the context of application and involve heterogeneous groups of actors. Disciplinary knowledge would be transformed to meet the need at hand – here researchers would need to be reflexive as they engage critically with new fields - with the possibility of new knowledge production. The argument put forward by Muller (1999) is that such research is dependent on detailed disciplinary knowledge, not alternate to it.

Whichever way one views 'responsive research' it will involve collaboration around difference at some point or other, and cannot be expected to always happen spontaneously.

In Work-responsive curriculum development initiatives, the inclusion of generic skills in higher education curricula is not new and can be traced back, at least, to the nineteenth century (Barrie, 2004). However, the perceived need to create a more skilled workforce in response to recent globalising influences has led to the convergence of higher education and economic needs, and hence generic skills in education, being treated with greater urgency in the last ten years or so.

Generic skills have come to act as a bridge in policy pronouncements (or at least as an attempted one) between different disciplines and between learning at university and learning in Work and society (Barrie and Prosser, 2004), and are strongly represented in South African policy (see, for example, the New Academic Policy, 2001: 108). In this framework, students can just as easily learn problem solving in sociology, engineering, Work or society and these learnings are equivalent, drawing from the same 'mother lode of competence' (Muller. 2000: 97). However, where boundary between disciplines and contexts is recognised, and change happens with movement across boundaries, these skills are unlikely to be equivalent across contexts.

Another responsive curriculum movement in South Africa and elsewhere (for example North America) is community responsiveness or service-learning (Muller and Subotzky, 2001; Stanton, 2000). The development of service-learning as part of the curriculum involves the incorporation of community knowledge with academic knowledge. As with Work and academic knowledge, community and academic knowledge are likely to be different in nature and purpose. Thus the development of integrated academic curricula on the ground may be more difficult than policy makers and service-learning delivery sites envisage. Boundary needs to be recognised and theory as to how boundaries can be most fruitfully crossed and new forms of academic/community knowledge arise needs to be utilised.

Curriculum development in the 21st century also needs to be responsive to 'new' students with different backgrounds and knowledge to those traditionally enrolled in the past (Clark, 2003; Scott, 2000). Such responsiveness can take different forms such as an increase in formative assessment so that students come to internalise disciplinary rules (Yorke, 2001), peer learning networks (Peat et al., 2001) to provide both social and intellectual support and utilising students prior knowledge (Steinberg and Slonimsky, 2004), amongst others.

In South Africa Brodie and Long (2004) and Steinberg and Slonimsky (2004) argue that curriculum responsiveness to new students should take the form of cognitive apprenticeship into academic disciplines. Students are scaffolded into academic disciplines though starting with what they already know and developing this through mediated activities towards the desired disciplinary outcomes. Mediated activities take the form of tasks which focus students' attention using disciplinary concepts in relation to their current knowledge and experiences, and extensive feedforward and feedback. The structure of the responsive curriculum also changes as students start with what is already known and progressively develop and match this to more textual and abstracted disciplinary concepts.

Though the aim is apprenticeship to academic discourses the process is one of initial hybridisation of social and academic knowledge, which is then used as an entry point to inculcating the rules of the disciplines in students.

All the above examples indicate processes of boundary crossing occurring at some point or other, whether it is within research or curriculum development. Gibbons (2005) goes so far as to suggest that that the 'new' university academic would need to play a boundary-crossing role, if they are to deal with the often conflicting needs of Mode 1 disciplinary knowledge development and responding to and working with society more generally. Work in such a mixed learning organisation would require that academics navigate their way through different boundaries and act as boundary crossers and hybridisers. Gibbons does not take the position that boundary should be flattened or ignored, but rather that it should be recognised and worked with, which is also the approach followed in this thesis.

In the next section the field of policy which exhorts academic institutions to Work responsiveness in their curriculum with a particular focus on South Africa is examined. It is argued that even though much of the pressure on institutions is developed exogenously through responsive policy development, it is the grounded practices of implementation which are the most important sites of analysis.

2.3 Work-responsiveness educational policy in South Africa

Young (2005) and Muller (2000) argue that the ideology of social constructivism as a post-apartheid progressive ideology has strongly influenced education policy development in South Africa. What drives and supports this constructivist ideology is the perception that the radical exclusion of South African blacks from higher education is primarily because of the exclusivist western origins of academic knowledge, and hence its non-relevance for most South Africans. This powerful movement has ridden on the crest of post-apartheid optimism of opening the doors of education to all.

The effects of social constructivist ideology in curriculum are to promote the erosion of boundary between different academic disciplines, between academic disciplines and Work knowledge and between academic knowledge and societal needs and knowledge. Higher education has not been so radically influenced by the social

constructivist movement as the schooling sector, but it has still been influenced by this ideology. Evidence of this influence can be seen in the growth of outcomes-based curricula, integrated programme design and the recognition of prior learning, though they have been differentially realised across the higher education landscape (see, for example, Griesel, 2004 and Breier, 2001).

2.3.1 Work and economic responsiveness in higher education policy

In South Africa, higher education policy has been strongly influenced by Mode 2 debates (Kraak, 1999) and by other responsive developments in Europe and Australia. The United Kingdom Dearing Report, for example, emphasised the need for convergence between higher education and the new workplace in order to further the development of knowledge in students. Dearing noted that most teaching practices were of the transmission variety and there was little space for conversation between students and staff in order that they might understand and use new concepts and develop the skills of lifelong learning and learning-to-learn. He suggested that higher education should aim for ' less pronounced distinction between academic and vocational subjects …' and '… provide real benefits for employers and students …' and that '…students should plan and map their way through courses in which key skills of employment are embedded' (Dearing, 1997: 6; 38)

All-in-all South Africa has adopted a high skills approach to education policy which may clash with equity goals (at least in the short term) but may also serve to meet the needs of the poor in the long term, through economic expansion and the creation of job opportunities (Young, 2001; Kraak, 2001).

The first highly consultative document on higher education transformation, following on from the African National Congress education policy unit and the higher education group of the National Education Policy Investigation was the NCHE Report of 1996. The National Commission on Higher Education (NCHE, 1996a, b) was charged by government with analysing the current higher education landscape in South Africa, and with suggesting ways in which it might be restructured. A dominant theme in the NCHE report is the link between improved quality of and access to higher education and economic development. The research groups involved senior representatives from higher education institutions, from government and from civil society. As with much

policy development at this time, it was highly representative. Muller (2000), however, suggests that 'participation' had a more ominous rationale derived from the radical social constructivist position of equivalence of all knowledge and hence a mistrust of disciplinary expertise, such that a substantive proportion of the research groups were made up of non-disciplinary expertise.

The findings of the Commission are quite clear about the need for higher education to be more responsive. Responsiveness would need to include taking into account increasing numbers of new students and their learning needs and being more accountable to the needs of Work and society. For example, the report explicitly describes knowledge production as currently at the 'interface between higher education and society' and being open to scrutiny and an appraisal of its usefulness by a variety of stakeholders; and as being concerned with a greater degree of transdisciplinarity and crossing over into Work and society (NCHE, 1996a: 49). In general, the Commission advocated the need for a softening of boundaries between higher education institutions and society.

Following on from the NCHE report, the Higher Education Act White Paper of 1997 directed change towards both meeting global economic trends, again underlining the importance of programme approaches, and issues of increased access and equity. Unlike in other countries going through democratic change, there was an entrenched system of racial inequality in higher education with major differences in funding, quality of delivery and pass rates (Christie, 1994). Thus changes in the South African higher education landscape post 1990 have involved both responses to the forces of globalisation and to the need for equity and redress.

Subsequent to the publication of the White Paper the focus of government directives shifted towards a foregrounding of economic factors, such as the development of generic Work skills in academic curricula (see Section 5.2), creating academic/Work or society partnerships and efficiency, ahead of a focus on political redress (Cloete and Maasen, 2002: Boughey, 2002).

The resulting educational policies attempted to create a substantive and radical framework which could deal with both the inequities of the past and the possibilities for future economic development, though with the latter dominating. This framework, the National Qualification Framework (NQF) put all types and sectors of education and training into one composite basket of level-based qualifications. Qualifications were linked horizontally and vertically by generic level descriptors and key skills. These were designed to enable ease of access to the system, ease of vertical development from lower levels to higher ones, as well as horizontal movement across different fields.

2.3.2 Tensions within the NQF

This radical move towards a single NQF created perturbations in education as a whole, with both positive and negative results. The policy was commendable as a vehicle for both equity and economic development but was problematic in that it a) assumed that knowledge and ways of learning at Work were equivalent to knowledge and ways of learning in the academy and b) that different academic disciplines were sufficiently equivalent for ease of transfer of skills learnt in one discipline to the other.

Knowledge differences

As Young (2003a, b) and Ensor (2003) point out, knowledge at Work and in the academy comes in different forms and is acquired differently, and one cannot easily dissolve the one into the other. This difficulty is highlighted in Australian and British educational institutions where knowledge from Work is unsuccessfully imported into more academic curricula (Boud and Solomon, 2001; Solomon and Mcintyre, 2000).

The single NQF, which attempted to equate knowledge learnt in different sites under different conditions under a rubric of ‘different content, same outcomes’, was not the route followed by other countries on which the NQF in South Africa was originally based. For example, the Australian NQF, recognized that knowledge and learning in different sites may have different outcomes and there is thus not an attempt to seamlessly equate these learning outcomes (Keating, 2003). Thus in South Africa:

> ‘There was a determination to erode three knowledge boundaries: between education and training; between academic and everyday knowledge and between different forms of knowledge, disciplines and subjects.’ (Ensor, 2002).

The development of appropriate learning programmes with a strong emphasis on generic skills in turn supporting the ability of graduates to work flexibly and innovatively with new problems and new organisations (NCHE, 1996a: 29), was an example of this boundary erosion.

Competing educational discourses

Moore (2003), a researcher into the impact of curriculum integration programmes in South Africa, describes programmes as having the following thrusts. Firstly there is the thrust towards integration across traditional subject boundaries which was seen as better meeting the economic and transformatory needs of the country (NCHE, 1996a).

Furthermore, integration should allow for higher education to become more open, changeable and hence responsive and accountable to the needs of the markets. Related to this is the representation of tertiary degrees in the form of outcomes and assessment criteria, which necessarily cut across traditional subject boundaries and involve assessment of the whole and not just the constituent parts; included here are generic skills. This was enthusiastically taken up as a new approach by the South African University Chancellors Association (SAUVCA, 1999; 27). Outcomes would serve the function of both integrating and providing a measurable output for quality assurance. In a sense outcomes would capture the essence of what was meant by a programme and could easily be re-arranged as qualification statements. The approach to education transformation and responsiveness was thus centred on outcomes-based qualifications. Embedded within the NCHE Report, however, were at least two competing approaches to curriculum design:

> … stimulated by worldwide changes in the production and dissemination of knowledge the traditional model is being augmented in many ‘mass’ systems by an approach based on modular programmes and the accumulation of credits. This offers multiple entry and exit points, while progression is based

> on pragmatic connections between topics and levels without, however, abandoning the norms of cognitive coherence (NCHE, 1996a: 77).

According to Ensor (2002, 2001), the competing discourses are those of disciplinarity with its vertical and developmental nature into which students are apprenticed over time, and credit exchange and transfer systems (CATS). Within CATS, knowledge is more segmentally arranged with equivalence of units rather than vertical progression (though there may be some of this). The usefulness of CATS is that students may gain mastery of aspects of a qualification informally or formally at, for example, the workplace, and then transfer their credits to the academy. In fact there are attempts by the Department of Labour affiliated sectors to offer unit standards-based qualifications (Young, 2003a) in competition with the universities. Similarly, students should be able to move more easily between institutes of learning with nationally accepted credits.

The origins of a CATS discourse in higher education relate to the need for substantive change in higher education to promote access and mobility for all, and the need to be more responsive to Work, both of which can be equated with a social constructivist approach to knowledge (Cf. Muller, 2000). But there were also other subtle forces at play which weakened the position of academic representatives from the department of education in comparison to those from Work, as represented by the Department of Labour.

One proposition, put forward by Jansen (2001), is that the Department of Labour was able to dominate the educational transformation debate in the late 1980s and early 1990s with an outcomes and unit standards-based approach. This was made possible because of buy-in and consensus from the old apartheid-orientated training boards and the private sector in the early 1990s. We could say that the Department was able to enrol the other actors (Callon, Law and Rip, 1986, Cf. chapter 3) by making a unit standards approach both interesting and essential to their own development (or even survival in the case of the training boards). Furthermore, the most articulate advocates for linking education to the economy were those from the dominant trade unions at the time, who had developed extensive knowledge in this field through their

interactions with Australian labour federations (Christie, 1994). In this way the position of those who supported a more disciplinary position was weakened.

On the other hand, there were significant differences between the progressive educational movements of the ANC, and the still in-office apartheid planners in the department of education. There was, as Christie (1994) puts it, an ideological battle for hegemony which effectively divided and weakened the position of educational representatives as opposed to the more cohesive suggestions put forward by Work representatives.

Added to this was the powerful promise of the social constructivist position to provide access to university knowledge for previously disadvantaged students through a boundaryless NQF.

The result was that higher education policy discourse was encumbered with competing discourses which were conflated into one policy document. The conflation of Work and academic knowledge in policy effectively 'black-boxed' issues of difference which became problematic on the ground where actors were required to combine the two forms of knowledge in ways that make sense to both Work and academic communities. The problem is not so much that opening the black-boxes of difference, and dealing with these, cannot be done. It can be done as I have shown in Chapters 6 and 7 but it is complex and requires hard work from the actors involved; there is also no guarantee of success. The problem seems to be an understanding that the inclusion of responsiveness in policy will result, without undue complication, in the creation of meaningful Work/academic combinations.

2.3.3 Top-down 'implementation'

The NCHE report (NCHE, 1996b: 6, 41) does mention that too little attention is given to matters of curriculum (in terms of practices of teaching, learning and assessment) and that future developments should attempt to focus on these more grounded educational practices.

In practice, though, educational policy was largely top-down, driven by senior academics, unionists and political activists (de Clerq, 1997; Chisolm, 1992). This,

coupled with the need to indicate the representivity of the above stakeholders, and the need to strongly signal a break with the past, led to a policy which was substantive and powerful in its outlook but not necessarily implementable (Henry et al.1997).

A top-down approach to policy is also characterised by a focus on the development of qualifications (as opposed to, for example, teaching practices) which would populate the NQF policy framework.

The question needs to be raised as to why we have followed a top-down, outcomes-based qualification-led education and training route in the emergent democratic South Africa. Firstly, as already discussed, there was a perceived need for a break with past systems of education, and in particular racially based education with its focus on authoritarian and unequal access to education and low-level rote learning for black students. At the same time, there was an awareness by policy makers from the ANC and the trade union movement in the 1989 – 1994 period of the impacts of globalisation on the development of South Africa. For these policy makers globalisation signalled the need for a high skills approach to economic development if South Africa was going to compete in the world market. Successful economic development was also understood as the driving force to enable social development and the creation of a more equal society (Kraak, 2001; 1999). Outcomes–based education (OBE) and a National Qqualifications Framework (NQF) were seen as breaking significantly with past educational systems and as an engine for both economic and social upliftment (Allais, 2003; Kraak, 2001).

The state is unlikely to allow a national initiative of such importance as educational transformation to be voluntary and beyond its direction and control. A qualifications-led system of change enables the state to set targets and monitor both the production of qualifications, numbers of learners enrolled in them and their relative success rate and hence the accountability of providers towards successful provision of education (Young, 2003). This, it is argued, is substantially easier than attempting to direct, monitor and control teaching and learning on the ground. A qualifications-led education system in the form of the NQF also had the advantage of allowing accreditation of previous learning, particularly in industry, and the accumulation of credits which could allow the learner to access increasingly higher qualifications in a

step-wise manner. Thus all sectors of society, and particularly those who were previously disadvantaged by unequal access to formal and more prestigious educational resources, could trace a pathway of learning from the now much cited 'sweeper to engineer'.

In my analysis of responsiveness I distinguish between responsiveness policy, which refers to higher education policy which incorporates the needs of Work and society, and responsive policy which refers to the possibility of making policy changes in response to local feedback during implementation.

The challenge for responsive educational policy is to bring together differences at macro-levels with those at micro-levels, bearing in mind that difference will exist at all levels. It needs to be designed in terms of what can be done on the ground, what structures, knowledge and dispositions are available which together make up social reality. If the gap between reality and policy is too great then there will be implementation difficulties (de Clerq, 1997; Ball, 1994). As Kraak and Young (2001) suggest, implementation in previously fractured societies with low capacity, such as South Africa, is always going to be slow and policy needs to be continuously interrogated in order to refine it in the light of reality.

Similarly, Pressman and Wildavsky (1984) argue that for policy to be effective it must set up a developmental space in which localisations affect and change the original policy canons, and are themselves changed. The questions that such an approach raise are to do with what it is possible to do on the ground.

Moore (2003) points out how different conditions on the ground, what he refers to as different academic dispositions, influence uptake of programme-based policy directives in South African universities. For example, he cites the relative ease of uptake of interdisciplinary policy where strong epistemological links between subjects in a programme already exist. There would be less ease of uptake where the academic dispositions are at odds with policy, for example where the university focus is on student learning and success, whereas policy promotes marketability of courses as a major thrust. Not surprisingly, uptake is relatively rare and most departments still

cling to disciplinarity as an organising principal, whether because of insecurity, conservatism or confusing policy directives.

These types of interpretation (or lack of thereof) can be contrasted with others. For instance, the technikon/universities of technology sectors saw no need to respond to calls for programmitization. Qualifications and programmes within this sector were already based on collections of vocational subjects rather than on disciplinary majors (in fact the subjects in the programmes tended to be treated quite separately rather than being integrated - they were thus more collections of disciplines than integrated programmes) (Naidoo & Cooke, 2001).

2.4 Conclusions

I have outlined tensions and activities involved in the development of policy that is responsive to Work in South Africa (responsiveness policy). Understanding these processes is important as it provides a backdrop to the empirical work in the thesis where issues of implementation are discussed.

Two main positions on university responsiveness can be identified across a number of sites of responsiveness and in responsiveness policy, particularly as regards responsiveness to Work. The strong social constructivist position (at least in terms of curriculum) assumes that knowledge traditionally outside of the university can be uncomplicatedly brought into the university disciplinary structures as both are equivalent in some fundamental way. Here the boundary between inside and outside the university is eroded or disregarded. The other more structuralist position is that knowledge outside of the university and that within and between disciplines are different types of knowledge and are thus boundaried from one another. Any attempt to put them together must involve recognition of boundary and hence some form of recontextualisation of the one knowledge form according to the rules of the other.

Within the South African situation we can detect the influence of a strong social constructivism position in educational policy development, sometimes co-located with more disciplinary or structural positions. The real problems arise when such policy is treated in a top-down fashion and the assumption that Work/academic

boundaries are unimportant, as well as contradictory positions, have to be implemented on the ground.

Chapters 6 and 7 pursue the practices of Work/academic knowledge interactions with a focus on difference, boundary and hybrid developments.

2.6 Coda

Implementing responsiveness policy in practice involves, firstly, the interpretation of exogenous requirements from changing society by higher education institutions and the practitioners within them. I have already mentioned some dimensions which may determine how and even whether or not policy may be interpreted; for example academic dispositions towards accepting policy changes and symbolic policy which does not necessarily take implementation into account.

But a claim can still be made, using indicative data from secondary studies, that vertical differences between Work-responsiveness policy and practices on the ground are likely to influence policy uptake. If the policy is too different from what it is possible to do on the ground then uptake is unlikely or at least is made very difficult. Symbolic policy, with its emphasis on what should be done to break with the past rather than what can be done would feature here. But if there are appropriate forms of knowledge, structures or dispositions (Cf. Moore, 2003) already in place then the chances of the new policy at least gaining some foothold within current practices is enhanced. This seems a common sense though not empirically robust point, at least in this study.

Mention is made of this possibility in Chapter 4, section 4.3 where the implications of cognitive distance between policy and practice are briefly explored. Parallels can be found in empirically-based strategic niche management studies where new technologies have a better chance of take-up where there are already elements of ‘fit’ between what is being proposed and what is already being done on the ground (Hoogma et al., 2002). In strategic management terms, this is a fit-stretch strategy in which current practices are developed or stretched towards a desirable outcome (Cf. Chapter 4, Section 4.4.3).

There is another dimension of implementation of responsiveness policy which is where academic actors in departments mobilise their own and outside resources in an attempt to articulate the two in some meaningful manner. This is the horizontal dimension of implementation between Work and the academy. Even if Work actors are only indirectly involved academics need to create some sort of model of what Work requires and so re-represent Work. It is at this level that differences and boundary between them become apparent and needs to be dealt. Such differences may have become hidden or black-boxed in policy development but can no longer remain so in grounded Work/academic activities.

Maintaining the fit-stretch strategic niche metaphor for Work responsiveness in grounded academic practices, it may be possible to start with small-scale experiments in curriculum responsiveness, which open up learning spaces in a limited fashion, rather than attempting to open up all the black-boxed differences at once. Over time, the project could become more ambitious in dealing with Work/academic tensions. This potentially productive strategy is again picked up in the concluding chapter, Chapter 8.

Chapter 3: Communities, interactions and knowledge differences

3.1 Introduction

In examining Work responsiveness in the curriculum, the empirical focus of the thesis is on the concept of boundary and boundary-crossing processes and the opening up of hybrid spaces within hybrid Work/academic forums. As was pointed out earlier, methodological approaches for examining boundary crossing are contentious and the overall methodological position taken in the thesis must first be outlined. The hybrid forums examined are at the level of academic practice and its interaction with knowledge and representatives from the world of Work. In order to answer my research question the literature reviewed in this chapter is a selection of current theory on boundary crossing and hybrid forums, and the nature of knowledge difference between Work and the academy which sets up boundary in the first place.

Theory concerning communities of practice elucidates the idea of 'boundary' between different Work practices. Boundary crossing involves actors implementing connecting or disconnecting behaviours. Activity theory concerns itself with boundary and boundary crossing between Work communities of practice, and focuses on difference as a productive force which disrupts old ways of doing things and opens up possibilities for new, hybrid formations. Actor-network theory (ANT), like activity theory, focuses on the actions of actors in heterogeneous groupings creating coherence across their differences. Difference and boundary, boundary crossing, knowledge transformations and hybrid developments are all examples of such actions. ANT also celebrates difference and disruption as a productive force in interactions.

In addition to the above theories, Bernstein's theories of the structuring of pedagogic knowledge detail different types of knowledge, boundary and boundary maintenance and the transformation of knowledge as it is pedagogicised. These different theories are now used to show that there is difference between Work and academic knowledge which takes the form of different communities of practice, different activity systems, difference within hybrid forums and different types of discourse, and hence boundary between knowledge at Work and in the academy. Further they are mobilised,

particularly in the next Chapter, as ways of explaining how knowledge moves across boundaries and in what sorts of ways it can develop and change.

3.1.1 Choice of theory to examine interactive processes within hybrid forums

Studies in the sociology of science and technology (for example actor-network theory), activity systems, organizational dynamics and innovation provide a number of useful insights into interactions and knowledge development between different communities, and can be applied to the field of Work/academic interactions.

There is a common thread in all these theoretical approaches. Even though they may have different epistemological roots – semiotics in actor-network theory (ANT), Marxism in activity theory (AT) and phenomenology in organisational dynamics/communities of practice - they deal with similar concepts (communities, networks, boundary, transformation and hybridity, for example) and cross-reference one another. Further support for choosing and grouping these theories as representative of the social construction of knowledge, and later in selecting and combining elements of these theories into a conceptual framework in this thesis can be found in the special edition of the journal *Organisation* (2000), 7(2). In this edition writings from John Law (representing studies in the sociology of science and ANT), Frank Blackler and Yro Engestrom (Representing AT), Etienne Wenger (representing organisational learning/communities of practice) as well as other authors are brought together under the heading of practice-based learning in order to better understand knowledge and organisation (Gherardi, 2000).

The work in this thesis has incorporated many of the above approaches. I have taken a slightly different stance, however, in that I have explored the development of difference between communities as a tool for opening up new developmental spaces for the production of knowledge; this approach can be contrasted with approaches that examine how different communities may 'march to the same tune'. Recent work on activity systems has highlighted the developmental nature of difference in developing hybridity in in-between, potentially productive spaces (Engestrom, 2001; Gutierrez, 1999) so the work of the activity theorists has been influential here. I have in addition, extended and explored the idea of productivity from activity theorists with economic theories of innovation (Nooteboom, 1999: Cf. Chapter 4).

Much of the theory described above has traditionally been mobilised to describe knowledge transformation and boundary-crossing activities between related communities. For example, studies in the sociology of science and technology describe and analyse knowledge circulation within related outdoor and natural history communities, or between field and codified science (Latour, 1999); activity theory describes and analyses the production of new objects at the interface between different but related health and educational communities (Engestrom, 2001); and, likewise, the concept of communities of practice (Wenger, 1998) has been mobilised to examine knowledge movement and change within related Work departments. In this study the theories have been extended and somewhat altered in order to attempt to describe and explain knowledge production and transformation at the interface between the two more markedly different communities of the academy and the workplace.

3.2 Communities of practice

The origins of community of practice theory are located within an attempt to move away from largely positivist epistemologies, in which knowledge is out there to be discovered and internalised, towards more social theories. Community of practice theory challenges psychological and cognitivist theories of learning as being too focussed on structures and on individual learning. The nature of knowledge circulation and acquisition within communities of practice (CoP) is like that of activity theory but the zone of proximal development is not a primary feature of learning within the CoP. Neither is it that of induction into the prevailing social norms of institutions. CoP theory is more concerned with the construction of identity within social groupings as individuals put forward current identities and adjust these interactively in the light of the communities of practice(s) they are engaging with (Wenger, 1998:, 4, 280).

Community of practice theory also draws strongly on ethnographic studies of apprenticeship in which learning is not just the mechanistic acquisition of techniques but also that of social divisions, identity, conditions for respect and so on, which are

often tacitly transmitted in concrete situations; knowledge is relational, holistic and learning is practice-based (Lave, 1996).

3.2.1 Workplace communities of practice

Wenger (1998: 73) with his colleague Jean Lave coined the term community of practice to represent different workplace communities. Such a community is bonded together by having shared meanings, significations and typical ways of doing things, in other words there is a shared repertoire of knowledge, and boundaries between it and other communities.

These boundaries may be tacit and only become apparent when different communities interact with the other. Knowledge shared by the community may be explicit, often in codified form, or is tacit, circulates and is open to change. Brown and Duguid's (1991) example of photocopier representatives attempting to use a codified problem-solving manual and finally resorting to comparative narrations in order to solve a problem is an example of circulation between tacit and explicit knowledge, and the development of changed practices and learning within a community.

As Brown and Duguid suggest, learning and development within the community is situated in that it occurs within the contexts and cultures of the workplace and is social in that it involves interactions with other members. Learning is simultaneously about belonging to the workplace discourse and about the synthesising of one's own identity within the community (Gherardi and Nicolini, 2000; Wenger, 1998).

The development of communities of practice relies not only on the circulation and tacit development of knowledge as new problems arise and are dealt with, but also in the induction of new members in the zone of peripheral participation (Lave and Wenger, 1991). It is here that the process of outsiders becoming insiders occurs, as they gain access to the formalised structures of the workplace and learn about their community. The tensions which arise as outsiders and insiders interact are those of the outsiders attempting to gain legitimacy and of their potential to introduce innovation and change within the CoP.

Criticisms of entry to CoPs through peripheral participation, as put forward by Lave and Wenger, are that the 'what' and 'how' of learning is not spelt out and that personal motivation to learn and access to learning are important contributors (Billet, 1994). Studies such as that of Blaka and Filstad (2004) shed some light on these issues.

Blaka and Filstad studied graduates entering the nursing and estate agent professions in an attempt to understand and perhaps test the nature of peripheral participation. Despite differences in the profession and what needed to be learnt, they found surprising similarities in how newcomers learnt. Newcomers needed to become part of the more informal conversations of work (corridor talk) where often tacit knowledge is circulated, rather than just the formal meetings. In addition they were often confronted by distinct though related trends, each with their own champions, rather than with a homogeneous community (Cf. Eraut and Contu and Wilmott below). Newcomers needed to attach themselves to a more experienced mentor within one of these trends. Lastly, confidence of working in the unknown and asking questions of more experienced members played an important role in learning and gaining legitimacy.

The above study indicates something about the nature of motivation to learn (through questioning) within a community of practice and something about the need to attach to an experienced member in order to gain access to the community. Access, however, still remains somewhat problematic. How does a newcomer become accepted into a community and able to 'attach' themselves to a willing mentor, particularly if the newcomer is perceived as marginalized through class, race or gender, or is potentially a threat to accepted community practices?

Communities are already structured and the structure is likely to represent positions of power in terms of who can claim membership and who cannot, as well as what level of membership can be claimed. There is not, for example, equivalence between the newcomer and more experienced mentors, and we would expect there to be some form of structured though tacit mentoring, much like that which has been observed in craft apprenticeships (Gamble, 2002).

Contu and Wilmott (2003) believe that Lave and Wenger were always conscious of the interplay of power and structure in communities of practice, but that they failed to highlight this aspect. Communities of practice, in the view of the above authors, have thus been often interpreted by Work management as technocratic tools to position workers where they can best benefit the company, rather than as structures where individuals may gain learning for their own benefit. It should, however, be possible for learning within communities of practice to benefit both individuals as they gain more Work satisfaction and opportunities for advancement, and management as their workforce becomes more skilled. Support for this view can be found in investigations of highly productive workplaces by the International Labour Organisation (Ashton and Sung, 2001).

Eraut (2004) and Contu and Wilmott (2003) critique communities of practice as being too focused on commonality amongst its members, rather than differences, and of focusing too strongly on communities which are stable. Eraut highlights the importance of individual interpretations of codified and everyday knowledge and how these may develop separately and even remain insulated from their colleagues' knowledge. Trowler and Turner (2002) develop the critique of an oversimplification of commonality further. They also critique the concept of communities of practice for representing community as relatively closed rather than continually shifting and porous to both new members and knowledges. In addition, the exercise of power by individuals within the community receives little attention. In terms of the oversimplification of 'community' versus 'individual' knowledge, and Duguid's (1991) above description of workers exchanging narratives suggests that individual differences do exist but that, where they are explicitly expressed, they enable growth and change of the community's repertoire of knowledge.

My own reading of Wenger's (1998) Communities of Practice Volume is that he does acknowledge individual differences within existing communities and new participants as a source of development and learning within the community, but that this is not adequately dealt with. Intra-community and intercommunity interactivity and change within communities is further developed through an activity theory lens on community in later sections of this thesis. Questions concerning the exercise of power by individuals within communities in terms of securing individual/sub-group

advantage and/or through the setting of exclusionary agendas and the privileging of certain discourses over others are also inadequately dealt with in community of practice theory. Elements of actor-network theory (see later) may serve to deal with this omission.

Further criticism of CoP theory has centred around its focus on a 'process ontology' (Sawyer, 2002); in other words that objects and processes only arise in interaction and have no independent existence. This thesis could be read as having its roots in a process ontology paradigm. But, the pre-existence of different structure and their potentially productive influence on later, constructed outcomes is also recognised.

The concept of community of practice can be used to help explain on-the-job learning as newcomers enter Work communities. Because the community is boundaried from other communities through having certain ways of doing things there is something of substance which newcomers can acquire. Such community information is often in tacit form but may also be in more codified manuals. The concept can be used to explain how newcomers become old-timers, as was partly shown in the Blaka and Filstad (2004) example of newcomer nurses and estate agents earlier.

In Wenger's work the communities described were cognate in some form or another, usually through being interlocking parts of the same organisation. Some of the communities I describe extend beyond the term originally introduced by Wenger. Work communities in my study are not necessarily part of one organisation, but they get linked up through the goal and practices of responsiveness. The representatives are drawn from different industrial fields, geographical regions and positions in their workplaces but they share partially common histories in terms of the broad development of Work in the country, and partially shared discourses of training and economic development. They would also be likely to experience common conditions (e.g. the effects of globalisation). Furthermore, the fact that they are part of a purposeful meeting with a group which has a history and will meet in the future further serves to cement their affiliation to one another.

The concept of community of practice, with its inherent quality of boundary from other communities, also includes a number of sub-concepts which can be used to

explain how knowledge from one community may move into another, through particular structures and actions of community members.

3.2.2 Boundary crossing in communities of practice

Each workplace may have a number of communities of practice concerned with different functions or hierarchies, or may be required to deal with other, related communities of practice outside of the workplace. In Wenger's (1998) work he was interested in how these communities managed to pass on information and generally interact with one another. He carried out an ethnographic study of a medical claims processing company in the United States with particular focus on the nature of boundary-crossing activity between the community of the claims processors and requests coming in from other communities (medical and insurance institutions).

Wenger identifies different types of disconnections and connections between the claims processors and the outside communities. Firstly there is the concept of community reifications.

Reifications

When one community of practice purposefully interacts with another, nodes of practice which concretely reflect the members' community participation and differences or similarities become evident. Wenger (1998: 58) refers to these nodes of practice as 'reifications' which are, in addition, 'succinct, portable and focusing'. Reifications may serve two opposing purposes. Firstly, they may serve as explicit instantiations of practice which make the work of the one community visible to the other; community members now have something concrete to work with. Reifications may lead to 'boundary objects' (Star and Griesemer, 1989) which are constituted by typical procedures and objects which enable the passage of outside knowledge into the community.

Secondly, reifications may serve to establish a separate identity of one community as substantively different from another. They may have the effect of situating knowledge in one community as an immovable object, thus making it beyond the realm of negotiation with the other community.

Boundary objects

Boundary objects in claims processing are texts or structured ways of doing things in one or other of the communities. Such texts act as receivers and reconfigurers of knowledge from one world into the other so that it becomes understandable and recognizable (Wenger, 1998). These may be standardized forms through which the claims processor reorganizes claims information into pre-decided categories and in so doing abstracts the information from its context, highlighting some information and reducing other information, so that it fits in with processing requirements. Boundary objects can be compared to codifying structures which enable the transformation of the more everyday into disciplinary knowledge.

Brokers

Brokers are those who transiently occupy positions of dual membership of communities. They use this multimembership to transfer elements of one practice to another. Brokers are typically people of standing within the community. For example, a new claims supervisor from another CoP was able to reflect on differences between her previous Work methods and the new, and to instantiate change (Wenger, 1998: 109).

Overlaps and peripheries

In claims processing, there are two distinct communities; general claims processors and technicians with specialist legal knowledge who deal with difficult claims. Once dealt with these difficult claims are returned to the general pool for processing. But there are disjunctures and difficulties with this process. The technicians, therefore, choose to spend some time on a regular basis acting as normal general claims processors in order that they may better understand that community's issues and problems. The two communities overlap. Peripheries refer to the more permeable outer reaches of the community, such as in the community of practitioners dealing with the public, or even, as Wenger remarks (1998: 120) when dealing with researchers.

Boundary practices

Boundary practices are formalized cross-community units such as task-teams, meetings to resolve differences and difficulties or even more informal

customer/workplace discussion forums. In the claims industry one example of boundary practice was regular meetings between head and local office officials.

We will find these and similar structures and processes of making community connections emerging in the theories which follow.

3.2.3 Academic communities as teaching and learning regimes

Becher and Trowler (2001: 36) attempted to classify the nature of academic communities by describing different academic disciplines in terms of their epistemological underpinnings and how this determined the culture of disciplines, in other words how meaning is typically made in a disciplinary area. They attempted, for example, to distinguish between broad categories of hard and soft, practical and applied disciplinary areas.

The classification arose from earlier inductive work into the different natures of disciplines as understood by academics. This together with other work on student understandings of disciplinary differences (Kolb, 1981) led to the classification shown in Table 1.

The Becher and Trowler classification is based on issues such as the nature of knowledge growth, modes of enquiry and what is typically examined and claims for what counts as truth. In such a classification an attempt is made to ‘fix’ the epistemology of different disciplines, rather than one which involves the different behaviors of academic actors and the effects of different contexts. This can be seen as a crucial difference between the social contsructivist version of the CoP in which knowledge is constructed as community members interact. Here, community members interact around relatively fixed disciplinary reference points. However, one could posit that even claims processors from Wenger’s work have fixed knowledge referentials but that they change the nature of this knowledge through their interactions. Becher and Trowler (2001) are at pains to point out that their classification is at best a broad brush-stroke characterisation of the different disciplinary domains, and needs to also take into account the social relations within and between different disciplines.

Disciplinary groupings in higher education	Nature of knowledge
Hard-pure: Pure sciences such as physics	Cumulative, atomistic, impersonal and value free
Soft-pure: humanities and social sciences such as history and anthropology	Reiterative, holistic, value-laden and personal
Hard-applied: technological subjects like engineering and clinical medicine	Purposive and pragmatic and concerned with mastery of the physical environment
Soft-applied: Applied social sciences education, law and business	Functional and utilitarian and concerned with enhancing professional practice.

Table 1: Becher and Trowler's (2001: 36) classification of academic communities

As Becher and Trowler (2001:184) emphasize, the classification of all soft- and hard-applied as being alike is somewhat misleading; there is more to academic identity than the general epistemological nature of its knowledge base. High status business schools with strong research records may have a stronger focus on more strongly classified academic subjects such as economics and mathematics. Similarly, newer, less traditional engineering schools may be more open to and closer to Work than higher status research-focused engineering schools. Though important and necessary for describing the workings of disciplinary groupings, the highlighting of epistemological characteristics may have led to the neglect of the perhaps more mundane aspects of academic work such as teaching, dealing with students and typical ways of operating in the department. Ideally, the nature of the epistemological base and the nature of the institution and department have to be combined to predict the relative success of hybrid objects arising from Work/academic interactions.

A different research focus on academic communities was Trowler and Cooper's (2002) research into academic departments. They noted tacit theories of teaching and learning and conventions of dealing with and talking to students which only emerge in discussion with outsiders. They also noted power relations between students and lecturers which occur in normal day-to-day teaching, which are similar to Engestrom's (1999) division of labour (Cf. Section 3.4.1). These power relations are different to the power relations evident when the departments deal with significant, advisory outsiders like those from quality assurance or academic development departments. One could imagine this tension as also arising in dealings with those

from industry. Lecturers who are typically in charge of students have to operate in a different way with the industrial advisors who have to be treated with some measure of respect and circumspection.

Trowler and Cooper (2002) thus coined the term 'teaching and learning regimes' as a more appropriate descriptor of academic departments than communities of practice. Teaching and learning regimes of departments can have local schisms around epistemological, personal or practical issues which are contained within the department as a whole to a greater or lesser extent. They are not seen as seamless as Eraut's (2004) above criticism of communities of practice would suggest. Unlike Becher and Trowler's (2001) analysis of disciplines, in which the predominant defining feature was that of differences between types of codified, disciplinary knowledge; much of the knowledge of the regime is tacit and in the form of embedded practices. Trowler and Cooper's interest in describing these regimes is how they may interact with knowledge from outside a department, particularly knowledge within academic development departmental regimes and from policy. They posit that such interactions are often not fruitful because purveyors of outside knowledge have not taken into account the tacit knowledge of the regime; hence the failure in departmental take-up of many academic development and policy initiatives.

Trowler and Cooper's analysis highlights the idea that knowledge difference between outside and inside the academy is both about epistemological issues as well as more tacit practices. Knowledge differences between academic departments and Work in this study will thus also be likely to manifest themselves through epistemological as well as practical and organisational issues.

A further observation about the social nature of disciplines, in terms of power relations, can be derived from Bernstein's (2000) theory of classification and framing. Disciplines can have a strong and clearly identifiable knowledge base and modes of enquiry which clearly delineate them from other subjects and from society. This would represent strong classification. Framing refers to the degree of control academics have over how the discipline is to be acquired by learners. In Bernstein's view these relations of power are open to change as circumstances change; one such circumstance could be changes in educational policy signalling the need for Work

responsiveness, which may involve the weakening of disciplinary boundaries to include generic skills.

Bernstein (2000) also describes the structures of academic disciplines in terms of their hierarchical or horizontal knowledge structures; the hard sciences characteristically having a hierarchical structure and the social sciences and humanities having a more horizontal structure in which a number of different theoretical constructs compete with one another. Furthermore, horizontal structures may be characterised by having strong or weak grammars (Ibid.: 163) which refers to their boundary permeability.

Despite the complexities of applying the concept of communities of practice in higher education academies, it is a useful unit for analysis for the work conducted in this thesis. Academic communities do exhibit characteristics of shared concepts, artefacts, tools and narratives; mutual engagement with their own complexity, diversity and community maintenance (for example in departmental meetings); and engage in joint purposes around the education of their students, research and so on.

3.3 Activity theory and activity systems

3.3.1 Introduction to activity theory

One critique of Wenger's 'community of practice' theory is its vagueness on the constitutive and interactive elements of the community (Trowler and Cooper, 2002). Describing a community as an activity system provides us with analytical tools to understand its inner workings and illustrates the dynamic interaction between different components. Also, and this is more pertinent for this work, it provides us with a means to understand something about the nature of interactions between Work and academic communities.

Activity theory has its roots in Marxism in that human nature is not viewed as fixed but may change in its interaction with nature, and this is dependent on what resources are available and how these are mediated. Like community of practice theory development in the 1990's, its early manifestations in the 1920's were also a reaction against the then currently privileged theories of fixed, individual psychological structures (also the biological roots of these (Miettinen, 1999). Vygotsky developed

this insight further concentrating on the use of language as a tool which individuals may use to alter themselves and their environments. Leont'ev gave Vygotsky's theories a social dimension by stressing that language mediated activity is social in nature (Blackler et al., 2000; Miettinen, 1999), even though this was already implicit in Vygotsky's notion of language as a historical/cultural product.

Later developments by theorists such as Engestrom (2001) developed the social structure of activity as the backdrop for human endeavour as well as something which produces such activity. The turn that Engestrom and colleagues took was to view activity as transformative in that tensions within activity enable the development of new ways of thinking and doing. Such tensions are a development of the Vygotskian concept of the zone of proximal development. This can be contrasted with communities of practice where the focus is more on the interactive development of identity within community (Blackler et al., 2000), and on the reproduction of the community of practice rather than its transformation.

Activity theory, as a theory of socially mediated meaning-making, has been extensively written about elsewhere (See, for example, the volume edited by Engestrom et al., 1999). It is not my purpose to offer an analysis of the theory except in so far as it contributes to the concept of community, intercommunity difference and boundary work.

Activity systems, comprised of communities of actors engaged in a common purpose as well as their artefacts and social relations, are the units of analysis within activity theory. Activity systems are systems of interacting socio-historical, rule-bound, mediated structures with specific subjects, objects and outputs (Young, 2001; Engestrom, 1999; Miettinen, 1999). The system constitutes the social and other rules which act on objects (such as knowledge) emerging from the system. In the activity system of a department, for example, the objects would be teaching and research, the subjects departmental academics[2], and the possible outputs would be passing students and research publications. The object is the raw material on which the whole activity system acts to produce the output. The mediating artefacts would be the tools of

[2] Students may also be seen to have some level of agency in departments in challenging and setting up tensions between themselves and rules of the activity system.

teaching; e-mails and the internet, texts, educational quality control forms, policies, report forms on students, examinations and tests, laboratory demonstration tools, integrated tasks, funding and so on. The division of labour would be, firstly, hierarchical through the head of department to professors, senior lecturers, lecturers, technicians and students. Secondly, there would be a more horizontal division between different academic subjects, support work and mentoring, industrial liaison, materials and curriculum development. The workers would themselves be part of a larger community of the institution (the managers, faculty, exams office and so on) as well as a community of like practitioners (for example engineering educators and subject specialists). Rules and conventions would be those typically associated with departments in the institution: time at work, number of classes per week, disciplinary procedures, research outputs, approaches to teaching and learning and so on. Differences between the different components may produce tensions which influence the outcome of the system. For instance, the division of labour into different academic subjects and the perceived lower status of certain subject areas (like language) may make it difficult to successfully operate certain artefacts involving integration across these areas. Or, a policy focus on formal face-to-face instruction and assessment in the department may leave little time for research hence setting up further disruptions. The activity system is represented in Figure 1. The bold capitalisations indicate the different elements or nodes which constitute the system as a whole. The interactions between the different nodes are indicated by two-way arrows (all nodes interconnect with one another but not all the interconnecting arrows have been included so as to maintain clarity).

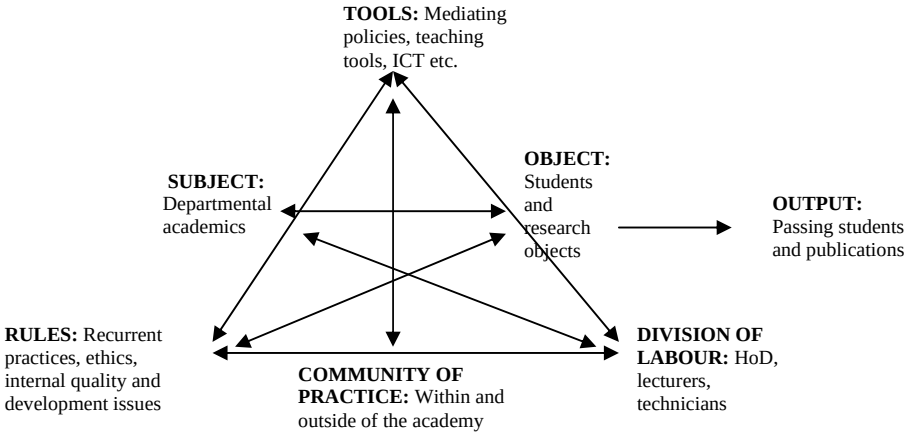


Figure 1: Proposed activity system of an academic department (After Trowler and Knight, 2000)

The description of workplaces as activity systems has been extensively studied by Engestrom and his associates (Engestrom, 2001; 1999) in the fields of health and engineering in order to understand their internal dynamics and possibilities for change, as well as to study differences and interactions between like systems. In the example below the activity system of a health care centre is described.

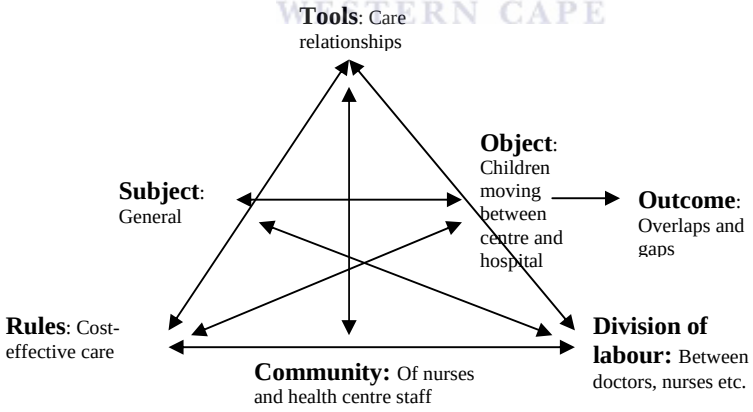


Figure 2: Activity system of a health care centre (Engestrom, 2001: 145)

Difficulties arise because of the need for cost effectiveness and the implementation of holistic care relationships and the effects these have on the object, the child, as she moves between the care centre and the hospital. The system is unstable as the care relationship does not transfer to the hospital and it is furthermore not cost-effective. The outcome is thus one of difficulty with transfer from the care centre to the hospital.

These instabilities between the nodes of the system are drivers for change and adaptation of the system. They create opportunities for reflection and learning amongst representatives and hence the addition of knowledge to the community. This can occur in higher education settings as well, and across systems.

An analysis of the component parts of complementary activity systems of Work and related academic departments will reveal knowledge differences which are barriers to communication, but challenges, and thus opportunities, as well.

3.3.2 Critiques of activity theory

Although based on Vygotsky's theories of social mediation through language, activity theory does not contain a theory of discourse practices within the system. If there is a division of labour and rules for practice then how are these reflected, changed challenged and exercised by subjects within the system? Issues of the operation of power in social contexts may be occluded (Trowler and Turner, 2002). Daniels (2005) suggests that the notion of subject-subject interaction within activity systems could be better developed through using elements of Bernstein's theories of symbolic control and identity. In particular, he suggests, the totality of what can be said as legitimate text within a particular discourse (Voice) will be mediated by the strength of the rules for the indeterminancy or agency in its transmission (which is dependent on framing).

Secondly, activity theory has been criticised for seeking causation for tensions and developments in social structures through deterministic arguments. For example, tensions in activity systems are often put down to the inherent contradictions of capitalism (Blackler, 1993) or to the Marxist notion of 'false consciousness', rather than to the non-deterministic construction of social identities, favoured in studies in cultural activity (Trowler and Turner, 2002).

As with communities of practice, my interest within the empirical Chapters is not in the internal dynamics of the activity system itself, and how things are played out there, but in interactions between activity systems in relation to boundary crossing and the development of hybrid spaces.

3.3.3 Activity systems, boundary crossing and hybrid developments

Activity theorists are currently exploring the ideas of boundary crossing. I will use two examples to illustrate important activity theory concepts concerned with boundary crossing: the importance of *visibility of difference* and mutual adaptation (Hall et al., 2002) and the role of *disruption* in opening up developmental *hybrid spaces* in which *hybrid objects* may be produced (Gutierrez et al., 1999).

Visibility of difference

Interactions across boundaries between activity systems occur in interprofessional work. Hall et al. (2002)[3] examine a building restoration work site where representatives of architectural, structural engineering and historical preservation activity systems interact with one another in order to modify and make safe an historical library building in the Californian earthquake zone. The preservationists want as little change as possible; the engineers and architects must follow building safety codes with the engineers concentrating on issues such as 'stress' and 'load' and the architects on overall holistic design. The authors analyse interprofessional problem solving sessions in which typical and different ways of doing, thinking and communicating (including electronic and graphic means) within professions become apparent. These so called 'representational infrastructures' tend to be transparent within their respective communities of practice, but are not necessarily obvious or transparent to those outside until the typical ways of doing and thinking are challenged by outsiders; '…conflict arises when specific perspectives from one quarter attempt to unravel the stability of another' (Ibid.: 205). Under these sorts of conditions of challenge the representational infrastructures and their historical roots may be made visible, scrutinized and adapted by the different professionals to meet the needs of the particular problem being discussed.

Hybrid languages

Different activity systems may also come in to contact in the classroom. Gutierrez et al. (1999) analysed a classroom situation where the different social worlds of teachers

[3] Hall et al. discuss negotiations and disruptions as being within the field of distributed cognition. In distributed cognition (Hutchins, 1995) knowledge and thought is seen as social as individuals interact with one another in their environment through putting forward sets of representations. Wenger (1998: 286) views the theory as somewhat 'mechanistic' often involving analysis of gestures. My theoretical stance has been to involve more rhetorical tools in analysing heterogeneous interactions.

and pupils interact within a 'third space' which extends the knowledge of both worlds. The authors then propose the development of an interlanguage which bridges between these two worlds but does more than this. At this stage I will briefly refer to interlanguage, as it is a concept I wish to elaborate further after discussing boundary crossing.

Gutierrez et al. (1999) show how the interaction of social groupings, each with its opposing social characteristics and epistemologies, creates disruptions and the possibility for hybrid transformations. Their example focuses on the school, on a particular attempt to teach the subject of reproduction to junior school children. Their methodology is to first examine the different discourses used by teachers and children, and then how the teacher incorporates the children's discourse to create a hybrid language which talks to both the 'rude' world of the children and the official requirements of the curriculum. The authors identify two activity systems, that of the teacher, school and official schooled knowledge, and that of the 'rude' lived experiences of the children, each with its own language of description for reproduction. The two systems disrupt one another. Between them lies a third space in which a bridging, hybrid object in the form of a hybrid language develops that is understandable and operative for both systems. The hybrid language practices in the third space meditated the ways students and teacher interacted with one another and mediated student learning and intellectual development. The third space can be depicted with samples of language from both activity systems and resultant hybrid language practices inscribed (Ibid.: 297).

1. Teacher talk	2. Third space (hybrid space)	3. Student talk
The chest.	'In some families the chest is affectionately known as chi-chis'.	Chi-chis.

Table 2: Hybrid language in the third space

The development of an in-between or hybrid language between researchers from different disciplines has also been described by Duncker (2001) and Galison (1997). I will use their insights later to extend the concept of hybrid language development.

The examples of interacting activity systems above can now be used to explain how new knowledge forms may arise. Outputs presented from each system (which result from the action of the system on its objects) come into contact with one another and there are similarities, differences and gaps between them. Where there are differences they may serve to challenge and disrupt the previously held knowledge of the other. The processes of disruption are that knowledge is questioned, analysed and potentially remodelled in a way which satisfies both activity systems. A new zone of potential knowledge development can be opened up between the two activity systems such that 'potentially shared or jointly constructed objects' may arise and be identified (Engestrom, 2001: 136).

Work responsiveness involves interaction between Work and academic representatives. We are now in a position to extend Engestrom's analysis in order to analyse an academic department as an activity system whose outputs (e.g. knowledge and procedures) interact with those of another activity system from Work. In between the two systems there is zone of potential development. This zone arises because differences raised between the two systems disrupt one another and these disruptions can be mediated by boundary- crossing work. The interactive structure is shown in Figure 3.

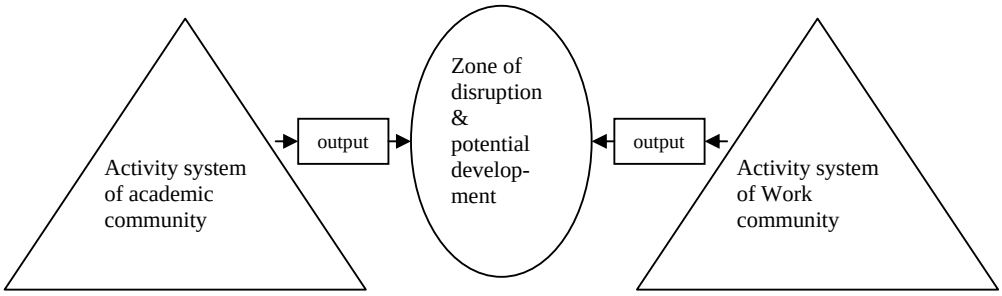


Figure 3: Interactions between activity systems

The zone of potential development can become, under certain conditions, a productive in-between space or third space. Third spaces, as is argued by activity theorists, are the result of boundary work and can also be developed further by such work.

3.4 Studies in the sociology of science with special reference to actor-network theory

3.4.1 Introduction to studies in the sociology of science and technology

The third main theoretical focus mobilised in an attempt to understand interactions, differences and changes between communities is that of studies in the sociology of science and technology with a special focus on actor-network theory (ANT). Studies in social science and technology provide a number of useful insights into knowledge movement and transformation between contexts (or across boundaries), and between different communities of actors.

It is often difficult to pin down what ANT and studies in the social studies of science and technology (SSST) actually are and to what extent they constitute a theory. This is especially so where its earlier proponents claim that it is based on radical indeterminacy of actors which can be forces, things or active or passive individuals in networks, all exerting some sort of force and influence. Rather, it may be understood as a collection of methodologies in constant change (Law, 1997).

ANT has arisen from attempts to study the development and effects of science and technology as social events involving interpretations and transformations of knowledge as it circulates. It has its roots in semiotics and French philosophy, particularly the work of Serres (see, for example, Serres, 1995). Serres was concerned with the idea of difference and how differences result in points of convergence and the recognition of similarities. He introduced the concept of translation as both movement, as it used in physics, and change in form, as it is used in language studies (Gherardi and Nicolini, 2000; Miettinen, 1999). This more ethnographic and social constructivist approach can also be traced to challenges to science as faithfully reflecting the 'real world' out there and the increasing involvement of society in critiques, expectations and disappointments with scientific knowledge.

The current concerns of ANT are to do with empirically examining heterogeneous network interactions and attempts by actors to create order amongst its living and non-living components so that the network may be more robust and act in a more purposeful and hence productive way (Gherardi and Nicolini, 2000). ANT is socially

constructive in nature but extends the field of the social to include non-living elements, thus creating socio-technical rather than social networks. This has been much criticised (See Miettinen below).

Heterogeneous networks, where they occur in some defined way, are also described by ANT researchers as hybrid forums. One type of hybrid forum is 'hot' interactive spaces where representatives and knowledge move in and out with no clear direction; they are at first tangled and confused (Callon, 1998). While Rip et al. (2004a) point out a certain amount of heterogeneity is necessary for hybrid forums to be productive, this is counterbalanced by the difficulty, in too heterogeneous or hot spaces, to discuss anything at all. There is thus a trade-off between requisite variety and productive convergence.

When hybrid forums are optimally balanced, with enough variety and some level of agreement, and there are attempts to cross the boundaries between communities such that the hybrid forum as a whole may be better co-ordinated and more coherent, then there is the possibility for the production of new knowledge. Different communities of practice interact and exchange knowledge.

Miettinen (1999) suggests that ANT currently has two main thrusts, that of the sociology of translation and the use of force within heterogeneous social groupings and that of symmetry between living and non-living entities within such groupings. The aim of ANT is to empirically study these heterogeneous groupings in terms of repeated attempts to create some sort of ordering and coherence, and hence robustness amongst the elements of the group (which may consist of people, things and sentiments); these are the tactics of translation (Gherhardi and Nicolai, 2000). The following example of the development of the electric car illustrates heterogeneous groupings, translation and the related concept of force and enrolment (Callon et al., 1986). It also shows how these concepts may be used to explain how heterogeneous actors with different knowledge and interests may become co-ordinated towards a single purpose.

ANT and the electric vehicle

The Vehicle Electrique (VEL) was an initiative of the French national electricity supplier (EDF) in the 1970's. The need for the VEL had arisen as a response to rising pollution levels in the country's cities and the corresponding public and political demand for a cleaner, healthier city environment (Callon et al., 1986). The EDF brought together a number of entities to design and promote the car: the car manufacturer Renault to design the body and basic mechanics of the car; an electrical engineering firm to design the motor; current technologies in fuel cell and catalytic converter technologies, the ministry of environment, local municipal units concerned with health, safety and transport, public sentiment and so on. As can be noted the entities or actors are made up of people, things and sentiments. Each entity is essential to the success of the project; no one entity is more important than the other. If the fuel cell cannot produce enough energy for a long enough time, or the public ceases to support the project then it will fail. Each entity thus exerts force on the project as a whole.

The role of the EDF here is that of prime mover or entrepreneur. It has to convince each entity of the actor-network to become interested in and to engage with the project. The EDF must translate the different elements towards the needs of the VEL project. It does this, firstly, by orientating the entities to the purpose at hand, the development of the electric car. Other issues which may be pertinent to one of the entities, for example Renault's new petrol models or its labour disputes, but not to the EDF's purpose, are taken out of the thrust of the project and black-boxed. Then, more forcefully, the prime mover may exert force on the entities to engage through convincing them that their very survival may depend on the project; Renault is persuaded that, if it wishes to become the foremost car manufacturer in France, it must engage with the VEL project.

This more Machiavellian aspect of exerting force to enable translation is termed enrolment. Entities may resist enrolment by the prime mover, or themselves attempt to enrol others in the network to support their own interests.

The VEL example also illustrates the concept of general symmetry between living and non-living components in the networks. Things and people in actor-networks play an

equal role and one cannot empirically distinguish the one from the other in terms ot its effects on the network as a whole.

Miettinen (1999) critiques actor-network theory by arguing that translation and enrolment are contradictory to the concept of general symmetry. Enrolment must involve some sort of rhetorical devices to persuade the other to align itself to the cause at hand and thus cannot be performed (or indeed received) by a non-human. There thus cannot be a symmetrical relationship between living and non-living entities; the living, through its ability for action, will always dominate and indeed animate the non-living. This remains a difficulty with general symmetry but may be answered through understanding each entity within the network as itself existing within a network which may consist of persuasive text or public and scientific opinion which can exert force on decisions taken by humans.

Interesting ethnographic work on heterogeneous networks of scientists and non-scientists (Star and Griesemer, 1989) and on heterogeneous networks of scientists (Duncker, 2001; Galison, 1997) has emerged within the broad field of the social studies of science and technology. In both cases the examination is of heterogeneous network interactions and attempts by actors to create order amongst the network's living and non-living components, so that the network may be more robust and act in a more purposeful and hence productive way. The relevance to this thesis is that Work/academic interactions are also heterogeneous network interactions and may be similarly analysed. The ways in which such interactions unfold is discussed below.

3.4.2 Boundary objects between scientists and non-scientists

Star and Griesemer (1989) describe a network of communities of museum scientists and conservationists, amateur birdwatchers and other naturalists and professional hunters in southern California. The museum director attempts to translate the different activities of these communities towards the conservation of animal species in the area. She does so through mobilising and exploiting boundary objects within their different activities. We can understand this approach to translation as less Machiavellian and more subtle in practically dealing with the interests of the different actors than was the case with the VEL.

Star and Griesemer (1989: 410) identify the notion of ‘coincident boundaries but different contents’ as a boundary crossing object. They use their observations of museum biologists and amateurs, who are both active in the state of California, as an example of different communities with common boundaries but different content; both are interested in the plants and animals in the area, the one in terms of identifying and mapping them and the other in terms of identifying and enjoying them. The coincident boundaries may serve to create a common interest which may smooth the way for enrolment as was discussed earlier.

There may be overlap between different communities of conservationists and hunters. Conservationists need to know the distribution and frequency (according to sex, age etc) of animals in the area. Hunters are interested in and knowledgeable about animals and can provide this information. The conservationists manage to enrol the hunters to voluntarily provide information even though the desire to kill, and not necessarily conserve animals, is the focus for the hunters.

Furthermore there may be overlap in terms of ‘ideal type’ boundary objects. This sort of object is conceptual and refers to no particular domain and is thus adaptable. Star and Griesemer use the example of the concept of ‘species’, when used by both professional biologists and nature lovers as just such a generic, boundary-crossing object. For bird watchers species is more about what they have spotted whereas for the conservationists it is more biological, embracing issues of environment, ecology, distribution and frequency. By asking bird watchers to fill in information on a form (a type of standardisation, Cf. boundary crossing in communities of practice), conservationists can derive useful biological knowledge.

Standardisation is another boundary object. It may manifest itself as text or structured ways of doing things in one or other of the communities. Such texts act as receivers and reconfigurers of knowledge from one world into the other so that it becomes understandable and recognizable (Wenger, 1998). As Star & Griesemer (1989) put it, these texts may serve to cut out local anomalies and ‘standardize’ information. They are thus related to the generic idea of decontextualisation but are more specific in that knowledge is decontextualised and authorised within a specific format which then shapes subsequent recontextualisations.

Both Dunker (2001) and Galison (1997) deal with convergences and difficulties around communications between scientists from different fields or sub-fields engaged in interdisciplinary projects, and propose the formation of interlanguages as bridging devices.

3.4.3 Hybrid languages and dictionaries

Galison (1997) studied how experimental physicists, theoretical physicists, engineers, mathematicians and instrument makers formed a co-operative, investigative community in an experimental micro-physics project. Each of the groups of actors came from traditionally distinct disciplines with different professional identities.

As with other studies in the sociology of science, Galison attempted to understand how this heterogeneous group of actors managed to orientate themselves to the purpose of the project so that productive outputs might be attained. He likened the way these actors worked in a co-ordinated fashion to the anthropological metaphor of the 'trading zone'. Here the goods that are exchanged may have different meanings and values to the social groups presenting them but they are still able to trade to the benefit of both groupings.

> … these distinct groups with their distinctive approaches to instruments and their characteristic forms of argumentation, can nonetheless co-ordinate their approaches around specific practices (Ibid.: 806).

Galison (1997) argues that engaging in the trading zone does not imply one's original identity is lost. Trading can occur momentarily or for longer periods, but those involved in trading can always return to their original identities, unchanged.

Galison (1997: 20, 836) refers to knowledge items from the different sub-cultures of physics as becoming stripped of their context (black-boxed) and co-ordinated with new contexts. Exactly how trading is able to occur is through the production of interlanguages or pidgins which may be fleeting or more developmental over time. Galison (1997: 834) describes the linguistic categorisation of pidgins as being characterised by contraction and elimination of complexity, and of being relatively

unstable compared to natural languages. Similarly, the language in the micro-engineering project trading zone also involved the contraction, reduction and simplification of information in order for it to be more understandable to the other. The process of simplification is a complex and reflective process on behalf of the speaker and listener.

Additionally, Duncker (2001) analysed cross-disciplinary research work in science, between different sub-fields of chemistry and physics at the University of Twente, in terms of their different symbolic repertoires and the development of intercommunity communication mechanisms. These repertoires are segmented and thus only partially share commonalities. Interlanguages emerge when differences are raised resulting in attempts to bridge between the two communities using boundary devices.

Duncker gives a hierarchical typology of interlanguage development from generic forms to initial hybridity. Each stage leads into and helps develop the subsequent one. The lowest and least productive form of interlanguage is generic repertoires.

Generic repertoires are non-specific, such as general academic language, gesture and informal communications. This repertoire would be characteristic of the early stages of interdisciplinary work. Stage two of heterogeneous, interdisciplinary communications involves using common overlapping repertoires. The field of mathematics is just such a common repertoire and different communities can use it as a conduit for representing their meanings to the other. Though common to different disciplines, mathematics is used in different ways in different disciplines. It has 'different meanings in different social worlds but (its) structure is common enough for more than one world to make (it) recognisable, a means of translation' (Star and Griesemer: 1989: 393). Stage three involves the use of specific repertoires in part by one community and their translation by the other into more familiar specialist terminology. This 'listener's dictionary' can serve to build a base for further, more depthful communications in the form of 'speaker's dictionaries'. Speaker's dictionaries are attempts by individuals of one community to transgress into the relatively unknown repertoire of the other, and to represent this repertoire as if it were partly their own (this is similar to brokering but much more detailed). In addition, their own familiar repertoires are re-focused so that, as Galison observed, the point is

to reflect interdisciplinary connections rather than internal disciplinary ones; the speaker's repertoire is reduced and partially simplified. Successive attempts over time at successfully using speakers dictionaries from representatives of both communities are likely to build up a form of interdisciplinary communication, or hybrid repertoire, which could be termed a pidgin language.

For both Duncker and Galison the development of a full hybrid language is a long term process which may arise after years of interdisciplinary negotiation. Parts of the hierarchy of hybrid language development, and even elements of this language itself may, however, emerge transiently in more short-term, heterogeneous interactions.

Latour's (1999: Chapter 2) elegant ethnographic account of the development of scientific knowledge in the Amazon rain forest is also about making things that are different coherent, but in a different way. In this case it concerns the incorporation of 'raw' field science observations into a more processed and codified format of disciplinary knowledge through a number of stepwise transformatory processes performed by the scientific actors. One such process is the stripping off of all extraneous contextual information about the soil in the forest so that it can be represented as an abstracted cross-sectional diagram. In this way it can be more easily inserted into disciplinary knowledge formats. Latour's account illuminates (again) how knowledge transformation involves the boundary-crossing objects of reduction/abstraction and particularisation (ignoring some topics and amplifying others), as was discussed in the community of practice section.

In the theories mentioned thus far the focus has been on boundary crossing between the different knowledge of different communities of practice as they interact within hybrid forums. In Bernstein's theories a distinction is drawn between more everyday knowledge, and much of Work knowledge may be of this type, and academic knowledge (Bernstein, 1999). In the everyday knowledge meanings are developed through everyday experiences whereas in academic knowledge meanings are developed through access to specialised principles for making meaning. These two (idealised) knowledge types may thus differ in terms of content *and* in terms of their underlying structure and are thus not easily embedded in one another.

3.5 The contribution of Bernstein to knowledge transformation

Bernstein's work has been guided by and is in part an extension of Durkheim's work on the sacred and the profane nature of knowledge, and how these different orientations may or may not interpenetrate one another (Muller, 2001). His concern over the last 25 years has been with pedagogic democracy, in other words the equal access to pedagogic knowledge for all social groups (Bernstein, 2000: Introduction). Bernstein viewed the sociology of education as being dominated by attempts to understand educational knowledge's relations to broader society. Pedagogic discourse, in his view, was seen as only a relay of other, outside knowledge and social/power relations. Bernstein attempted to shift the focus to understanding the nature of the relay and the structure of educational discourse, its inner workings and what sorts of knowledge are made visible and what is hidden (Moore and Maton, 2001). Bernstein's early theorisations were around the transmission and acquisition of pedagogic knowledge through the analysis of, for example, boundary characteristics between disciplines and control of acquisition (classification and framing). Subsequent work focussed on the pedagogic device, how knowledge from other fields becomes transformed into pedagogic discourse. In his last works he focussed on knowledge structures from which pedagogic discourse is selected and recontextualised. This was the theory of horizontal and vertical discourse and structures and grammars internal to vertical discourses.

Two significant critiques of Bernstein's work have emerged. One was that Bernstein's theories contributed to the identification of cultural and class-based deficit in his early descriptions of restricted and elaborated codes; the former, for example, being more typical of working class discourse in Britain (Labov, 1972). Bernstein (2000) has always maintained that this is a distortion of the original intention, which was how pedagogic discourse was unevenly distributed and acquired in favour of middle class children. The second critique was that his theories were not empirically based or proven (King, 1981). In his last book, (Bernstein, 2000) Bernstein summarised a mass of empirical data supporting and developing his theories from various authors. In addition, after his death, a volume including substantial empirical research using Bernstein's theories was published (Morais et al., 2001)

Unlike the first three theoretical perspectives discussed, Bernstein's work sits within a structuralist framework and is not cross-referenced much by those writing from socially situated learning, activity system or actor-net perspectives; Daniels (2001, 2005), writing from an activity system perspective as was discussed in Section 3.2 earlier, being the exception. Bernstein's work does, however, have much to say about structural differences between different types of knowledge, and processes of boundary maintenance and recontextualisation of knowledge across boundaries.

3.5.1 Horizontal and vertical discourse types

Following Bernstein (2000; 1999), vertical discourses have broadly accepted guiding theories and are systematic in that there are interlocking concepts. They operate in a context independent arena (and so across contexts) at a high level of abstraction; they are furthermore highly coherent and explicit. All vertical discourses are theoretical, abstract in nature and internally coherent. What sets them apart from one another is their different internal logic and structure (for example between different subject knowledges) and, overall, their abstract nature and internal coherency sets them apart from typically everyday knowledge in society or at Work. Within vertical discourses there are also two main types of knowledge structure, hierarchical and horizontal (the horizontal type can be thought of as 'parallel', to avoid confusion with horizontal discourse). The former is hierarchically organised as in the sciences and the latter consists of a number of parallel, competing and equivalent specialised languages, modes of enquiry and rules for the realisation of texts (Bernstein, 1999: 159) as in arts and social science subjects. There is, too, a further sub-division of horizontal knowledge structures into those with weak and those with strong grammars. Horizontal structures such as linguistics and psychology would be classified as having strong grammars whereas fields such as cultural studies, sociology and education would be seen as having weak grammars. The difference would be that fields with strong grammars would be immediately recognisable as such whereas within weakly 'grammared' fields a student may be uncertain as to what counts as valid knowledge. Within strongly grammared fields the internal rules for legitimate enquiry and realization of texts would be explicit whereas within weakly grammared fields rules may be more tacit and thus more dependent on tacit and contextual acquisition. Bernstein (1999: 165) further suggests that such weakly grammared fields have

commonalities with what was previously referred to as horizontal discourse, the discourse of everyday Work and society. Gamble (2002) illustrates the nature of such weakly grammared fields through the description of cabinet making craft apprenticeships. Though occurring at Work and largely tacit in nature, there is still a holistic, integrated system of meaning into which individual events in crafts may be positioned and explained.

Vertical discourses tend to be insulated to differing degrees from other forms of knowledge, whether everyday knowledge or other vertical discourses. There are furthermore, explicit rules (pedagogic recontextualising principles) for the transformation of knowledge from one to another vertical discourse. Vertical discourses are typically acquired through access to the organising principles of the discourse which in turn can be operationalised to explain different events.

Research into interdisciplinary research projects at university describes similar differences between different vertical discourses. Duncker (2001) describes disciplines as having specific symbolic repertoires (ways of representation, including language and graphics) which may be esoteric and idiosyncratic, making interdisciplinary communication difficult. But, there are always possibilities of bridging through shared symbolic elements, as will be discussed later in this chapter.

Horizontal discourse on the other hand is likely to be ‘oral, tacit, local, specific to particular contexts, multilayered and contradictory across but not within contexts’ (Bernstein, 1999: 157). This is the dominant discourse of the workplace. Central to this discourse is its segmented nature; it is differently realised according to the different activities and specialisations it is embedded in. Horizontal discourses, being often tacit, context bound and flexibly applied, do not insert well into vertical discourse ways of doing which are more cross-contextual and abstract. Similarly, vertical discourse sits uncomfortably with horizontal discourse knowledge.

3.5.2 Framing

Framing refers to the structuring, pacing and control of the subject being taught (Bernstein, 2000: 11). It relates to the strength of classification or boundary between different knowledge areas. From the point of view of radical social constructivists knowledge boundaries between subjects and between academic and everyday knowledge tend to be weak, absent or at least not recognised; in its strongest forms all knowledge is equivalent (Muller, 2000). In acquiring knowledge the role of the lecturer would be diminished to that of the facilitator and students would have quite a lot of control over what they learnt, in what order and to what depth. Framing here would be weak. At the other end of the spectrum is the position that knowledge resides mostly outside of the student in the form of a strongly classified subject knowledge which would be packaged, paced and assessed by the lecturer. Here the role of the expert lecturer is strong and so too is framing.

In vocational education the questions of framing can be extended not just to the different roles of the lecturer and student in control of the curriculum but also the extent to which the occupational or traditional academic concerns determine the structure of the curriculum. Barnett (2004) suggests that framing shifts from predominantly Work control at lower levels of vocational education to more academic control at higher levels. The question which Barnett (Ibid.: 141) poses is ‘is it unrealistic to want it both ways?’. In problem-based learning in medicine, for example, courses are structured to both expose students to medical practice as well as to structured academic learning. Does this qualify as having it both ways? Is problem-based learning differently framed at different levels of study? In Chapter 6 something will be said about framing in responsive curriculum units but through a slightly different lens, that of the symmetry of hybridisation.

3.5.3 Recontextualisation fields and principles

Recontextualisation refers to the process of knowledge change as it moves between contexts. Disciplinary knowledge is that knowledge produced by communities of researchers and changed or maintained through research and peer review. Such knowledge is not, however, structured for pedagogic purposes. In order for it to become teachable as a subject it is selectively transformed by disciplinary educators, most typically into the form of a textbook. Pedagogic discourse is now constructed by pedagogic recontextualising principles (Bernstein, 2000: 33) which selectively

appropriate, relocate, refocus and reconstitute the broader field of disciplinary knowledge. In performing this transformation a number of power relations come into play: For example, what knowledge is to be included and excluded? Who are the experts? Who controls acquisition?. The last question is one of the 'framing' of pedagogic discourse such that control and pacing over learning is distributed between those engaged in learning and experts in different degrees.

The principle translates into functions and agents who mediate the transformation at two different but interactive levels. The first level is the official recontextualising field - that of the state and its agents (ministers, policies and so forth) - which attempts to shape the way pedagogic knowledge in general is constructed. We can view policy which exhorts institutions to respond to economic needs, for example through the inclusion of generic skills, as such an official field of recontextualisation. Then there is recontextualisation by those involved in the design and delivery of disciplinary knowledge, the pedagogic recontextualising field. Where policy exhortations are strong then the suggestion is that the pedagogic recontextualising field has little room in which to manoeuvre. In South Africa, however, Muller (2000) suggests that the pedagogic recontextualisation field of a particular social constructivist kind has dominated the recontextualisation field. Evidence for this can be seen in the equivalence of outcomes across different subjects and sites of learning within the NQF.

In Bernstein's (2000) theory of pedagogic recontextualisation, academic subjects derive from, but are not the same as, the larger academic research field from which these subjects arise. Subjects arise from selection and elision of various elements of the field so that it is structured as a curriculum with a focus on teaching and learning. The 'pure' academic subjects from Becher and Trowler's (2001) classification would fall into this category. The distance between the academic subject and the academic research field is likely to be maximal in lower level courses and progressively shortened at more advanced levels as students are inducted into the research field.

Bernstein was not so explicit about the genesis of vocational higher education, which would include subjects classified by Becher and Trowler (2001) as 'applied', or the

formation of knowledges and pedagogies which attempt to be more responsive to society.

Layton et al. (1993) give us some indications about the relationship between vocational and more academic knowledge. Using the example of moving between school science knowledge and technology in order to solve a technological problem, he suggests that, firstly, a student needs to understand the complex reality of the problem and, secondly, to pick and choose from available scientific knowledge sources:

> The problems which people construct from their experiences do not easily map on to existing scientific and pedagogicial organisations of knowledge. What is needed in solving a technological problem may have to be drawn from diverse areas of academic science at different levels of abstraction then synthesised into an effective instrumentality for the task at hand.
> …. Solving technological problems means building back into the situation all the complexities of real life, reversing the process of reductionism by recontextualising knowledge.
> (Layton et al., 1993: 58-59)

What this suggests is that in developing a vocational curriculum there is an additional step to that of pedagogic recontextualisation of the disciplinary field. It first has to be reorganised as a different sort of disciplinary field, one which is attuned to the profession rather than just the field. Disciplinary knowledge needs to be first 'reclassified' as occupationally focussed knowledge before it can be pedagogicised (Barnett, 2004: 147).

Barnett (Ibid.) operationalises Bernstein's theory of recontextualisation to explain the development of vocational disciplines and pedagogy. According to Barnett the recontextualisation route for vocational subjects - such as those in law, medicine, engineering, education, commerce, social work and so on - is the selection of elements of the field, not through a focus on teaching and learning, but through the lens of the sorts of application-orientated subject knowledge required by the professions. Once suitable professional subject matter has been identified, the second

recontextualisation involves its re-packaging as teaching and learning units. The way in which the academic research field of physics is re-packaged into the engineering subject ‘applied mechanics 1’ could be said to follow this process. Then there is an additional level of pedagogic recontextualisation in which more situated practices, as opposed to academic knowledge, are pedagogicised. An obvious example in engineering education is the recontextualisation of collaborative workplace activities, often across hierarchies and job types, into group project work in the institution.

In being recontextualised, Work knowledge would be disaggregated, reordered and certain parts may be amplified or reduced so that they are more in line with subject teaching; the focus has changed from Work to pedagogy. Pedagogic knowledge in the academy is not a different object from the original Work knowledge but the same knowledge which now exists within a new network of relations. It appears, in this argument, that the incoming Work knowledge is changed through pedagogic recontextualising agents in the academy, but is itself a passive partner. It is predominantly the relations surrounding the knowledge which change rather than the knowledge itself. The transformation is weighted in favour of the academy and is thus asymmetrically performed leading to what will be referred to later as a relatively unproductive knowledge interaction.

Thus two problems emerge in conceptualising the integration of Work knowledge into academic knowledge. The first is that these two types of knowledge are differently structured and boundaried from one another and the second is that where Work knowledge does become part of academic knowledge it is likely to be substantially recontextualised in more pedagogic format; thus what was originally of value to Work may be lost in integration.

3.6 Knowledge differences between Work and the academy

I have shown that Work and academic knowledge, as well as residing within predominantlydifferent types of discourse, are also likely to inhabit different communities of practice, activity systems, and, when brought together, constitute a hybrid forum in which the different knowledges jostle for ascendancy.

Work knowledge's immediacy, unpredictability and context-bound nature, captured in Bernstein's (2000) concept of segmentation of horizontal discourses, can be fleshed out with observations of professional Work practices drawn from Eraut, Barnett, Boud and Brown and Duguid. Further differences can also be alluded to.

A key difference between Work and academic knowledge is difference in purpose to which the knowledge is to be put. At Work, knowledge is essentially used to enhance the productivity, innovativeness and skills base of the firm whereas in the academy it is concerned with the mastery of disciplines and their (possible) application in the world. Eraut (2004) explores this difference in purpose as it manifests itself within the nature of knowledge.

Eraut (2004) typifies workplace knowledge as being largely context-bound, acquired through interaction with similar contexts and adaptive to prevailing conditions which may include: the degree of collaboration/supervision; time constraints and their conditions of performance; the culture of the workplace; and unpredicted situations to which the worker must adapt. Most Work knowledge is not codified and there is little time for critical reflection and analysis.

Professional academic knowledge tends, on the other hand, to consist of codified academic knowledge in the form of academic subjects (like sciences), academic professional fields (like medicine or engineering) and some elements of the occupation itself. In Bernstein's terms these fields are then pedagogicised. Barnett (2004) throws some light on the relationship between academic subjects and academic professional fields – the latter consists of a professionally orientated selection of academic subjects or sections thereof (reclassificatory recontextualisation). Elements of the occupation and the selection of academic subjects are then, in Bernstein's (2000) terms, pedagogically recontextualised as an academic curriculum (pacing, development, timetabling etc). According to Eraut (Ibid.) the relative prominence of these components is usually weighted in favour of the academic as this is the 'culture' that staff work in. Knowledge is developed and circulates through, predominantly, interactions with other field specialists and research. The more occupational aspects are often interpreted through seminars, simulations and on-site experience.

The immediacy and context-bounded nature of Work knowledge is further supported by other authors working in the field of Work and training. Boud and Solomon (2001), in researching Work and higher education, claim that issues raised at Work are likely to be novel and one cannot, as is often possible in academic teaching, simply transfer and apply an algorithmic method or received knowledge to implement a solution. Boud and Solomon's contention is supported by research reported by Brown and Duguid (1991) on problem solving and repair amongst photocopier technicians, referred to earlier but expanded upon here; it also supports the idea of interpersonal learning and learning through feedback. In their study they found that simple, regular photocopier problems could be easily taken care of using the repair manual, a form of codified knowledge at Work. But the manual was insufficient for many of the more complicated problems experienced by the repairers[4]. In their descriptions there is a complex, situated process of exchanging narratives of past experiences of problem solving which develop from incoherence to coherence and are re-mixed in an innovative way to approach the particular problem they are confronted with. For these authors such narrative work is an essential glue for the formation of communities of practice. Eraut (2004) reports similarly on workplace problem solving as involving 'unconscious aggregation in memory … of cases' and interpersonal identification of salient points in the problem and its relationship to previous memorable experiences (Ibid.: 214).

Learning in the workplace has a strong component of explicit exchange of situated narratives which are potentially inexhaustible, each new experience generating another narrative; such segmented acquisition of horizontal discourse is also likely to involve trial and error experimentation, exploration and tolerance of dead ends (and Duguid, 1991). Learning in the academy is different as lecturers deal in predominantly sequential, codified, abstract and theory driven knowledge, or vertical discourse, which students are expected to acquire in their interactions with academics.

Young's (2005) interpretation of Bernstein's concept of vertical and horizontal discourse is that these are ideal-type analytical categories rather than knowledge types

[4] Brown and Duguid cite this as an example of management downgrading on-the-job skills and misrepresenting the true nature of Work knowledge.

that occur empirically. Vertical and horizontal discourse may thus occur in different proportions in all types of knowledge. For example, Breier (2003: 83) argues that in labour law teaching practices vertical discourse is not the preserve of the disciplinary lecturer but is produced, too, by trade union workers during interactions with the lecturer. Furthermore, everyday practices (horizontal discourse) emerge in the discourse of law within formal lecture delivery mode. There is, she asserts, a 'complex relationship' between vertical and horizontal discourse in pedagogic discourse. Labour law is more of an in-between hybrid of the two.

Bernstein (2000: 52) refers to professional academic fields as regions. Regions involve aspects of the occupation and some sort of academic integrating principles in the development of recontextualising rules which determine which subjects, and in what fashion, will be incorporated. Barnett's (2004) previous description of reclassificatory recontextualisation of disciplinary knowledge and the pedagogic recontextualisation of both the reclassified subject knowledge and situated knowledge expands the development of regions. Regions also weaken subject boundaries and there is some element of interdisciplinary hybridisation, even if, as Eraut (2004: 204) points out, regions tend to academic dominance and hence show the characteristics of vertical discourses.

Other mixes between vertical and horizontal discourse in regional fields can be found in 'responsive' moves in higher education, for example in the introduction of problem-based learning in medical training. However, whether or not such approaches in both regions and other field types are in fact discourse mixes or appropriation of one discourse by the other is the topic for Chapter 6.

According to Bernstein, vertical discourse cannot generate horizontal style discourse and vice versa. For Eraut the transfer of knowledge from the academy to the workplace involves substantive work on the part of lecturers and students alike, equivalent to or greater than the effort required for disciplinary knowledge acquisition; this is seldom realised by lecturers. The two types of knowledge, from Work and from the academy, seem to be doomed to a state of almost perpetual separation. Thus, Work responsiveness is a problem of larger proportions than is imagined by policy makers. In order to gain insights into how the transfer,

transformation and productive integration (productivity refers to my concept of knowledge which is jointly constructed and mutually acceptable to both communities. Cf. Chapter 4, Section 3.4) of knowledge from Work and the academy may actually occur in practice, it is necessary to look beyond the field of education per se into the fields of knowledge transformation and boundary work in general; in other words to revisit the more socially constructivist theories of communities of practice, activity systems and actor-networks. Chapter 4 synthesises insights and theories of knowledge difference with those of knowledge transformation and boundary-crossing activities, and mobilises additional theory from innovation studies, as a tool for understanding possibilities for the integration of Work and academic knowledge.

Chapter 4: A conceptual framework for examining productive interactions between Work and academic communities.

4.1 Introduction

This chapter puts forward a synthesised conceptual framework drawn from Chapter 3 to describe and analyse responsiveness in Work and academic interactions. The model is derived from a number of theoretical perspectives involved in the study of heterogeneity and boundary-crossing work.

The chapter begins with an explanation of the theoretical position on productivity in interactions taken in the thesis. Knowledge difference and hence boundary is understood as a necessary element of productivity. The concept of productivity is further illuminated using the concept of vertical recontextualisation after van Oers (1998a).

Where there are boundaries there need to be ways of crossing them as difference alone is insufficient to enable productive interactions. The idea of boundary-crossing devices synthesised from the theories presented in Chapter 3 is thus developed further with specific reference to Work/academic interactions.

The idea of difference and development of new knowledge as productive is now addressed through, firstly, the concept of difference between the old and the new in innovation studies. An optimum degree of difference can be recognised and this can be mapped onto the activity theory concept of a third space in which new, productive knowledge can be developed. In this way a theoretical platform is set up which can be mobilised to answer the research question concerning Work/academic bridging in the thesis.

4.2 Productivity

In defining the concept of productivity, knowledge development in Work and academic interactions which is neither predominantly academically or Work orientated is described. Firstly two extremes are put forward then the concept of

something which may lie between Work and academic knowledge which looks both ways is put forward.

Thus far I have established that knowledge in workplaces and in the academy is likely to be different in terms of its structure, purpose and mode of transmission. Bernstein (2000) describes changes in recontextualisation as that of changes in the ordering, focus and social relations of knowledge. When knowledge from one community moves into another community it moves into a different network of relations of people and things that support and make possible ways of doing.

According to Boud and Solomon (2001) Work knowledge is more often than not 'subjectified' as it moves into the higher education curriculum. Subjectification refers to the degree to which ways of doing and thinking in workplaces become subsumed to the needs of subject teaching, or separated out such that they are ancillary to the main work of the academy. In the first instance the immediacy and reality of the workplace tends to be lost. Work decisions frequently involve on-the-spot judgements through mobilising and integrating previously learnt selected elements of mostly codified academic knowledge, codified Work knowledge of procedures (including legal and safety rules amongst others) and tacit knowledge acquired on the job. Secondly there is a danger that Work knowledge would be viewed as less prestigious and important than academic knowledge (Young, 1998) and would tend to be separated out from it; for example this may take the form of adjunct workshops on Work skills or short Work related projects which are not integrated into the larger mainstream body of knowledge.

On the other hand, when academic knowledge enters the workplace (for example in workplace training) it may be stripped of its vertical discourse nature which gives it explanatory power, 'dumbed down' (Bernstein, 1999: 169) and presented as an add-on to the existing horizontal discourses. This can be referred to as 'workification' of knowledge to contrast it to 'subjectification'.

Productivity

My concept of productivity has been inspired by activity theorists who view knowledge development within a single community as being contextually constrained

and thus limited (Engestrom, 2001; Gutierrez et al., 1999), and by Wenger's (1998) work in the field of situated learning which view productivity as the development of 'potentially shared or jointly constructed objects'.

Productivity relies, firstly, on boundary recognition and hence the existence of some degree of difference between different knowledge forms. Boundary recognition involves making difference, which may have previously been implicit, explicit. It is not, however, necessarily a barrier to further development. When two different communities interact their differences become a resource and there is the possibility that previous contextual constraints fall away or are muted as a new, intermediate space develops. Mention must be made here of the ANT concept of trade-off between variation, which can be seen as equivalent to my concept of difference and the possibility for co-operative work, a theme which will be expanded upon in Section 4.4 On its own the space is not necessarily going to result in interactions which may be productive. There needs to be actions by actors to cross these boundaries.

Productivity is now measured as the extent to which new, collaborative knowledge formations arise within this intermediate space through the collaborative actions of the actors involved. Being productive is thus more than just communication across differences. It involves the production of new knowledge with elements of both higher education and Work which has value in both of these contexts. Productivity is the measure of success of the hybrid forum in which communities interact.

Productivity and recontextualisation

The concept of productivity can be further elucidated with reference to another activity theorist, van Oers, and his generative conception of 'recontextualisation'. This is not to be confused with Bernstein's concept of recontextualisation in which one form of knowledge, academic or otherwise, may be recontextualised into vertical discourse through the operations of the inner, abstract structure and principles of the latter. It is also not simply a process of selection of appropriate subject knowledge, as was the case with Barnett's (2004) concept of reclassifcatory recontextualisation.

van Oers' (1998 a, b) concept of recontextualisation of knowledge between contexts involves a process of mutual transformation of knowledge. van Oers was not

specifically referring to Work/academic knowledge interactions but the relationship between more practice-based mathematics and the development of abstract mathematical thinking in children[5].

Applying van Oers' conceptualisation to Work/academic interactions, the central and most desirable outcome is where Work knowledge is used to frame, extend and deepen codified disciplinary knowledge. In essence, there is change in knowledge from Work and the academy as the two knowledge contexts interact. In addition, disciplinary knowledge and ways of doing things are applied in order to extend and deepen Work processes.

The concept of 'deepening' in recontextualisation can be explained through recourse to the work of Miettinen and Peisa's (2002) on engineering projects in industry. Students are asked to interrogate Work processes through the lens of their academic knowledge, and to offer and defend extensions to such processes which they believe would enhance Work productivity (they are also asked to do the reverse process in examining their academic work through a Work lens).

It is the notion of extension and deepening which suggests a zone of development for student learning at the Work/academic interface which is more useful and powerful than the rather empty description of 'application of knowledge'. van Oers (1998 a) describes such depthful integration and development of one form of knowledge within another as vertical recontextualisation and contrasts this with horizontal contextualisation in which Work and academic discourses do not undergo mutual development. In horizontal recontextualisation the workplace activity would be relatively un-problematically inserted into the curriculum. For example, learners may perform mathematical calculations of real situations within engineering classes. The workplace here serves to connect different strands of maths to one another in order to solve a problem, or to specify particular aspects of maths and exclude others. This only becomes vertical when the process opens up new avenues of thinking or new ways of doing things and becomes more generative, often applying theoretical subject knowledges in new ways to do this.

[5] Guile and Young (2003) mobilised van Oers' work in order to better understand the interaction between Work and academic knowledge and this is the approach followed here.

The combination of the situated and the academic does not lead necessarily to the absorption of the one by the other but rather to the development of something different, a new, hybrid combination. In my terms this is a *productive combination* because it looks both ways, meeting both academic and Work needs.

Before new forms of knowledge can develop which are mutually satisfactory to both Work and the academy, which is a desirable and productive outcome, there would need to be some sort of negotiation of knowledge between those at Work and those from the academy. In the following sections the concept of 'boundary devices' in interactions which may enable more productive interactions is firstly presented. Following on from here a model for the role of difference in productivity is proposed.

4.3 Boundary devices in interactions

The idea of boundary relies on the associated idea of difference between knowledge in different communities of practice which, under normal circumstances, prevents the easy passage of knowledge between such communities. Boundary devices, as a general term, relate to the range of transformational structures and processes that influence such passages.

Boundary devices are drawn from a synthesis of different theoretical perspectives presented in Chapter 3. All, however, have empirical referents and cognate epistemologies which form the basis for my discussing them as a whole. Some of the devices serve to disrupt intercommunity coherence whereas others serve to enable the passage and transformation of knowledge between the communities. Others still exploit and explore this emerging hybridity.

Forums in which Work and academic representatives meet are hybrid forums. When these hybrid forums are optimally balanced with enough variety and some level of agreement, then we could expect productive interactions. Whether or not this actually happens would then depend upon how boundary devices are mobilised.

The presentation of knowledge from either Work or academic communities as different, essential and, at least initially, immovable (reification) is a boundary device. Some reifications may be too strongly represented. I have termed these sorts of reifications 'deifications'. 'Deification' in the Collins English dictionary means 'exalted to the position of a god' and deify may mean 'to exalt in an extreme way'. It is this latter meaning I have adopted and transformed. The use of deifications by actors in one community tend to be deliberate moves to resist negotiation .

Reification can be dealt with by actors in different ways. Firstly it can be used to cement boundary and prevent further boundary crossing (reification as deification). Or, either community may attempt, through powerfully representing their reification as essential for the good of the other, to enrol the other. Enrolment may also involve some change in the knowledge originally presented. The idea of enrolment described here is not entirely satisfactory for the development of responsiveness to Work. The process may be somewhat Machiavellian rather than consensual and is likely to end up with an asymmetrical knowledge product (Miettinen,1999). If the product is too strongly representative of the knowledge of one community rather than the other then it is unlikely to be embraced by the other. Star and Griesemer (1989) take a more ecological approach to enrolment. Enrolment is more heterogeneous involving, as they call it, a meshing rather than a funnelling of interests. This is better orientated to attaining goals which are more congruent to my concept of productivity in Work/academic interactions.

Alternatively, actors may act on reified knowledge through stripping it of its social relations so that it is more easily insertable, in reduced form, into the other community. Various terms have been used thus far to describe this process, namely decontextualisation, de-alignment and reduction. Once it is inserted into the other community it may now be recontextualised within that communities' social relations. The extent to which the recontextualisation is predominantly one-way in favour of the receiver community, or more two-way to the mutual benefit of both communities, can be expressed as low or high productivity respectively.

Various additional devices are also mobilised by actors in attempts to cross knowledge boundaries, which may be co-located and additional to contextualising

processes or occur separately from them. Shared knowledge or practices or even partial dual Work/academic community membership may provide for overlapping, connecting structures which can enable knowledge movement and transformation. Run-through is a term derived from interdisciplinary studies. Run-throughs are types of knowledge that exist at the same time in different academic disciplines and thus strengthen their connectivity and act as conduits for communication (Klein, 1996). In interdisciplinary studies a subject such as mathematics may occur in a number of different disciplines and a concept such as atomic structure is taught in both chemistry and physics. At a more generic level design subjects may share a similar process of graphic representation. Run-throughs have common characteristics to the semi-specific repertoires of Duncker (2001, 1998) discussed in Chapter 3 Section 3.4. Here, versions of applied mathematics serve as a partially common language across disciplines. Although like concepts connect disciplines they also show up differences between them as meaning is realised through different social relations. This difference may be enabling or disabling, as was discussed in the section on reification.

Brokers may be those who are within overlapping structures and thus serve to further already existing connectivities. In Work/academic boundary situations some Work representatives play a training role in the workplace and could thus be said to occupy both a Work and an educational space simultaneously (though this may not be an academic one). Some academic representatives may also have recently come from the workplace or may even teach part-time while working and thus occupy both Work and academic positions.

Brokers may also be less formally instantiated in interactions as actors who are able to creatively ‘imagine’ the knowledge and practices of the other, which may also serve to further connectivity. Brokers (and others) can furthermore use standardised objects as a connecting object between two knowledge forms. Such objects are recognised and understood by both communities as having value within the hybrid forum, though they may have different meanings when restricted to one or other community (both scientists and amateurs recognise and understand the term species so it acts as a knowledge bridge between them. When restricted and used within one or other community, however, the term has different meanings).

The result of the actions of boundary devices can be hybrid objects consisting of elements of knowledge from both contributing communities to different degrees; the relative contribution of both communities relates to the productivity of the hybrid object. For example, standardised objects may go beyond the re-ordering of knowledge from one community into another but act as articulating or joining devices for knowledge from both communities. More and more knowledge of increasing complexity and detail can become deposited in these articulating devices.

Hybrid objects are not just results but are also potential boundary devices too in that they may enable further developments; hybrid languages which arise out of hybrid forums are an example of such a boundary device.

The process of brokering is in part a linguistic one as the speaker attempts to talk to and be accepted by two communities at the same time. Other boundary devices also involve some form of hybrid language. So it is useful to consider this phenomenon in its own right.

It is possible to identify new language structures which are created as specific results of interaction between two or more communities, belonging exclusively to neither one of them, but occupying instead a space between the two worlds. Such hybrid structures have been described by Galison (1997) in interactions between engineers and different sorts of physicists around a micro-engineering project, by Duncker (2001) in interdisciplinary research and by Gutierrez et al. (1999) between working class children and their teachers in a biology class, as was discussed earlier in Chapter 3. They refer to these concepts and language as pidgins or hybrid languages as they serve to explore, momentarily, a new space which lies somewhere between the two communities. As such they enable disparate communities of engineers and physicists, on the one hand, to produce micro-technologies and for children, on the other hand, to learn the principles of biology.

4.4 Difference, disruptions and productivity: towards a conceptual framework

The concept of productivity implies that differences are both a barrier and an opportunity, the latter especially if there is generative disruption. In actor-network theory mention was made of trade-offs between variety and productive convergence in hybrid forums. Very interesting work in this respect has been done in innovation studies (Nooteboom, 2004, 1999), and these studies will be used to expand on the concept of trade-off in order to help answer the question about productive bridging between higher education and Work knowledge.

In higher education 'innovation' is often used to describe new initiatives in teaching which includes creative ways to bring society into the classroom; problem-based learning in medicine, for example, is an innovative approach in response to the changing reality of medical practices. Innovation here is being used to serve educational thinking in times of change. Innovation studies from the workplace, such as those carried out by Nooteboom, and economic theory are not traditionally applied to understand the field of higher education curriculum development. However Muller (2001), writing from the curriculum perspective, suggests that Nooteboom's theorisation of the need for 'radical reconstructive novelty in innovation as opposed to cumulative, incremental novelty' (Ibid.: 128) could be usefully taken up when examining university responsiveness.

Nooteboom's innovation studies draw on cognitive theories of learning in the form of scripts, absorptive capacity and cognitive change (Nooteboom, 1999). Though these theories are primarily focused on individual learning and cognition, Nooteboom, in his conceptualisation of innovation, overlays individual cognition with a more social orientation.

4.4.1 Innovation studies

One of the conundrums of innovation is how to introduce a new way of doing things or a new product whose success is unknown, when there is already a successful method that still provides income for the company. Being able to do this is important for companies who wish to remain competitive. There is a problem of attempting to

communicate the unfamiliar and at the same time an opportunity to produce something radically new which may occupy a new or yet to be discovered market niche. At the same time, it is risky to produce something radically new without knowing whether it will be taken up in the market.

In Nooteboom's (2004, 1999) analysis of this issue he draws on cognitive theory to understand how new ideas may be understood by those steeped in older, previous ideas. Simply put, in order for A to understand B, A needs to have sufficient familiarity with what it is B is attempting to put across. Familiarity, in cognitive terms, would involve some sort of prior learning from A which enables A to accommodate B's ideas into cognitive structures which are already there, either partially or completely.

Where the new is very like the old then the cognitive difference is small and the new is easily accommodated into the old; so there is little innovation, even while there is a high degree of communicability. Where the cognitive difference is very large then communicability is compromised and again there is little innovation.

For something to be innovative it has to be sufficiently different from the old; if it is the same as or very similar to the old then it is not innovative. So the higher the degree of cognitive difference between the new and the old, the greater the potential for innovation. But this drive for innovation and novelty is counterbalanced by increasing novelty becoming increasingly incommunicable.

Thus there is a trade-off between increasing cognitive distance between the old methods/products and the new innovation, and hence the relative novelty of the innovation, and the concomitant reduction in the possibility of it being successfully communicated and hence accepted.

The relationship can be visualised graphically as shown in Figure 1. The novelty of the innovation is represented by a sloping line increasing with cognitive distance between the new and the old (the x-axis). Novelty needs to be communicated to be realised, but communicability decreases with increasing novelty. So there is a trade-

off between novelty and communicability with the optimal position (depending on the situation) somewhere in the middle of the cognitive distance axis.

The trade-off can be simply understood by reading off points on the x-axis for cognitive distance against high or low values for communicability and novelty. Point A represents a new product which is much like its predecessor. An imaginary vertical line crosses the novelty transect at low values and the communicability transect at very high values. This we would code as 'A = low novelty but high communicability'. It is productive in the sense of absorption of the new within the old, but not in terms of my vision of productivity because there is not much that is new which is created. Point C on the x-axis is at a position of large cognitive distance. Here, the imaginary vertical line crosses the communicability transect at very low values and the novelty transect at very high values. The coding of 'C = high novelty but with low communicability' again indicates an unproductive outcome as the innovation is too novel to be taken up.

Point B at the midpoint of cognitive distance between the new and the old methods/products we would code as 'B = moderate novelty and also moderate communicability'. Here one could predict that there is sufficient novelty for something to be called new and sufficient understandabilty for it to be successfully communicated and accepted. This position, then, is likely to be productive.

Productivity, in the sense I use it following Nooteboom, i.e the realisation of some novel product, thus relates to cognitive distance as an inverted U-shape curve; the better starting point for productive innovation is somewhere in the middle.

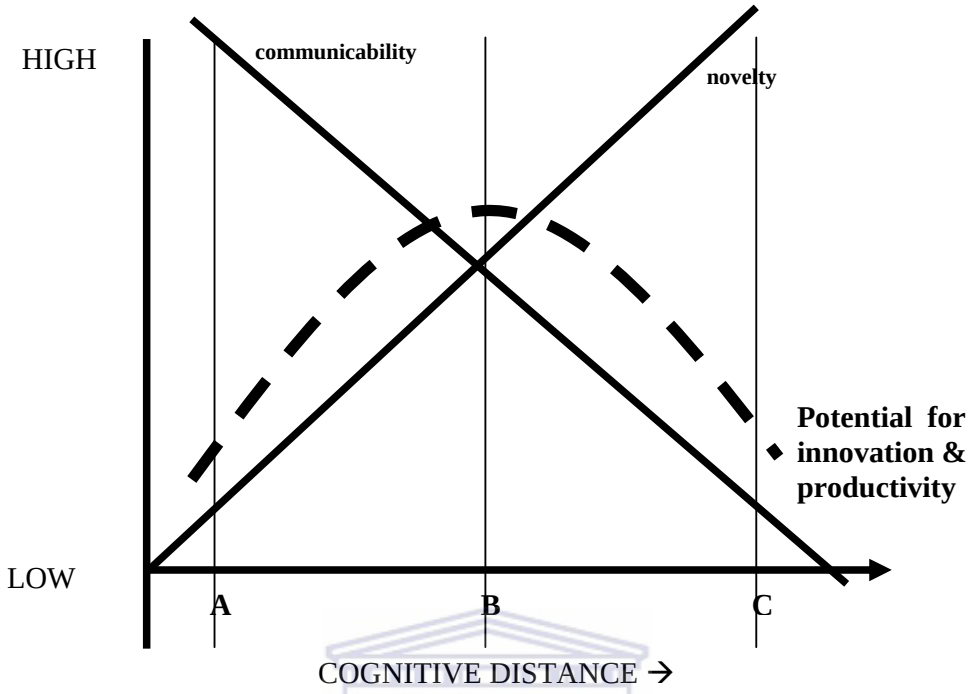


Figure 1: The potential of increasingly innovative products (after Nooteboom, 1999)

In economic theory the Nooteboom graph can be used as a partial explanation for the success/lack of success of innovation. This is because it operationalizes the idea that, in order for innovation to occur, existing linkages which firms have with others are broken and competencies possessed by the workforce become obsolete. This process of de-alignment is then followed by one of re-alignment as new linkages and competencies are constructed (Rip et al., 2004a). Such an explanation can be turned into a predictor for success and productivity if circumstances in the new cases are sufficiently similar to those previously analysed as successful or not successful.

Nooteboom (1999) points out that there are similarities here with Granovetter's (1986) analysis of the 'strength of weak ties' and a brief excursion is necessary here. Granovetter's thesis is based on research done on job seekers in the United States. He observed that those who used their immediate circle of close acquaintances to find jobs fared substantially less well than those who used weaker, extended networks to find work. He relates this phenomenon to the idea that, when dealing with those with

whom we have weaker ties, we need to clearly articulate our own ideas and respond to theirs, and in so doing a productive reflective space develops.

> '(weak ties are) the sort of ties that lead to complex role sets and the need for cognitive flexibility …. Since the ability to function in complex voluntary organisations may depend on a habit of mind that permits one to assess the needs, motives and actions of a great variety of different people simultaneously.' (Granovetter, 1986: 205)

The converse of weak ties are strong ties which consist of densely knit clumps of acquaintances with whom one shares strong commonalities of culture which makes rapid diffusion of ideas possible but at the same time is limiting. The strength of weak ties is that they promote the formation of productive bridges between disparate individuals or communities.

But weak ties are not always 'good' and strong ties 'bad'. Sometimes, strong ties are important where new objects once they have been introduced need to be developed further or exploited. This issue will be referred to again in Chapter 8.

The turn now taken is to apply the Nooteboom graph as a predictive and explanatory tool in understanding the possibility of success of educational innovation within existing systems. The innovation is new responsive policy and related curriculum initiatives in higher education practice. We can predict that academic actors should be able to incorporate policy initiatives so long as they are not too new as compared to current practices/dispositions, nor too incommunicable (which may be the same thing).

Taking policy directives which promote the idea of interdisciplinary programmes, which were discussed in Chapter 2 as an example, we can predict that there is likely to be a large cognitive distance between them and the traditional university subject-based programmes. Developing an interdisciplinary route would require the development of new sets of rules as to what counts and does not count as legitimate knowledge, and what the sequence of knowledge acquisition would follow from this. For academics in well-insulated and highly developed subject areas this change to

interdisciplinarity may be just too novel and its communicability low (position C in Figure 1). On the other hand for those who, for different reasons, are already exploring interdisciplinarity there would be less of a distance and new ideas would be more easily communicated and taken up (position B).

Where actors believe that what is being suggested by policy is not new at all but is already embedded in practice (even though their diagnosis may be incorrect) the idea would still be highly communicable but largely irrelevant in effecting any sort of transformation and hence not very productive (position A).

4.4.2 Mobilising differences productively between Work and the academy

The above examples are actual occurrences which support the graph's use as an explanatory and predictive tool. In Work/academic interactions the situation is somewhat different in that we are dealing with two different worlds with different concepts of knowledge, ways of doing things and overall purpose. Difference, rather than cognitive distance, is likely to be a deciding factor but the same picture as visualised in Figure 1 might hold.

Much has been written about the creation of boundaries between different communities and the subsequent processes of crossing these boundaries so that knowledge from one community may become transformed into something of use in the other (Star and Griesemer, 1989; Wenger, 1998; Engestrom, 2001).

Under normal circumstances difference serves to maintain separation between communities. Difference asserts community identity and produces boundaries between it and other communities. Difference is thus a stumbling block to the flow of ideas between communities. But it is also, as activity theorists assert, a resource for collaborative work and the formation of new knowledge. In order for difference to be put to work in collaborative engagements it must be made explicit so that collaborators from both communities have something concrete to work with. Thus difference both creates boundaries and the conditions necessary in order to cross them.

The process, as envisaged by Engestrom (2001) and others (Cf. Chapter 3, Section 3.4.3), involves differences between communities being brought into close proximity with one another within some sort of interactive space or third space. The proximity of different versions of knowledge within this space then sets up perturbations within each community's knowledge. Previous contextual constraints are shaken and loosened and there are opportunities for the development of new, combinatory forms of knowledge. Within this productive 'melting pot' of the third space hybrid knowledge may emerge and certain hybrid objects may also develop further.

Boundary crossing does not, according to Engestrom, involve simply the insertion of knowledge from one community into the other, but rather change in knowledge of one or both of the participating communities. The third space arising from boundary crossing activity acts as a 'melting pot' for the development of combinatory forms of knowledge which are hybrid products. These products may form and be of use as is, or they may lead to further hybrid development. It is the formation of these hybrid products in the third space which I have used as a measure of productivity in Work/academic interactions.

4.4.3 A hypothesis for the implications of Work/academic differences

The hypothesis now proposed, like the original Nooteboom prediction, is that degrees of difference between Work and academic knowledge are driving forces for the production of new knowledge in the third space somewhere between the two original knowledges. It is the proximity of these knowledges (sometimes stressed in hybrid forums) which encourages the development of disturbances leading to the development of the new. But disturbances will only occur under certain conditions and may sometimes be too large for any further productive activity to ensue. Where Work and academic knowledge are very alike there is low difference and a reduced possibility of disturbance. The knowledge is easily understood by the other but this in itself serves little productive purpose. Without disturbance there is limited opportunity for third space development and ensuing productive knowledge creation; this is visualised as the zone of proximity and low productivity in Figure 2. This is a similar observation to Nooteboom's prediction that innovation is unlikely if the new idea is too similar to the old, even though it is easily communicable. Conversely, where the knowledge presented by either Work or the academy is too markedly different from

the other, then the ability of the other to understand, absorb and do anything further with this new knowledge is again limited. This is hence visualised as the zone of rejection in Figure 2. Somewhere between very low and very high difference there is an optimal degree of difference where the other is sufficiently different to herald something new, but can also be understood and co-operatively developed. This area constitutes the zone of disruption and potential productivity and matches to Nooteboom's central zone in Figure 1.

To indicate gradual change, there is coloured shading on either side of the optimal zone rather than a distinct line.

This tendency, for heightened productivity of interactions with moderate difference, has been observed previously in studies of innovation in industrial practices (Rip et al., 2004a), in productive interactions between communities of practice in and beyond workplaces (Brown & Duguid, 1991), in productive negotiation of new knowledge involving contradiction, critique and questioning of received wisdom in teamwork (Engestrom, 1999); and in productive social relations amongst loosely tied groups and the so-called 'strength of weak ties' (Granovetter, 1986).

Figure 2 suggests a conceptual framework which can be used to analyse Work/academic interactions and to explain events and predict the potential for productivity. The diagram represents the framework as a somewhat static diagnostic tool as events occurring within the low productivity zones would be likely to remain there. But a situation in which knowledge is too proximal or too distant to result in productivity may change over time, and this would partly be because of the actions of actors involved.

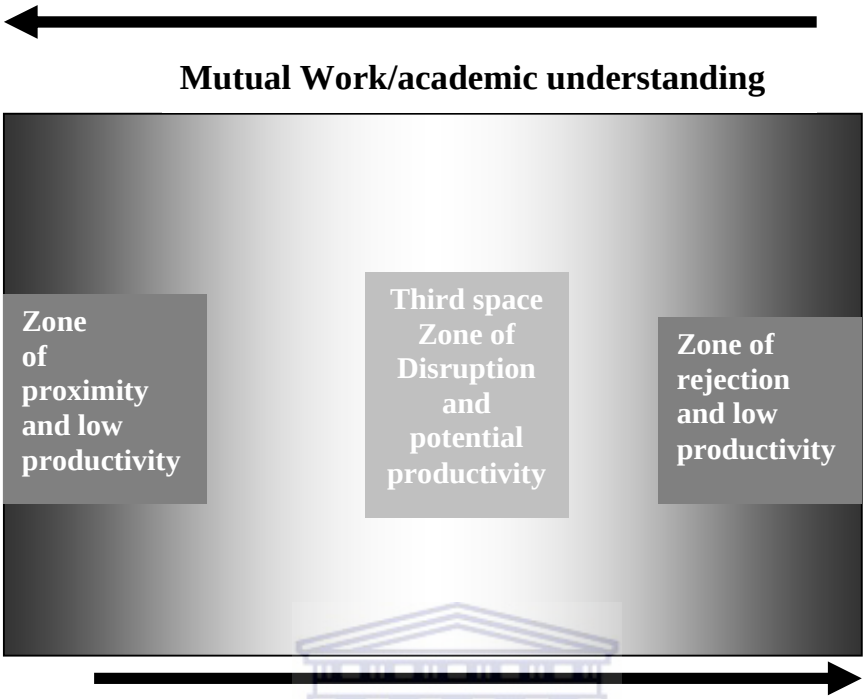


Figure 2: Three zones of Work/academic differences

Again I can mobilise insights from innovation studies, in particular Hoogma et al. (2002) study on the development and promotion of electric vehicles as opposed to the current dominant petrol and diesel vehicles, to illustrate change over time. There is a trade-off between introducing new technologies and what is already in existence and known and accepted by society. Hoogma identifies different strategies of introducing the new as against the old through using the terms 'fit' and 'stretch' from strategic management literature. Where there is fit then there is little difference between the new and the old and thus the new, though not very innovative, is easily taken up by society. Where there is stretch then the new is significantly different from the old; there is innovation but difficulty with uptake. In 'fit' new forms of electric car are introduced but with little disturbance on the prevailing and accepted systems; for example electric golfcarts or resort vehicles which are of peripheral use and unlikely to impact on the mainstream car market. We could match this to the zone of proximity and low productivity in Figure 2. At the other end of the scale there are advanced fuel cell cars which are so radically different from current vehicles that they are seen as a

novelty rather than a practical alternative to current vehicles. Hoogma describes this approach to development and implementation of new technologies as a 'stretch' approach which would be a match for my own high difference and low productivity zone.

In Hoogma's study of experiments with electric cars over 20 years the dynamic aspect of the productive tensions visualised in Figures 1 and 2 emerged. What starts as a fit strategy, with little novelty (at least in terms of mainstream cars), may over time open up possibilities for more radical changes and lay the groundwork for more stretch technologies to be more possible and acceptable. In some countries studied by Hoogma this actually occurred. In terms of Figure 2 some ambitious stretch experiments failed because they were located in the zone of rejection. Some fit experiments, which would normally be located in the low productive zone of proximity, developed over time into significant disruptions and changes to practice as actors chose to move out of this zone.

Figure 2 can be used as a prediction and possible explanation for observed events in Work/academic interactions. However, as with the electric car example, it could be extended to suggest productive strategies which could be developed over time. There can still be productive work in these more peripheral zones (zones of proximity and rejection on Figure 2) but more time and effort is required.

The framework built in Figure 2 of zones can now be mapped onto Engestrom's concept of 'third/developmental spaces' from Chapter 3 so that difference is related to potential development.

4.4.4 Exploring and enlarging on the third space

The Nooteboom and Hoogma strategies and my own explanations of effects (Figure 2) are only the beginnings of actions involving actors which need to follow on from here if these strategies are going to be operationalised. Nooteboom, for example, is not too clear on the processes following on from an optimal novelty/communicability position except to say that 'the new', or sections of it, may replace sections of previous scripts (ways of doing, products etc) so long as they are not too disruptive.

My hypothesis so far has proposed that there is an optimal difference which will promote productive interactions between Work and academic knowledge. But conditions of optimal difference and disturbance will only set the scene. Actor strategies need to be brought into play within the zone of potential productivity. These actor strategies (boundary-crossing processes) may result in hybrid and new forms of knowledge which may also be developmental as the new hybrid is explored and expanded on over time.

In Figure 3 the zone of potential productivity at optimal levels of difference is situated within the constraints of either too low or too high zones of difference. This zone opens up a third space which I have visualised as a funnel leading back into the page to indicate the potential for further development of hybrid objects, in particular hybrid objects which provide a structured and developmental integration of Work and academic knowledge.

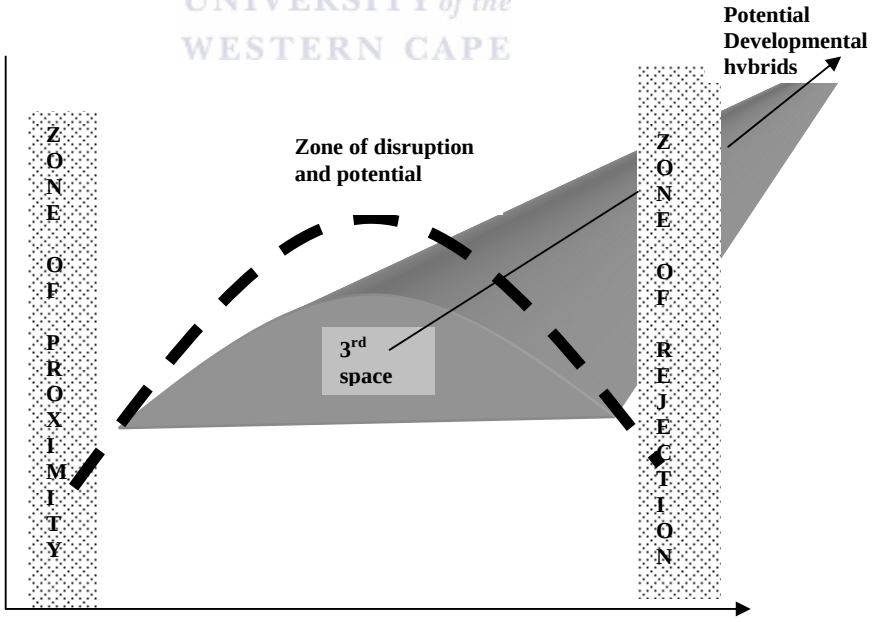


Figure 3: Productive zones and developmental hybrids

4.5 Conclusions: Theorising productive interactions

The starting point for productive interactions is the raising of difference between two interacting communities within a hybrid forum. Difference made visible as reification from one community set up disruptions in the knowledge of the other within a developmental or hybrid space. Reifications are thus a boundary device. Further boundary-crossing processes within the hybrid space which involve actors mobilising other devices, such as brokering, standardisation, reduction, overlaps and enrolment, may ensue which enhance co-operative work and hence the productivity of the interactions. A measure of the productivity of the interactions is their ability to generate hybrid objects which are a development of knowledge from both communities; these may be of the more restricted or of the more expansive form, such as interlanguage.

The degree and type of difference between Work and academic knowledge complicates the integration of the two within transaction spaces. Difference is a result of the network of relations within communities which create meaning for the context they typically operate in. Activity systems were used as one way to describe these networks of relations. The different networks of relations change knowledge which moves (either knowledge per se or sequencing and selective deletions and additions).

The original Nooteboom thesis, on conditions for the development of innovation, has been used to extend the ANT concept of trade-off in hybrid forums. This was done in order to provide a working model for the productive development of hybrid combinations of academic and Work knowledge, where degree of difference may play a role.

The conceptual framework developed can now be operationalised in the following methodological and empirical chapters.

Chapter 5 – Research design and methods

5.1 Specific research questions

The Literature and theory in Chapters 3 and 4 provided a conceptual framework for the nature of boundary and boundary crossing between Work and academic knowledge. In these chapters the basis was laid for the empirical focus in Chapters 6 and 7, which is on processes of bridging differences between Work and the academy, and the outcomes of this process, using hybrid forums as an important empirical entrance point. Chapter 2 provided an impetus for this work to actually be done in higher education institutions. This was because of general changes in the nature of society and the economy worldwide. In South Africa the impetus for greater Work/academic integration can be broadly understood as also coming from worldwide changes but from particular needs for social transformation and development. Hence the significance of the earlier research question:

> *What processes within hybrid Work/academic forums lead to the bridging of difference between Work and academic knowledge and what is the nature of the outcomes of these bridging processes?*

In addressing my question concerning the processes and outcomes of Work/academic interactions, I needed to identify situations which involved some sort of identifiable interactive event, and products or processes (potentially leading towards products) arising out of the event. Events which involved interactions across different forms of knowledge were earlier termed ‘hybrid forums’. The first question which needs to be answered in this Chapter is which hybrid forums will be likely to reveal sufficient information to answer my question about productivity.

5.1.1 Choosing hybrid forums to analyse at two levels

The transformation of knowledge as it moves from Work into the academy (and vice versa) involves a number of potential hybrid forums, in which different communities with possibly different conceptions of knowledge interact (Cf. Chapter 1, Figure 1). For example, the interaction of Work representatives, such as supervisors, with those who actually do the work on the ground could constitute a hybrid forum, albeit within the workplace. The interaction of academics with those promoting new systems of

teaching (either internally or externally), such as outcomes-based education, could also constitute a hybrid forum. However, neither of these hybrid forums addresses my question about Work/academic interactions, even though outcomes-based education could be said to partially represent the world of Work. Other forums, such as the initial experiences of academically trained individuals in the workplaces, and the experiences of academic staff drawn from the workplace, would be more representative of the sorts of forums in which Work and academic knowledge interact. In the case of transition from the academy to the workplace, the question of how appropriate academic knowledge applied to the workplace was from the point of view of students, could be examined. Where staff are from the Workplace they could also be asked about gaps in the curriculum and how they would ideally integrate their knowledge of Work with current academic knowledge. Though information about integration could be obtained from both these forums, they are not as structured or purposeful towards achieving Work/academic integration and potential productivity, as was the case with the meso- and micro-level forums studied.

In the thesis Introduction I pinpointed two general types of hybrid forum which were of interest to me, namely those concerning the integration of academic and Work knowledge into academic projects (meso-level forums) and those concerning face-to-face meetings between Work and academic representatives (micro-level forums). Both types of interactions were more complex than an initial surface scan revealed. In examining the integrated tasks I noted a complex interplay between 'real' Work knowledge and subject knowledge. Work knowledge was not simply inserted into the curriculum unit. There was, rather, a tendency to design such tasks to meet the needs of the academy rather than those of Work, and the value of different Work knowledge was partly or wholly lost. Academics struggled to find some sort of in-between construct that could meet both of these needs. Such an in-between construct would be productive in my terms. In order to explain the nature and possibility of productivity, I would thus need to examine a number of such Work/academic knowledge interactions in the form of projects and curriculum units.

In the advisory committee described in the Introduction I observed differences in the kind of knowledge, which was highlighted as 'relevant' for students, and interactions that involved the force with which different propositions were presented. I was able to

discern these interactions as being somewhat lopsided in that they favoured either Work or the academy. Again, I was interested in seeking to find out whether I could detect elements of more mutually produced knowledge, i.e. productive knowledge, and what sorts of processes and actions led to productive and non-productive outcomes (or the potential for such outcomes). Having already observed interesting interactions in a number of formalised advisory committees in mechanical engineering, it made sense for me to examine other such meetings in order to conduct more in-depth analysis. Furthermore, I could examine a wider range of disciplinary advisory committee 'cases' in order to seek replication and patterns of processes across them.

Case study research has been used extensively as a method in higher education and in social research generally (Cohen et al., 2004; Yin, 2003; Hammersley and Gomm, 2000; Yin, 1994; Nisbet and Watts, 1984). Case study research is typically associated with more qualitative, socially constructive or interpretivist research paradigms (Cohen et al., 2000). The problem, as Tight (2003: 9, 186) outlines, is that almost any higher education research can 'in some sense' be termed case study research and thus elaborating on case study research methodology is not particularly helpful in providing guidance as to the researcher's research design. In this thesis hybrid forums are presented as cases in the empirical chapters. However, to address my questions, I do not have to go into all the complex dynamics and unfolding interactions in each particular case, only to take these into account as a check while concentrating on the particular sets of data of interest. Thus I have not accentuated case study research as my methodology, though more is said about such research at the end of this chapter. Rather, I have focused my discussion on which cases were chosen and examined, and why they were examined in a particular way.

At the meso-level, transformed Work knowledge is brought into the ambit of academic curriculum unit design through interactions with academic staff from different disciplines. At the micro-level, representatives from Work engage in face-to-face interactions around knowledge at Work and in the academy. In these hybrid forums the actual nature of the interactions around difference can be analysed, rather than being done retrospectively as was the case with the meso-level.

From the general research question more specific research questions pertaining to the hybrid forums to be examined at the different levels, and processes and outcomes can be identified. At the *meso-level* of curriculum unit design:

> *What is the role of difference between academic and Work knowledge in the construction of productive Work/academic curriculum units?*

And at the *micro-level* of face-to-face interactions in meetings:

> *What is the role of boundary and boundary-crossing activities in the opening up of hybrid spaces with the potential for productive outcomes?*

Productivity was earlier defined (Chapter 4, Section 4.2) in terms of initial difference between Work and academic knowledge acting as a resource for the development of new, collaborative formations.

Hybrid curriculum units at the meso-level can be analysed in terms of a measure of their productivity. This is possible as these are already formed and are examined retrospectively. The situation is different in naturalistic face-to-face interactions where there is a limited time span involved. Here I was able to locate the seeds of productivity, the opening of spaces for it to occur, rather than productivity itself. Firstly, following Gee (1990), representatives' language use reflected their membership of particular communities and their understanding of reality. Then, as they presented their versions of reality, they began to orientate to one another and in the process began to co-construct new realities (Edwards and Potter, 2001).

This implies that discourse analysis (in a broad sense) must be done in observed Work/academic meetings in order to better understand interactions between the different representatives. In this way cases can be studied in some depth according to a number of key interactive dimensions derived from the conceptual framework, while the complexity of the meetings is maintained through providing actual transcripts.

The analyses at the meso- and micro-levels are commensurate with the sort of research outcomes desired within a broad, constructivist paradigm. Here, the anteriority of structures is recognized but these may be altered or 're-constructed' through the actions of actors in ways which cannot be entirely pre-determined by structure; new hybrid knowledge forms may arise which are not necessarily reducible to the original structures from which they originated (Carter and New, 2004).

5.2 Meso-level design: Curriculum unit analysis

The hybrid forums to be analysed at the meso-level are those in which attempts are made to integrate Work knowledge into the academy; for example in projects, in Work case studies in the academy or in longer curriculum units. Such units, being constructed from elements of both Work and academic knowledge, are hybrid curriculum units. The analysis was retrospective, and involved an investigation of how the units were structured in terms of the relative influence of Work on academic knowledge and vice versa, in order to understand something about the productivity of the hybrid unit. The first step in the analysis was the selection of appropriate case studies.

5.2.1 Case selection

As I was interested in ascertaining whether disciplinary field was in some way related to initial difference and hence productivity of hybrid curriculum units, a classification of different disciplinary types was required. Thus sources for cases were selected according to Becher and Trowler's (2001) classification of hard and soft and pure and applied types of disciplinary field, discussed in Chapter 3. This classification is useful in this research because it serves to differentiate between academic disciplines at two levels. Firstly, it provides a means of differentiating between different academic disciplines in terms of their differing internal logics. Secondly, the classification proposes something about the external relations of these disciplines to professional knowledge and the world of Work, and about whether these relations are likely to be proximal or more distant. Here we can also import Bernstein's (2000) theory of the strength of boundary classification of different disciplines, and the extent to which they may be more or less permeable to hybridisation with outside knowledge forms. Mention must again be made of the framing of responsive curriculum in which both

Work and academic knowledge jostle for influence in the structuring of the curriculum. In academic programmes framing is likely to be predominantly disciplinary with Work being muted. As one goes down to vocational training at lower levels, framing tends more to be more occupationally related (Barnett, 2004).

Despite problems with their classification of academic disciplines, I agree with Becher and Trowler (2001: 39) that such classification does provide a 'workmanlike' object, which can be used to better understand the external relations of academic disciplines.

If disciplinary field was predictive then I would expect similarity of outcome across cases drawn from similar fields. Conversely, where the fields are substantively different I would expect there to be different, but still predictable, outcomes. This sort of differently structured multiple case analysis enabled me to ascertain whether my original, rough 'hypothesis' was in any way robust, and pointed me to what else needed to be considered in predicting productivity. As such I was sampling on the dependent variable in that case studies, which I already knew to have elements of heterogeneity of Work and academic knowledge, were chosen, and others, which did not meet this condition, were ignored. This kind of selection is defensible in that my interest was not in whether or not heterogeneity was evident, but rather in what the nature of this heterogeneity was across and within the different fields. Other relational studies in the fields of social (Cooper, Scherer et al.; 2001: Barret and Ong Tsui; 1999) and business (D'Aveni and Macmillan; 2001) research also sample on the dependent variable where the object is to understand or theorise a relationship rather than to see whether or not it has occurred.

In order to provide a wide spectrum of different disciplinary types, cases were also selected from a number of different countries. Sources for cases were initially identified through surveying the literature on Work responsiveness in higher education with a particular focus on the United Kingdom and Australia; sources included the 'Society for Research into Higher Education' publications on Work and higher education, and relevant academic journals. These countries were specifically chosen as they had coherent and developed policies and practices for Work/academic integration (for example the Dearing and West Reports), and had been influential in

the development of higher education policy and practices in South Africa. The spectrum was not only limited to these countries, however, and Work/academic practices of interest in other countries were also identified in the literature (for example Finland) and through my supervisors (for example the Hogescholen in Holland and the higher education technical 'Ecoles' in France). In South Africa sources were identified through the researcher's academic development network. The spectrum included a spread of scientific and non-scientific and professional and non-professional university disciplinary fields in health, business, environmental studies, engineering, humanities and sciences.

One source examined from Finland (Miettinen, 1999) was in the form of a research paper, which was already very detailed and afforded sufficient data for it to be used 'as is' in order to illustrate Work/academic integration. The other sources required further investigative work before they could be used for illustrative purposes.

At this point the sources of data were the following:

In the United Kingdom

A contact, Val Butcher, at the then Generic Centre unit on higher education and employability was used as a guide and entry point to various sources for cases in the UK which were: The University of Leeds context studies project; the Generic Centre employability skills unit; the University of Edinburgh adult education department; Sheffield Hallam University; and Coventry University.

Other European countries

My supervisor Professor Rip directed me to the Paris Ecole Des Mines and the Hogescholen Enschede, Deventer and Amsterdam and two other Dutch universities as sources of data. The Satakunta Polytechnic industrial design project from Finland was an additional source drawn from the literature.

In Australia

The work of Professor Boud in Work-integrated learning at the University of Technology Sydney was identified.

In South Africa

Various integrated curriculum design initiatives in health and engineering were drawn from the Peninsula Technikon in the Western Cape Province and the Durban Institute of Technology in Kwazulu-Natal Province. Other integrated design initiatives in medicine were drawn from a Western Cape university medical school, and in science and humanities from two other two other Western Cape universities.

5.2.2 Refining the sample

The identified sources at the different higher education institutions were e-mailed the general question of 'how have you responded in your teaching and learning practices to the changes in the workplace over the last few years?'. More details of the research being undertaken were given in the form of additional questions about curriculum design (Appendix 1). Individuals from the sources were asked if the questions in fact reflected the work that was being done, and if so whether they were willing to be interviewed. Where informants responded positively and with interest, interviews were set up in South Africa and during a study tour of Europe. The same questions from Appendix 1 were addressed in interviews but not adhered to rigidly, forming what Cohen et al. (2000: 275) term a semi-structured interview protocol. These interviews and supporting material constituted the set of cases to be examined.

The cases were then checked against the following criteria:

- Is there an attempt to respond to the changing nature of Work, i.e. something which the respondents had discovered as new and hence requiring change to educational practices?
- Is there an identifiable curriculum unit which could be analysed?

In the process of conducting the research some of the cases were not used as they did not meet the above criteria. For example, some of the old polytechnic/technikon curriculum practices were not responding to new workplace demands but rather to functionalities that were understood as having been constant for the last twenty years or so, and hence these cases were not used. Altogether eight cases from different

countries, which covered the different Becher and Trowler types, were selected for further analysis.

There is one soft-pure and one hard-pure field represented by humanities and sciences respectively; there are two hard-applied fields represented by engineering and medicine; and four soft-applied fields in business and environmental studies. The strong representation of soft-applied disciplines relates to their being weakly classified knowledge fields and hence more amenable to hybridisation with Work, though how successful such hybridisations are needs to still be addressed.

The list of case studies selected for analysis, the sources and dates for the interviews, their field, Becher and Trowler classification and expected degree of difference, derived from the claim below that some fields are more different from Work than others, are summarised in Table 1.

Name and identity of responsive curriculum case study	**Disciplinary field**	**Becher and Trowler type**	**Sources of data**	**Techniques**	**Expected degree of difference**
1, 2. University programmes (SA university)	Arts (1) and sciences (2)	Pure soft and pure hard	R. Moore PhD thesis.	Document analysis; Interview October 2005, R. Moore	High
3. Integrated tasks (SA polytechnic)	Engineering	Hard-applied	Practices and documents	Observation	Medium
4. Problem-based learning (SA university)	Medicine	Hard-Applied	M. Alperstein, lecturer; Prof. Gibbs; course documents.	Document analysis interviews May 2003, October 2005.	Medium
5. Finnish industrial	Business	Soft-	Published paper	Document	Low

design project (Finnish Polytechnic)	studies (in engineering)	applied		analysis	
6. Context studies (UK university)	Environmental and geographical sciences	Soft-applied	Pauline Kneale, Leeds university; HEA resource materials; conference presentation.	Interviews June and December 2003; document analysis	Low
7. Competency-based education (Dutch Hogeschool)	Business studies	Soft-applied	Lecturers M. Kok, J. Egmonde, W. Verdaasdonk; competency-based materials	Interviews June 2003; document analysis	Low
8. Work-based learning (Australian University)	Business studies	Soft-applied	David Boud; keynote conference address and SRHE materials	Interview June 2003; document analysis.	Low

Table 1: Representative case studies

The eight selected cases were then analysed in terms of the mutual development of new forms of knowledge.

In terms of initial difference, the expectation was that soft and hard-pure curricula would be markedly different from Work knowledge and hence their hybrid Work/academic units would be relatively unproductive. Soft-applied curricula, such as environmental and business studies, were expected to be more closely related to Work knowledge and this closeness might inhibit productivity. Hard-applied curricula in medicine and engineering would be somewhere between being too different from, and too alike to, Work, and their hybrid Work/academic units would be expected to show the most productivity.

5.2.3 Empirical analysis of the cases

Once selected, each case was analysed in order to better understand whether the variation observed in the responsive, hybrid case studies was related to the concept of difference between Work and academic knowledge. The analysis was one of retrospective examination of interactive processes. There are, however, also more structuralist ways of describing these interactions that can help us to understand the likelihood of productive outcomes. For example, the strength of classification of an academic subject or field may afford the required level of difference between Work and the academy to drive innovation (or not, as the case may be).

The cases were analysed according to the processes leading to the production of hybrid objects and some measure of what sorts of hybrid objects emerged. As to processes:

- What forces led to the development of these responsive units?
- What was the nature of the hybrid forums in the design process?

As to the nature of the hybrid objects which emerged:

- Was the hybrid object real-life or simulated?
- What was the nature of the recontextualisation of Work knowledge in its relation to subject knowledge and vice versa? How symmetrical was the hybrid object?
- How productive was the interaction in terms of the production of something new in a new space?

5.3 Micro-level design: The advisory committees.

The second type of structured and purposeful hybrid forum to be examined were those at the micro-level, the level of observable curriculum interactions. The specific question to be answered here was:

> *What is the role of boundary and boundary-crossing activity in the opening up of third spaces with the potential for productive outcomes?*

Evidence was sought of differences raised and how this may lead to a potentially productive development. The research was limited to the potential for productive processes, or at least the beginnings of them, rather than searching for evidence of productive outcomes. The appropriate constructs to research the beginnings of productive enterprises were those that highlighted the presentation of knowledge by representatives from one community and which described and explored the ensuing interactive work in reshaping and developing these initial presentations. Such imported constructs were those concerned with boundary and boundary-crossing processes.

5.3.1 Case Sampling

I started out investigating advisory committee meetings in mechanical engineering at my institution (the then named Peninsula Technikon) in late 2002 and early 2003. At that point my interest was in the field of engineering education and what sorts of curriculum orientations were arising in response to 'new Work order skills' such as problem solving, teamwork, networking and so on. My interest then shifted from the field of engineering to the broader field of responsiveness in professional education.

Sampling was criterion-referenced (Geisler, 2004) in that I sought practices which involved purposeful, structured curriculum development processes between communities from Work and academics, which have the potential to show boundary-crossing activities. I sampled a wide selection of meetings including engineering, sciences, business and social sciences from geographically distant institutions in South Africa.

Again this was, in case study research terms, a multiple-case, theoretically replicative methodology (Yin, 1994) in which patterns were sought across different sites.

Limitations to widening the number of cases

Initially, evidence was sought from other sites of academic/Work interaction so as to give as wide a spread of data as possible. Since the data was to be analysed in terms of its interactive dynamics the researcher needed direct access in order to tape record the meetings; official reports of meetings would simply not be sufficient. The second

constraint was that these sorts of meetings are not commonly formalised in universities as a method of curriculum design/evaluation. And, where they are used, they may be irregular or occur as a once-off in the initial curriculum design phase, as was the case in one medical school. The third constraint is that these meetings are often seen as private and may expose tensions between particular academic departments or institutions and the workplace which the academics would not like publicised. From my point of view the existence of such tensions and their visibility made them ideal sites for research. However, on two occasions requests to observe meetings were turned down as senior staff expressed a lack of trust about my motives as I was also functioning as an academic developer with a perceived quality judgement role. In addition, such meetings may be about developing a competitive edge for that institution and there was unhappiness about this information being researched by an outsider.

Despite these constraints a large number of committees, across different fields in the host institution in Cape Town and in a geographically distant similar institution in another city, Durban, were accessed.

A total of 17 advisory committee meetings were observed and recorded, each lasting between 2 and 4 hours, giving a total of approximately 50 hours of transcripts. The full list of advisory committees is shown in Table 2 (the 'level of success' refers to the development of boundary crossing activity and is more fully explained in Chapter 7).

Field.	**Department and transcript number.**	**Level of success of the meeting.**	**Institution.**	**Date recorded.**
Engineering.	1. Civil engineering.*	Moderately successful.	Peninsula Technikon.	06/11/03
	2. Civil engineering.*	Unsuccessful.	Peninsula Technikon.	14/12/04
	3. Civil engineering.	Moderately successful with borderline moderately successful/unsuccessful parts.	Cape Peninsula University of Technology.	11/10/05
	4. Mechanical engineering.*	Moderately successful.	Peninsula Technikon.	00/10/03

Field.	Department and transcript number.	Level of success of the meeting.	Institution.	Date recorded.
	5. Mechanical engineering.	Moderately successful.	Cape Peninsula University of Technology.	31/03/05
	6. Power engineering.	Borderline moderately successful (a lot here was organisational).	Durban Institute of Technology.	22/09/05
Science.	7. Analytical chemistry.*	Borderline Successful.	Peninsula Technikon.	16/11/04
	8. Analytical chemistry.	Moderately successful.	Cape Peninsula University of Technology.	22/03/05
	9. Analytical chemistry.	(Tape failure).	Cape Peninsula University of Technology.	20/09/05
	10. Analytical chemistry.*	Successful.	Cape Peninsula University of Technology.	22/11/05
Health.	11. Medical technology.	Borderline moderately successful (much focus on organisation).	Peninsula Technikon.	12/12/04
	12. Medical technology.*	Unsuccessful .	Cape Peninsula University of Technology.	29/07/05
	13. Radiography.	(Tape failure).	Peninsula Technikon.	13/12/04
Design.	14. Built environment.	Moderately successful.	Peninsula Technikon.	05/09/03
Humanities	15. Journalism.	Moderately successful.	Durban Institute of Technology.	22/09/05
Business	16. Human resources management.	Not used.	Peninsula Technikon.	29/11/04
	17. Human resources management.	Not used.	Peninsula Technikon.	29/11/04

Table 2: The advisory committees

The choice of meetings to analyse

Two of these (numbers 8 and 13 in Table 2) had to be discarded as the tape malfunctioned and, even with handwritten notes, it was not possible to gather sufficient transcript for meaningful analysis.

The two business meetings (16, 17 in Table 1) were not typical advisory committee meetings as they involved meetings between academics and the directors of two community-based organisations. They were initially examined here because they were about interactions between academic knowledge and Work knowledge within a community organisation. Students from the Peninsula Technikon were tasked with creating a newsletter that served the needs of these two organisations. This newsletter was an example of responsive curriculum development. However, I found that the meetings focused more on how the academic institution could in future help to promote community-based organisations, rather than on propositions concerning knowledge within the two institutions. They were informative but did not provide material for analysis.

The remaining transcripts were then used to identify and analyse moments in boundary crossing. While an initial scan of the transcripts of the meetings revealed that they all contained moments where the actors began to explore boundary crossing and the seeds of productivity were developing, not all of them were equally interesting and amenable to detailed analysis (for example, the boundary-crossing moment may have been just a passing remark). Six meetings of four committees (analytical chemistry, civil engineering, medical technology and mechanical engineering) were selected for further analysis. This final selection contained enough variety to study the three main possibilities which were: opportunities for boundary crossing were not taken up (‘unsuccessful’); only partially taken up (‘moderately successful’); and taken up more fully (‘successful’).

Within the middle, partially productive category I wished to capture meetings which were close to being unproductive and those which were close to being categorised as productive. Three moderately successful meetings, two unsuccessful and one successful meeting were identified, corresponding to the asterisks in Table 2

The whole meeting transcript was too long to fully represent in the empirical chapter. Thus, once the meeting had been identified, the next stage was to refine the data in order to highlight processes to do with boundary crossing. Illuminative excerpts of the full meeting transcripts were chosen to illustrate the raising of difference, interactions and levels of success of the meetings, as is shown below in Figure 1.

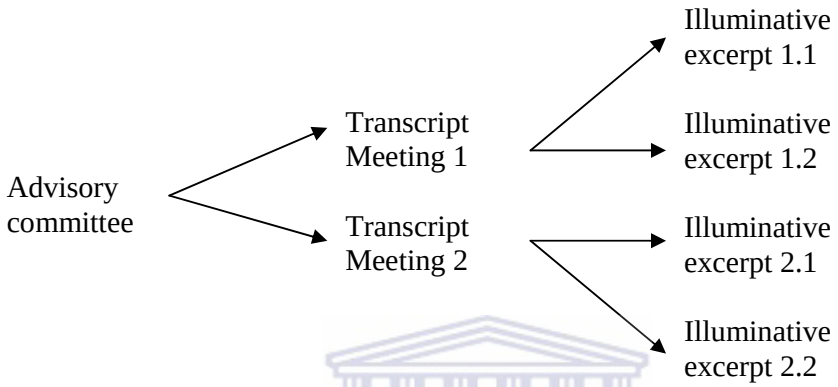


Figure 1: The Relationship between meetings and excerpts

5.3.2 Data gathering

The Work/academic curriculum meetings were recorded. All tape-recorded meetings were also backed up with the observer's verbatim notes in case of equipment failure and as a second source of interpretation in case of poor recording quality.

5.3.3 Discourse analysis of the meetings

Discourse analysis is a dominant methodology in the social constructivist paradigm. This is not surprising as constructivist research often focuses on the use of language in the social construction of knowledge (Potter, 1996), though it is used more restrictively in this study.

Discourse analysis typically follows the route of, firstly, identifying relevant cases or occurrences which illustrate how particular tasks are to be accomplished, the identification of language constructions to negotiate these tasks and the identification of patterns of construction within and across cases (Edwards and Potter, 2001; Tuffin and Howard, 2001). Such patterns may then serve to differentiate the outcomes of different cases in terms of the actions of the actors involved. As my research involved

verbal interchanges between representatives and as I sought to track knowledge negotiations and constructions, discourse analysis was the main method used.

As I was interested in larger units of meaning rather than in short sections of language use, such as individual clauses, tenses, vocabulary and their type and frequency, I used Geisler's model for discourse analysis.

After Geisler (2004: 31) I referred to the smallest unit of meaning, which makes some sort of linguistic 'move' a T-Unit. Such T-Units typically consist of a main and sub-clauses and attached non-clausal elements which together make up a unit of meaning. In my analysis the focus of the research was on boundary-crossing activity so the sorts of moves which interested me were those to do with asserting community membership, attempts to broker difference and the emergence of other language devices which can enabled or disabled the passage and recontextualisation of knowledge between communities.

T-Units are not isolated events and may form part of a 'topical chain' in which the original topic raised is extended by the addition of new, related T-Units (Ibid.: 35). We might thus expect that an initial attempt to broker difference (which would be a T-Unit) would be followed up by some sort of supportive or disruptive moves (which would also be T-Units and hence part of a chain). The topical chains are similar to the flow and management of information through networks of participating worlds as described in studies in science and technology (Callon, 1996; Star and Griesemer, 1989).

The analysis of discourse presented has much in common with James Gee's (1999: 17) idea of (capitalised) big Discourse. In big Discourse, language is used as a social tool to represent community positions (Gee specifically points to languages of communities of practice as Discourse) but also acts in dynamic ways as a vehicle for change and reflection. Language here can sometimes be about the orientation of speakers to one another (for example during processes of brokering in this research), and where this is successful, the generation or co-construction of new meanings (Edwards and Potter, 2001).

Big Discourse is about representing one's community's ways of doing and thinking to others as statements of authority, obligation, truth or power. Analysis using the concept of big Discourse has common cause with rhetorical interaction analysis in which actors interact dialogically with one another, presenting and negotiating certain stances on the status of their community's knowledge (Lemke, 1998). Klein (1996: 67-68), working in the field of interdiscplinarity, cites the use of rhetorical devices as 'constructing reality' at the boundaries between different disciplines.

In my own analysis, within the context of Work/academic interactions within specific structures, the advisory committees, the notion of big Discourse/rhetorical analysis must be extended. The tools to do this are the boundary devices from Chapter 4 which specify the types of moves which actors from different communities engage in as they establish their positions and embark on the negotiation of difference. Thus in the coding of discourse I focused on units of meaning related to boundary-crossing activity, as was described in Chapter 4.

It was important to know the sequence of T-units put forward and from which community they came in order to identify where boundary crossing originated and how it developed over time; hence the units of language were arranged according to their order of natural occurrence. Secondly, I needed to know what the actors were attempting by putting forward a T-unit within the context of the meeting at that point. I could, for example, have interpreted a particular utterance as criticising or supporting another through using certain areas of content. This interpretation helped me to decide on a coding for the T-unit. The coding was a descriptor of the sort of boundary-crossing (or not) event occurring. The advantage of such detailed organisation and coding of the text was that I was able to recursively examine in initial interpretations and coding in order to refine them.

Thus the interactions observed were arranged in three columns following the discourse analysis approach of Geisler (2004), as shown below. The first column represents the actual text or reportage, the next column an interpretation of what the

actors seemed to be doing and the third a coding item derived from the conceptual framework of boundary devices in Chapter 4. No names were used in the transcripts. The participants were anonymised as Work or academic numbers 1, 2, 3 *(Wk.*1, 2 etc and *Ac* 1, 2 etc.). Where actual reportage in the text was summarised rather than fully reported on it is shown in square brackets []. Dots … showed where the text was indistinct. Where the actual reportage in the text was unclear I included explanation in round brackets () to enhance the flow of meaning for the reader.

Speaker and Text	Interpretation	Coding (boundary devices)
T-unit from work representative number 3.	The speaker is telling academics about important work they do.	Work reification.

One method to promote reliability in such analyses is to interview those researched about their overall perceptions of meetings observed and whether or not they agree with the way the researcher highlights and codes sections of discourse. To this end I interviewed members of the advisory committee involved in discussions in the transcripts analysed. This was both to check if my understanding of meetings would hold up under external scrutiny and, in a more detailed way, whether or not my coding of the flow of ideas made sense to the participants.

5.3.4 Advisory Committee interviews

Interviews were conducted and analysed subsequent to the meetings with one senior representative from Work and the academy in each advisory committee. They lasted for approximately 1 ½ hours each giving a total of approximately 11 hours of interview transcripts. I firstly wanted to get a sense of whether my categorisation of meetings as successful or unsuccessful bore any relationship to the perceptions of the members interviewed about the advisory committee in general.

My second purpose was to get feedback on my interpretations and coding of the meeting transcripts. I thus presented the most recent coded transcripts to both the academic and Work representative for comment in the interview. Presenting one's research methods and findings to the research subjects can, however, be problematic

in that they struggle to understand what it is you are trying to do. In four out of six of the interviews I was able to show the subjects what they had actually said and my coding of this (in the others the interviewees had not themselves been part of interchanges I analysed).

Each interviewee was asked the following questions:

- What was their involvement and history with the committee?
- How did they understand their role in the committee?
- What factors enhanced or hindered the successful running of the committee?
- What were their views on how the segments of the meetings had been analysed by myself?

One example of a full interview is given in Appendix 2. Table 3 shows the schedule of interviews.

Department	**Role in advisory committee**	**Position at Work**	**Interview date and place**
Medical technology.	1. Chairperson.	Manager, provincial blood transfusion services.	04/10/05. Health faculty.
	2. Academic co-ordinator.	Senior lecturer, medical technology.	21/10/05. Health faculty.
Civil engineering.	3. Senior Long term Work representative.	Cape Provincial Training Department with focus on civil engineering.	21/10/05. Provincial offices, Cape Town.
	4. Chairperson.	HoD civil engineering Bellville Campus.	28/10/05. Engineering faculty.
Analytical chemistry.	5. Chairperson.	Laboratory manager, ore analysis, Namaqua Sands.	29/09/05 Saldhana Bay.
	6. Academic co-ordinator.	Senior lecturer in chemistry at CPUT.	01/11/05. Science faculty.

Table 3: Advisory Committee interviews

5.3.5 The role of the observer

The role of the researcher as participant is commonplace, indeed central, to some research perspectives, for example in action research. There are different forms of action research, but they all have, within the critical theory paradigm, some element of social research which is at the same time linked to reform. The critical action research approach as espoused by Kemmis (1991) is as much about finding out what participants are doing as it is about guiding them towards their own emancipation. Such researcher participation is problematic, however, where the researcher is attempting to understand naturalistic settings in order to describe and analyse patterns, rather than to steer events in a particular direction. This remains a weakness in the participant observation carried out here where the researcher was mostly known as a curriculum expert. Attention will be paid to this issue in Chapter 8.

My role in the meetings was as an observer. Before participating in the advisory committees I requested permission to attend and tape the proceedings from the academic Head of department and the committee chair (sometimes these were the same). At the start of the meeting the chair explained my role as a doctoral researcher; on occasion I was asked to describe the aims of the research. I was also asked by the chair of the committee I subsequently categorised as unsuccessful to report back on my research[6]. I also asked permission from the participants in each meeting to tape record the proceedings (this was never refused).

My role was sometimes ambiguous, as all the HoD's knew me as someone involved with policy implementation and staff development. In at least three of the meetings I was asked to say something about what had happened to the new academic policy and related to this, whether or not the institutions were allowed to offer degrees. Furthermore, I was twice asked to clarify the new merged institutions'[7] stance on assessment. On one occasion only I deliberately intervened in an analytical chemistry meeting where I felt they were following an inappropriate approach to curriculum design. I suggested that rather than attempting to add on extra bits to the curriculum in response to Work needs, they should attempt to develop more integrated offerings.

[6] This was done with the biomedical technology advisory committee in December 2006.
[7] From 2005 onwards, my own institution Peninsula Technikon, began merging with the Cape Technikon.

Staff agreed this was a good idea and subsequently the productive, circulating idea of recurriculation was raised.

Since the focus was on boundary-crossing activity between the participants these subsequent events may still be examined even if they were occasioned by the researchers' interventions. Another issue is that the Work representatives may identify the researcher as a member of the academic community rather than as a more neutral individual. There is anecdotal evidence to support this from the interview with the unsuccessful advisory meeting Work chair in Chapter 7, Section 7.3. At one point in the interview, in response to his demonstration of often irreconcilable differences between Work and the academics, I described boundary-crossing laboratories which deal with just such situations (this was not included in the summary as it was not relevant to the success of the meetings). I then suggested that this was something I would like to try with the advisory committee, with myself as the neutral facilitator. His response was that Work representatives would respond to me as an academic linked to the department and not as an independent person.

5.4 Limitations of the research

Overall my research design was restricted to hybrid forums identified in Work/academic interactions. As such, much of the work concerned with academic/Work interfaces, such as the role of experiential learning and the entry of graduates into workplaces, was dealt with superficially, if at all.

The study was predominantly within the social constructivist framework the structural constraints in the form of different discourses of Work and academic knowledge and different disciplinary classifications (Cf. Becher and Trowler, 2001) were not ignored. A more structuralist research approach, in the tradition of Bernstein, to examining how Work knowledge becomes academic may have revealed different insights.

Overall, the study deals with interactions at different levels. Inevitably issues and questions arose that were worthy of exploration but which were beyond the scope of the study. Questions of power and control were not highlighted in terms of how they might influence interactions. The focus of the thesis was more on the flow and

circulation of knowledge within levels, and at what points and why successful boundary-crossing processes occurred. These often did involve relative positions of power but these tended not to be fixed, but changeable and emergent in interactions (Cf. Further research and reflection in Chapter 8).

Power was alluded to in terms of symbolic policy development, recontextualisation principles and issues around enrolment. In symbolic policy development actors, who may be initially concerned with what needs to be done educationally, become enrolled by powerful political actors to rather create a strong break with the past. Recontextualisation principles are a form of power when used by academic institutions and their disciplines to justify repositioning outside knowledge into an academic format. Enrolment is a subtle from of power. It involves one group of actors convincing others that it is in their own interests (and even sometimes necessary for their further development) to agree to a particular argument put forward.

Related to power relations are the identities and relative positions of the actors involved. In a sense these identities were black-boxed and subsumed under the heading of belonging to one or other community. More work could be done on the relative strengths of communities and the relative internal power wielded by, for example, different academic communities (see for example Kogan, 2005). Some Work communities may be more fractured than others, with individuals being in competition with one another. The inseparability critique of communities of practice and situated learning (Contu and Wilmott, 2003) could also be examined here and the following questions posed: Are some communities more cohesive than others and how does this come about? Are disparate voices within communities, which may in fact serve to enhance bridging, sometimes excluded?

There are more levels of potential difference between national policy and curriculum units and departments than was discussed in this thesis; for example there are the intermediate levels of provincial and institutional policy. There may also be disruptions and productivity/absorption in these interactions.

5.5 Some general considerations concerning case study research and issues of reliability and validity.

5.5.1 Case study research

The uses and limitations of case study research have been discussed extensively in the literature (Cohen et al., 2004; Tight, 2003; Yin, 2003; Hammersley and Gomm, 2000; Nisbet and Watts,1984). In this thesis cases are used to illustrate certain trends of boundary crossing in hybrid forums, rather than being examined for all the processes which are occurring. Even so there is alignment between aspects of more normative case study research and the research methods used in this thesis.

Case studies in social research can be loosely defined as events whose location, organizational constraints and the characteristics of participating individuals and communities set them apart from other events. It is easier to say what case study research is not – it is not laboratory experimental or broad survey research – rather than what it is. Nearly all qualitative research methods could be viewed as a form of case study in that the researcher is dealing with selected units rather than the whole of society (Tight, 2003; Hammersley and Gomm, 2000).

Case studies can be used to ascertain whether or not a known variable has predictive value through the examination of a number of case studies in which the given variable is constant. Outcomes of the examination would be expected to be similar following what Yin (1994: 45) refers to as literal replication. In addition, case studies can be sought in which the given variable is significantly different and thus different outcomes may be expected, this is referred to as theoretical replication. Yin (Ibid.) refers to this form of case study research as multiple-case design.

I used a form of multiple-case design methodology to examine my responsive curriculum units in Chapter 6 as I was probing whether disciplinary field is likely to affect the outcomes of these units. There is an issue of generalisation, but I have not used a single case-study (N = 1) approach. The point made by Yin (1994) about analytical generalisation remains important however: by characterizing the cases in

theoretical terms, in particular the nature of the different knowledge structures involved, generalisation is possible with reference to the theory, even if there are only a few cases.

Cohen at al (2000: 181ff) advocate the use of case study research as it is possible to examine the complex dynamics and unfolding interactions, often in the form of chronologies and causes and effects, of a whole event. Furthermore cases can be brought closer to the reader's world through providing them with a richly contextualised description, enabling the reader to transfer patterns observed to their own world (Nisbet and Watts, 1984).

In Chapter 7 I examined face-to-face interactions between representatives from Work and those from the academy as they negotiated how to go about responsive curriculum design. In giving detailed analysis of the processes within these hybrid forums I attempted to show some chronological development and causation within 'richly contextualised descriptions'. There was, of course, more going on here than the focused information recorded but this information was not noted.

5.5.2 Some general methodological issues concerning reliability and validity

In observing, analysing and constructing an argument about Work/academic interactions in face-to-face interactions, issues of reliability arose. How, for example, will the reader be assured that I have not simply followed my own biases, or that events which did not support my line of argument will not be conveniently ignored (Nisbet and Watts, 1984)? Issues of reliability were dealt with in two ways. Firstly, as full a description of events as possible was given in the text so readers can also draw their own conclusions, and I also provided at least one full transcript of observed interactions in Appendix 2. Secondly, I invited those researched to comment on the analyses I had done and the conclusions I had drawn, and to point out where their understandings differed from mine.

There were also issues of validity in the research where the question can be asked as to whether the research design and tools of analysis were appropriate to the objects to be examined and to the information derived from the research. I have already indicated the alignment between methods of gathering and organising data, my overall

theoretical position and the nature of the outcomes I wished to show. Then there is the point that I imported constructs that are already used to better understand cross-community interactions, as well as my own constructs, from Chapter 4; for example, boundary objects from Star and Griesemer. This is a measure of construct validity. In addition there were measures concerned with theorising the nature of cross community interactions as a series of interconnected hybrid forums, as was done in Chapters 1, 3 and 4 and again in this Chapter, which speak to the internal validity of the research.

Issues of external validity or generalisation are best taken up after the research has been conducted and thus are dealt with in the conclusions in Chapter 8. Suffice it to say at this point that I intend making something like a 'working hypothesis' for productive interactions rather than universal generalisations.

Ethics

Since I would be observing and recording participants in natural settings there is an issue of ethics. In order that participants would not feel that what they have to say in a closed setting is to be made public against their will, I firstly asked permission to tape and transcribe and later use information for my research. Participants may also have felt that they had been wrongly interpreted in the meetings so I ensured that at least some of them had an opportunity to comment on my analysis. Such a process also enhanced the reliability of the analysis. Then there are issues of respondents sometimes being very frank and critical of their peers and superiors, as happened in interviews with chairs of advisory committee meetings in Chapter 7, which might be harmful to their future working relationships. Where I believed this may have been the case, I explained the problem and asked if the respondent wanted that section removed; if not, I requested written permission to use that section of the transcript. Lastly, I maintained the anonymity of the participants through using pseudonyms.

Chapter 6: Developing Work-responsive curriculum units at the Meso-level

6.1 Introduction

This Chapter examines the role of initial difference between Work and academic knowledge in the construction of Work-responsive sections of curriculum. The Chapter can be read as an inquiry into the degree to which difference may act in the promotion of productive interaction, as illustrated in the Nooteboom-inspired diagram in Chapter 4, in which there is always a trade-off between difference and productivity. The chapter also goes further than this in that some complexities concerning productive interactions are raised.

There are a number of considerations which play a part in the movement and integration of Work into higher education. There is firstly the situation we begin with in any form of interaction which is that Work and academic knowledge are different. Knowledge at Work and in the academy is different in terms of its structure, how it is traditionally learnt, what it is learnt for and how it is put into action in different contexts. Context gives specialisation of meaning and local cohesion to knowledge (Young, 2003b; van Oers, 1998a). Meaning and cohesion would change, or at least be disrupted, as knowledge moves across the two contexts. Then there is the difference in relative prestige and positioning of knowledge traditionally learnt in the academy and that imported from outside with a more vocational flavour. Higher education tends to privilege learning, teaching and research within subject knowledge in academic settings over practice outside of the institution. Even within vocationally orientated institutions and programmes, Work practice is also frequently partitioned off from academic practices in the form of discrete, experiential events.

The second cluster of considerations are the processes which ensue as actors from the one community engage with knowledge from the other. Differences may be raised and noted and boundary activities mobilised to facilitate knowledge movement, transformation and integration.

The third cluster involves the nature of the outcomes arising from knowledge integration and how *productive* these were. The holy grail of Work integration into the curriculum is where engagement between Work and academic knowledge is strong and the resultant curriculum unit engages with and develops some related aspect of knowledge from both communities as actors collaboratively design a new, hybrid object. Such an outcome, in my terms, is productive.

Productive curriculum outcomes can be viewed in two ways. Firstly, there is the collaboratively developed knowledge object consisting of content from each of the previous content bases hybridised in novel ways. Then there is productivity in terms of how the novel hybrid is to be acquired by students. Does acquisition follow a path determined by how things are normally done within the relevant university discipline or does it follow a workplace logic? In this chapter, in order to answer my question about hybrid objects, the focus is on productivity of *curriculum objects* rather than on their acquisition.

6.2 Analytical approach

The responsive hybrid cases in Chapter 5 were deliberately selected in order to show variance in the relationship between Work and academic knowledge. Two extremes of strong academic dominance and strong Work dominance can be immediately identified in the form of the university's general science and humanities programmes and the extreme forms of Work-based learning where the curriculum is constructed within the workplace. Then there are a number of in-between hybrids where the dominance is not so clear without further, detailed analysis being done.

The hybrid cases can be used to address the question as to whether variation observed between the cases is related to the concept of difference between Work and academic knowledge. If productivity is related to initial difference, as was proposed in Chapter 4, then we would expect that the most productive and developmental hybrid case studies would be found at optimal levels of difference, whereas very large or very small differences would be less productive. Thus three types of cases can be distinguished in terms of expectation of productivity and its relationship to difference.

Type 1 hybrid unit: Difference between Work and academic knowledge is strong and interactions are poorly developed (one-sided) – low productivity *Type 2 hybrid unit:* Difference between Work and academic knowledge is moderate and interactions are relatively well developed – potential for moderate to good productivity *Type 3 hybrid unit*: Difference between Work and academic knowledge low and interactions are poorly developed (one-sided) – low productivity

Table 1: Case types related to expectations of productivity and difference

As was done in Chapter 4, Section 4.2, we can define productivity in terms of the extent to which new, collaborative knowledge formations arise within this intermediate space through the collaborative actions of the actors involved.
The situation is relatively simple in types 1 and 3 in which productivity is blocked, or a great deal of effort is required to produce it (this situation may, however, change over time). Productivity, we would expect, is more likely to occur with type 2 but processes leading to it will still require effort from the actors involved.

Knowledge differences

Can general differences between Work and academic knowledge be ascribed to the nature of the relevant knowledge fields? Were some fields of academic knowledge more amenable to interaction and hybridisation with Work than others? Based on the discussion in Chapter 3 there are good reason to expect this to be the case. Categorisations of different knowledge types are used as a tool to arrange the cases in a way in which we can understand something of what happens in Work integration, and certain expectations about productivity can be made. Then whatever else needs to be considered in understanding the cases can be addressed.

I will use Becher and Trowler's (2001: 36) widely referred to categorisation of academic fields as soft/hard and pure/applied. In using this classification I am acknowledging that structures pre-exist the actions of actors on them.

The academic fields characterised as soft-applied (environmental and geographical science and business studies) tend to be influenced by outside professional knowledge and professional bodies (Becher and Trowler, 2001: 179), and hence would be expected to already reflect some current Work practices. The nature of such influences, according to Barnett (2004) would be two-fold. Firstly these would be regional knowledges characterised by being made up of professionally relevant sections of traditional subjects. Secondly there would be pedagogic recontextualisation of the regions as well as of more situated knowledge peculiar to professional practice. The difference between what happens at Work and what happens in the academy is likely to be relatively small as compared to the other categories. In addition they might be expected to more easily hybridise with Work knowledge in that they are, according to Bernstein's (2000) theorisations, weakly classified and hence more open to interactions and combinations with other weakly classified fields, both inside and outside the institution. Here we can expect relative ease of combination between Work and academic knowledge. But, because of their relative closeness, there may be limited disturbance. So while collaborative work may be easy there will be little introduction of something new (Cf. definition of productivity).

Academic knowledge fields classified as hard-applied such as clinical medicine and engineering would also be open to outside, professional influences (Barnett, 2004; Becher and Trowler, 2001: 185), in a similar fashion to soft-applied fields. But a certain distance from the outside is maintained by the tendency of engineering and clinical fields to academic drift (Becher and Trowler, 2001, 177). By this I mean that these fields develop along subject lines within academic discourse and move progressively away from the practices they originated from. In addition, many of the hard-applied subjects already consist predominantly of technical-scientific subject matter with a long history of classification and framing (one could think here of mathematics in engineering and physiology and anatomy in clinical medicine). These fields would tend, however, to be less strongly classified as compared to 'hard-pure' fields. Hard-applied academic fields could be expected to exhibit more pronounced difference with Work practices than soft-applied subjects. This moderate degree of difference might be expected to open up the possibility for the production of new knowledge in hybrid spaces.

Soft-pure arts and humanities and hard-pure science disciplines, in Bernstein's (2000) terms, are pedagogic recontextualisations of cognate academic research fields; they do not include reclassificatory recontextualisation of the academic field to a more vocational one, or the pedagogic recontextualisation of more situated work knowledge (Barnett, 2000: 147). They are also formative in that they do not directly prepare learners for Work and thus do not have obvious Work counterparts. The Work/academic difference is likely to be large. We would expect that a high degree of difference may limit the development of hybrid objects and that such objects may not be classified as very productive.

Returning to the expectations raised about difference and productivity, and to the proposed nature of disciplines and hence their relative difference from Work as set out by Becher and Trowler, we can position the various academic disciplines from each case study onto the productivity graph in Figure 1. The position of each discipline reflects its relative difference from its Work knowledge counterpart and hence predicts how productive the hybrid object of that discipline and Work will be.

Academic business and environmental studies are assumed to be relatively close to Work and thus would be expected to lie somewhere between the zone of low and potential productivity, at positions 5 – 8 on Figure 1. Difference between Work and the academy would be relatively low, mutual understanding high and overall productivity low. We would expect pure sciences and pure arts subjects to be strongly different from Work counterparts (if there are indeed any counterparts for disciplines such as philosophy) and hence occupying a position towards the zone of rejection at positions 1 and 2 on Figure 1. Again, we would expect hybrid objects with relatively low productivity. The hard-applied disciplines would then tend to occupy the optimal trade-off position relative to their Work counterparts, somewhere close to the zone of potential productivity (3 and 4).

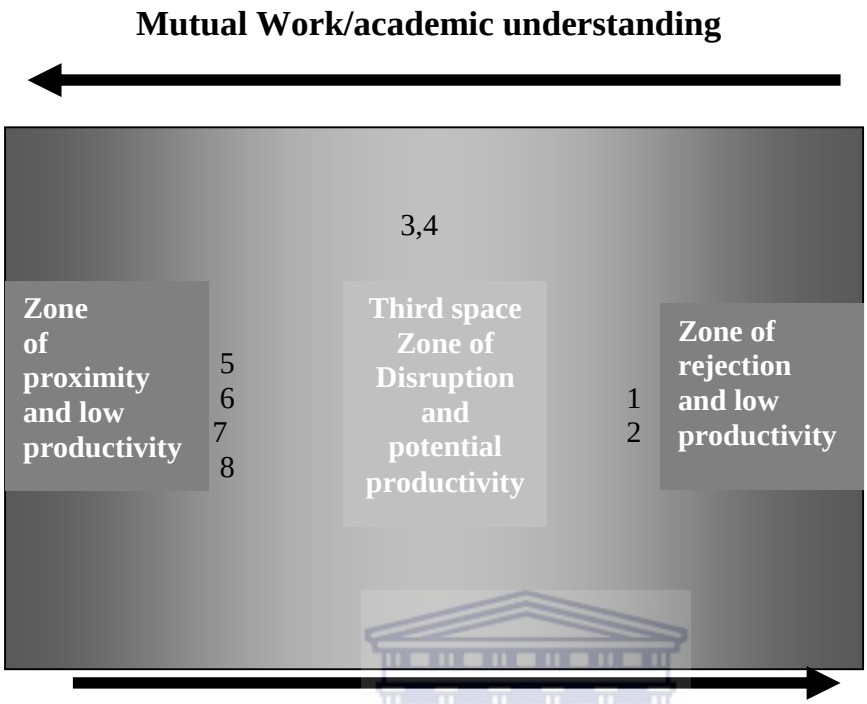


Figure 1: Expected productivity of the cases

The analysis of a departmental community as an activity system of which epistemology is only one part creates space for actor strategies to play a role in the relative productivity of the interactions. Then, there are also the interactions between communities in hybrid forums. Firstly, the nature of the forums matter in that they need to be sufficiently representative to bring variation between Work and the academy to the fore. Secondly, there need to be processes invoked and work done to bridge these differences and to produce new, hybrid products.

Thus there are further expectations as to the extent of hybridity that will arise based on the trade-off between difference and mutual understanding. Do all of these predictions make any sense when we now examine in detail the individual hybrid curriculum objects emerging from the interactions between the different disciplines and Work?

6.3 Empirical analysis of the hybrid cases

In order to answer my research question about the role of difference in the construction of hybrid curricula, I need to identify patterns across the case studies related to processes and hybrid formations and the nature of these formations themselves. The processes and products around the formation of hybrid objects which emerged in the cases are italicised in the following text to aid the reader's own analysis.

6.3.1 Cases 1 and 2: The introduction of programmes in humanities and sciences at a South African University

Information here is drawn from another doctoral research project in South Africa and an interview with the author (Moore, 2003). Policy directives within the White Paper on Higher Education (Department of Education, 1997) and subsequent policy documents provided the *force* for the conversion of more esoteric disciplinary offerings, particularly the arts and social science curricula, into more interdisciplinary formats which were partially projective in that they orientated themselves to the workplace. Although broadly responsive to government policy the development of programmes may have more complex roots. Moore (2003) describes how internal pressures may also have been the driver of a more interdisciplinary, programme-based approach. These internal pressures result from an already developed understanding of cross-subject epistemological and other linkages (Moore, 2003), or senior staff being members acting on the South African Qualifications Authority (SAQA) or standards generating committees, or from a perceived need to curb the power of disciplinary 'silos' which management may see as resistant to, or critical of, internal change; by the incorporation of departments into programmes the locus of control becomes more diffuse than is the case with discipline-specific leaders.

Two cases from different knowledge domains are drawn from a single South African university, University A (Moore, 2003).

Case 1: University A arts and humanities

A reading of the policy documents by a senior academic, as well as the perceived drifting apart of related academic subjects into silos, resulted in a guiding document

for integrated curriculum design in the faculty. The logic of integration is one of creating coherence through drawing on commonalities in a very generic sense across the subjects. Each subject then accentuates the teaching of, for example, the epistemological and ontological bases of the subject, its typical research and problem solving approaches, and so on. These are academic-style principles of coherence and not related in any clear way to vocational needs or market forces. This is because the academics generally see themselves as developing students formatively not vocationally

Some academics see this in a positive light as it helps make clear to students what it is they are supposed to learn (and how) and hence functions to better guide non-traditional students in their learning. For others it is a threat to their autonomy and is possibly a pre-cursor to job losses.

The *hybrid forum* for the design of the new, interdisciplinary programme consisted of expert representatives from each of the disciplines in the form of a unified central planning committee. The *hybrid object* consisted of redesigned disciplinary offerings which were 'integrated' according to common structuring principles (Ibid.: 125). The concept of Work responsiveness was much reduced to the form of an integrated programme. Integration, it was expected, would more readily relate to real life experience where problems are not sectioned into subjects and, as such, integration could be seen as a (very) weak attempt at simulating the outside inside the university. Academic knowledge was thus afforded a high *status* and what little there was from Work was strongly academically recontextualised. The programmes were *asymmetrical* in favour of the academy. The new, responsive programmes were more orientated to strengthening the existing disciplines and maintaining their separation with as little disruption as possible to the disciplinary order. There was very little by way of *productivity* or even integration across disciplines.

Case 2: University A science and engineering

Again at university A, but this time in the science and engineering faculties, members of mathematics, applied mathematics, physics and computer sciences were influenced by the *opportunities provided by the new educational dispensation* to develop a new interdisciplinary programme called 'physical and mathematical analysis'. In addition, these academics had already been working co-operatively in industrial research

projects and thus already possessed a combinatory logic based on epistemological linkages between their subjects. The objective of the 'interdisciplinary' project was to engender in students an advanced overall mathematical literacy as well as more employability-orientated generic skills such as 'independent thinking'. The design logic is one of the separate disciplines being taught together. The tendency was to offer modules in one or other subject to students in other disciplines so that they could get a 'feel' for how things were done in other subjects and there was not in fact much integration at all. Academic knowledge was afforded a high *status* with Work being hardly represented at all, even though in the early developmental stages Work representatives were consulted and the course appeared to be looking outwards. But this was not writ large and the 'integrated course' tended to focus more on research graduate development than any form of Work preparation. As with the humanities example, Work has had very little influence on the course design and was academically *recontextualised* in much reduced form. The *hybrid object*, the integrated course, consisted of largely unchanged sections from the original subjects which were simply re-ordered with their inherent academic logic, sequencing and pacing. The object was neither 'real' in terms of the outside world nor much of an attempt to *simulate* this world and was again a strongly *asymmetric* object. *Productivity* was thus low according to my definition of productivity.

The *hybrid forum* consisted of disciplinary experts and limited representation from relevant industries. Although there were assertions that the course had both an introjective (based on aligning disciplines) and projective (to Work*)* role industrial input was minimal and the course was more designed around the disciplines with no clear idea of how students would be able to use it outside of the institution (Ibid.: 197).

6.3.2 Case 3. Integrated tasks in engineering

Information here is drawn from the researchers observation and engagement with engineering lecturers involved in designing integrated tasks. In South African University of Technology engineering departments subjects are traditionally taught and assessed separately and together constitute an undergraduate engineering programme. The head of department and some lecturers felt that integrated tasks which cut across subject boundaries would better prepare students to use subject

knowledge in the workplace, as well as enhance more meaningful learning. It was also seen as a response to policy directives on integration and to assess holistic outcomes rather than subjects; these were the *forces* impelling the department towards developing the tasks. The integrated task:

- Simulates complex occupational roles
- Cuts across discipline boundaries by including the critical cross field outcomes (these are like the key skills in the UK and Australia) and sections of other subjects

The integrated task which constitutes the *hybrid object* was at the level of a project or assignment typically given after a significant block of teaching. The *hybrid design forum* consisted of lecturers from different disciplines who would import perceived Work-related problems into the academy in order to design the integrated task. In writing criteria, lecturers had to explicitly state what counted as knowledge in both the discipline and in the workplace. And where they were talking about the workplace they had to work co-operatively as no one subject could cover a workplace problem. The criteria were co-operatively planned in workshops, then graded. In this sense the task was a new space for integrated knowledge development and thus *partly productive*.

The first problem to arise was the difficulty in creating a project which met the skills and content bases of the different subjects. Lecturers had difficulty in using a Work example which could do this so tended to recreate Work problems in a more academic format. For instance ‘ways of solving problems in the mechanical engineering workplace’ became an academic project on the design of a steam plant, something students would be unlikely to do in real life, but which successfully encapsulated different subject matter and a decontextualised version of ‘thinking’ like an engineer; for example, the steam plant showed students how the parts of a system relate and make up the whole system. Actually what happens in workplaces was strongly transformed by the academics before being articulated with subject knowledge to create a *simulation.* To an extent, therefore, academic subject knowledge was given higher *status* than Work knowledge.

Different tasks, though, developed different skills and responses from students. Where the tasks involved complex negotiations with peers, time management, creativity and interactions beyond the institution, some students saw themselves as beginning to think like engineers, and to gain valuable experiences in the institution which could be transferred beyond it (Breslow et al., 2005). Some of these students were those who had already been in the workplace so there is some authenticity to this observation thus enhancing the task's *productive status*.

The second problem that arose was that boundary crossing between subjects was not easy. The result of transgression across subject boundaries was seen as potentially resulting in a contentless object which has little importance in the field of engineering training, as is illustrated in this transcript excerpt recorded by the researcher in 2006:

> 'I just get a sense you are going to get a watered down, um, practical, um, project, that is going to end up being a communications exercise which might as well be assessed by the communications lecturer.'

In addition there was concern about the relative amounts of different subjects in the task, and whether the task was including sufficient amounts of the prescribed content. There seemed to be a difficulty with recognizing that the object, the problem or task at hand, demands the reconfiguration of the subjects in new ways so that they form a new whole around the integrated task.

The dominant discourse in operation was that of the organisation and content of individual subject knowledge. The steps involved in this recontextualisation are, firstly, to define an organising principle which involves as much of the engineering subject knowledge as possible. Traditionally, this has been some aspect of design. The next stage was to decide on what artefact, situation or process in the workplace will provide a focal point around which to organise the subjects. Because it has to involve a range of academic subjects and have distinct sequential and assessable stages it has to be Work which is pedagogically *recontextualised* according to these principles. There is some change to the academic subjects too; they are brought together in a new way around the Work topic; previously unnoticed similarities or differences between

subjects may now be made more evident but the overall effect on subject teaching and hence productivity in this direction is limited. We have a new academic product here, an integrated project, which we can describe as a hybrid between Work and academic subjects. But it is a skewed hybrid in favour of the academic; it is an *asymmetrical* product. Work, through its recontextualisation, has been tamed or as Boud and Solomon (2001) put it 'subjectified' such that it has largely lost its original meaning in the Work context and the overall framing is predominantly determined by academic structures.

6.3.3 Case 4. A South African Medical School problem-based learning initiative

Information here is gleaned from two interviews with two staff members involved with developing the problem-based learning curriculum at the university, and written data on the project and PBL in general. The example described is drawn from a university, university B, and deals with the first two years of medical study. Students are traditionally taught through lectures in the form of separate science subjects rather than being more integrated and practically orientated. Problem-based learning (PBL) as an approach to professional learning has been circulating in higher education for at least the last three decades, and has been particularly dominant in medical schools (Albanese and Mithell, 1993; Mackinnon, 1999). Common to all forms of PBL are real life or simulated problems that require groups of students to mobilise and integrate theoretical knowledge in order to reach some form of solution. In this way students learn the sort of knowledge needed for medical practice in a meaningful way (Charlin, 1998).

The move to PBL in South Africa was driven by two main *forces*. Firstly, there was the rapid development of medical sciences; young doctors would need skills to learn on the job. Secondly, there was the need in South Africa to understand clinical practice more holistically, both in terms of psycho-social factors and networks of related diseases. Medical educationalists proposed PBL as a vehicle for sharpening students' learning abilities and understanding medicine more holistically. In addition, PBL would develop the key generic learning skills outlined in higher education policy.

The course is outcomes-based and the outcomes are derived from traditional medical training knowledge and more holistic, often primary health-based, scenarios on the ground. Students work in PBL teams with a single academic from one of the medical fields as their PBL tutor. A team of developers involving medical scientists from the various traditional disciplines, community health practitioners and/or practising doctors, amongst others, then design problem situations which attempt to capture as much of the knowledge represented in the outcomes as possible. In some cases the practitioners would say 'no, this aspect of science is not necessary', an example of Barnett's (2004: 147) 'reclassificatory recontextualisation'. Medical scientists, lecturers and practitioners constitute the *hybrid forum* and the *hybrid object* is a problem-based scenario.

However, using real scenarios has not been as successful as was expected and the tendency has been towards orientating the scenarios to *simulations* which integrate and teach the scientific principles of the subject knowledges, at least in the early years. To an extent, then, Work knowledge has been subsumed into academic knowledge but it has also changed this academic knowledge. There has, firstly, been a reduction in overall scientific content. Secondly, the orientation of subject knowledge taught in the lecture theatre has changed, or been *reclassified*, such that it is both limited by and directed to the hybrid object of the problem situation (there is also an element of Work framing here). Work knowledge has partially challenged and changed academic knowledge and, along with the development of the problem situations as opposed to subject teaching, this is a *moderately productive* enterprise.

In later years students are exposed to more real clinical situations. Difficulties have arisen with the assessment of PBL tasks as students are required to use quite detailed medical science knowledge. The academic tutors, who are specialised in a particular field, do not feel themselves competent to make assessment judgements on specialist knowledge in other fields at this level. *Higher status academic knowledge* is dominant to integrated knowledge based on real/simulated problem scenarios.

6.3.4 Case 5. The Finnish polytechnic example

The information in this section derives from a journal article. The Finnish Polytechnic example (Miettinen and Peisa, 2002) involves third year students in a technology and

a business department working co-operatively with one another in partnership with a truck cab industrial firm. The focus of the students, even though some are training as engineers, is on how the truck cab business is run. The purpose here is to engage students in more real Work scenarios rather than in often clearly (to the students) contrived simulations. The task involves learners in moving from simulation with no consequences to consequential, creative, exploratory work in the zone of development beyond that actually practiced by both the firm and the institution. In so doing both workplace and academic theoretical knowledge would be developed. The '*force'* for the project derives from academic staff's dissatisfaction with both imaginary academic simulation (students tend to 'see' through this) and pure Work problems which staff see as too limited as they essentially recycle workplace knowledge without much in the way of new insights.

Students are divided into four groups within the institution, each group representing the different functions of the truck cab firm (production, finance, logistics and accounting). Each group is asked to step outside the institution and do in-depth research and analysis of one function of the firm. This involves limited experiential work, observations in the firm, interviews with the firm's members and reading up on the firm so that they really come to know that part of the firm. The *hybrid forum* thus involves students, academic tutors and Work representatives. Once they really know how one of the functions of the firm works, they are asked to identify dilemmas or issues which arose.

The next step for students is to ask the question - 'if this is what the firm is currently doing, and this is the issue that is arising, how can they extend their current practices to deal with it?' In identifying the issue and in suggesting ways in which it may be dealt with, learners are asked to mobilise what they have learnt in the institution in new and innovative ways - new because they have never seen these problems before and innovative because they have to bring their academic and Work knowledge all at once to the problem in order to come up with a creative solution. Much of this work involves interacting with their institutional tutors.

The solutions the groups come up with are not simply theoretical. The students are required to write these up and present them persuasively to the company; they have to

say why they think the company could benefit from such changes. Evidence as to whether or not their ideas are good comes from the type and level of critique coming from the company, thus there is again the involvement of the Work hybrid forum representatives. The *hybrid object* is thus a Work problem about which solutions are sought through mobilising academic knowledge.

The project involves another level of knowledge development. The academic curriculum is interrogated from the point of view of the students' work experiences; students with their tutors are asked to identify gaps and areas to be mutually developed. This is a mirror process of the one in the workplace in which academic knowledge is now transformed. Neither Work nor academic knowledge are given particular *status* and there is mutual *recontextualisation*.

The boundaries of the institution are weakened in that students do their research and present their work outside of the institution. However, much of their work is about applying disciplinary knowledge and working with fellow students and multidisciplinary tutor groupings. This is not so much a *simulation* as a sort of consultancy, but with a strong focus on students using academic resources to augment their problem solving skills (disciplines, tutors and fellow students). The locus of quality and control seemed to be within the academy in that this was predominantly a learning experience, albeit to do with real situation. However, whether or not the company accepts these recommendations was a measure of quality control.

The nature of the project is that new knowledge to deal with a Work issue is mutually constructed from both Work and academic components. Furthermore there is impact on the academic curriculum as it is re-examined in the light of workplace learning. In terms of my definition of productivity this is a *highly productive* Work/academic hybrid knowledge object.

6.3.5 Case 6. Context studies

Information here derives from interviews, a conference paper and materials available on the worldwide web. The context studies are *simulations*, based on real-life events, which have been *recontextualised* into teaching events according to pedagogic principles which attempt to draw out the new Work order competencies. The *forces*

for their development were the Dearing Report as well as more social pressures to enhance graduates' Work abilities (Kneale, 2003 a,b).

The context studies aim to develop in students' knowledge of workplaces, the complexity of workplace problems as well as key skills (such as cross-field collaboration, decision making, innovation and networking). The context materials may be used within academic courses or as separate events, with current usage favouring the latter. The context materials are available on and promoted by the government higher education resource network, the Higher Education Authority.

In designing the context studies (Kneale, 2003a, b) lecturers start with the new Work order competencies they are interested in developing, then scan industries in their area for real Work situations which they believe may develop these competencies. The lecturer then describes the project to the Work representative and suggests how the context study will benefit students coming onto the job market and also how, in some cases, the Work representatives may gain more insight into a Work problem. She then asks a set of open-ended questions which frame the type of problem involved, who developed the solution, how well it worked and reasons for this success.

The cases are then written up by academics but are returned to the industrial source before they are used, to ensure correctness. *The hybrid design forum* thus involves a Work and academic representative. The context materials for use in the classroom are the resultant *hybrid object*. The two examples chosen here were conducted within the academic classroom but sit outside of the mainstream curriculum, though they may serve to satisfy a module requirement when changed into a research essay format. Both examples involve approximately one day of focused group work from students.

The first example of a *hybrid object* is that of a parks ranger/education officer who investigates the needs of schools and develops innovative programmes to draw them into the activities of the park. The focus is on how the ranger uses the available resources of the park and her co-workers to come up with innovative ideas, so called 'intrapreneurial' work. Students are asked to do pre-reading on the 'theory' of intrapreneurship, then to match this to the *simulated* park ranger case study presented. The theory involves the main characteristics of intrapreneurship, which are about

customer focus, planning, experimenting, boundary crossing and the empowerment of cross-hierarchical groups in the business. Students are asked to compare what the park ranger did to other ideas they may have generated. Finally, students attempt to critique what they have studied, and relate it to their own social activities or part-time Work, in this way extending what they have learnt through the hybrid object to their own Work situations.

The second example is clearly focused on *simulating* the advantages and needs of networking in 'green' businesses. Each group of students is given the description of a different small, 'green' company, for example a cardboard collection or a wool industry waste scheme, and has to work out, through discussion with the other groups, the sorts of co-operative projects they could do together (in this case a mixture of cardboard and wool waste produces a good fertilizing mulch). Students share their ideas, critique them and reflect on the idea of networking. As these were real initiatives and real networking occurred, students were asked to compare what they came up with in the simulation to the actual projects undertaken in the real world. Again knowledge learnt is extended to help learners complete skills sections of their CVs.

In context studies the Work issue is reworked around a generic skill, for example 'networking' to produce the hybrid curriculum object. As academic subjects do not figure greatly there is little that can be said about knowledge recontextualisation, except in the most general sense that work knowledge is *recontextualised* in academic workshop format. Such workshops are highly contracted versions of (in this case) real events which are retrospectively analysed in sections, and involve discussion, agreement and presentation to peers. The structure of the workshop is, though, still defined by an interpretation of the actual events as they unfolded so that students follow in the footsteps of the Work practitioners.

6.3.6 Case 7. Competency-based education curriculum units in business studies

Information was derived from three interviews with a total of seven academics from the Hogescholen and samples of course material. The Dutch government has adopted a low key approach to changing higher education. However, higher education practices have been strongly influenced by the UK Dearing Report (1997) and the

European Network for Quality Assurance in Higher Education (ENQA, 2003) (Kok and Benammar, 2003). The government, furthermore, offers incentives to institutions who engage in innovative teaching practices towards furthering student independence and lifelong learning. In general, in the Dutch Hogescholen, there is a focus on professional fields: 'the programme is delivered by personnel who make a connection between study programmes and Work practice in the professional field' (Ibid.:). There is also an inclination towards 'productive knowledge and skills rather than reproductive knowledge', which is a version of learning-to-learn. There are thus strong *forces* for responsiveness.

In this example, drawn from business studies in a Dutch Hogeschool, the guide for curriculum development comes from a set of competencies which all students should strive to obtain during the course of their studies (van Egmond, 2003; Verdaasdonk and Schaeffer, 2003). The competencies consist of a mix of typical generic competencies such as problem solving, communication and information gathering, business field competencies and more specific job related competencies. The generic competencies come from the generally agreed upon new workplace abilities in Europe, and the field and job competencies from interviews with hundreds of small business firms in Holland. The competencies are made increasingly complex for each year of study so there is vertical progression, not in terms of content, but in terms of complexity of competencies to be achieved. The *hybrid forum* thus consists of academics and Work representatives. Students are also involved as the specific type of Work they engage in needs to be taken into account in the design of the curriculum.

These competencies are the same for all students in that field and sub-field. However, different students engage in different types of Work in order to achieve the competencies, So each student has to work with their tutor in designing suitable tasks which, on completion, will indicate that the competencies have been achieved. The tasks, as the enactments of the vertically progressing competencies, would need to themselves become more complex. Students also have to work with their tutor on the credit value of the tasks and competencies so that they can be assessed each year. As the informant put it 'we do not say what sort of learning will occur – the workplace will' (Verdaasdonk and Schaeffer, 2003). Together the competencies, tasks and credits constitute a four year personal development plan or PDP. The negotiated tasks

and the curriculum they make up constitute the *hybrid objects* developed in the hybrid forums.

The academic component in the design of the hybrid curriculum is predominantly the articulation of the generic competencies, their sequencing and assessment with grounded Work experience. *Recontextualisation* is quite strongly of academic knowledge to Work problems, though there is also partial recontextualisation of Work into an academic scenario format.

The actual content of the tasks/*hybrid objects* depends on what sorts of business students intend engaging with over the next four years; these are divided into a first year group entrepreneurial project and individual entrepreneurial work thereafter. On arrival at the institution learners are assigned to a group. Their first month's task is to interact with and work on the given generic and more specific workplace competencies. They have to assess themselves against these competencies, describe what they believe they can do already and what they believe they still need to learn about and what tasks would indicate this learning.

The group now proceeds to work in a room in the academy on a small business enterprise, which constitutes the second *hybrid object*. For example, one group had developed the idea of plastic collar stiffeners which could be stuck onto the inside of shirts and re-used a number of times. They would need to do all the things that a *real* company does (have capital, register, work with a manufacturing partner and dissolve the company) but this would happen in the protected space of the institution with advice from academic and workplace tutors. And, in particular, they would be developing the competencies set out for that year.

The role of the tutor is to help the students design activities which achieve the competencies set out, and to coach the students in achieving them. They collaboratively negotiate how much credit will be given for each competency achieved; together these credits will make up the pass mark for that year. Students are required to write a report on their company and to defend it orally to show how they have achieved the various competencies.

In the following year learners further develop their PDP by designing ways in which they will meet competencies they need to acquire through doing work, and this process drives the production of a third *hybrid object.* One of the ways to do this is to approach businesses and ask how they may help – in this sense the problem is *real rather than simulated* and its successful resolution would enhance the business. One example was in a football club's souvenir shop. The student, a club supporter, offered his services and was asked if he could improve on the issues of stock lists and payment recording. He did this by designing and implementing a bar-code system. As with the second hybrid objects this is real rather than simulated and has a direct effect on Work knowledge.

The students move between an IT room/library in the institution and in the businesses of their choice. They are required to report on their progress with their PDP to the tutor at the institution and times would be arranged to do this. Discussion between the student and tutor would centre around what credit the student should be given for evidence of work done against the competencies. Thus again the knowledge, and how it is to be assessed, which serves as evidence of having achieved the competencies in the PDP, is negotiated between the student and the academic tutor.

Students may decide that they need certain areas of knowledge or skill over and above what they are picking up in the workplace. When this situation arises students can ask for a short course on their desired topic, developed by the tutors in the institution. Thus although subject teaching may occur it is strongly determined and subservient to Work knowledge and is afforded a *lower status.*

This sort of course is characterised by weak boundaries between the institution and the workplace; students move freely between the two, using the institution as a resource to further develop what they are learning in the workplace. The course is highly hybridised. Reflective practices are strongly supported by the requirement that students match their learning, in consultation with their tutors, to the competencies in their PDP. Assessment (including quality assurance), however, seems to be negotiated between the student and the tutor and does not involve the workplace except in terms of their finding what students bring to the workplace useful. Interactions between academics and the workplace occur mostly in the design of the initial competencies.

Thereafter it is mostly the students at Work who interact with the academics about workplace issues, rather than more direct academic/workplace interaction. Though *not productive* according to my definition, a new, responsive curriculum has arisen.

6.3.7 Case 8. Work-based learning initiatives

Information was gathered from two texts on Work-based learning, a keynote address at a lifelong learning conference and an interview with David Boud. Although work-based learning has a fairly long history in Britain and Australia, dating back to the 1970s (Boud and Solomon, 2001) the issue has gained some urgency with late 1990s higher education policy changes, such as the Dearing and West Reports and the need to enhance income streams through taking on mature students. In addition, Boud and others advocate a strong work-based learning model in which the 'only useful learning is that which occurs at Work' (Boud, 2003b). There are thus strong *forces* in favour of this approach.

Some recent advocates of work-based learning (WBL) in Britain and Australia in the form of a university-workplace partnership include Boud and Solomon (2001), Stephenson (2001) and Symes and Macintyre (2000).

According to Boud and Solomon (2001) and Boud (2003a), WBL involves a co-construction of a university level curriculum between workplace managers, the individual who wishes to study and academic representatives in the form of a learning contract. The curriculum is based on the current position, gaps and developmental needs of individuals in the workplace and learning occurs almost exclusively in the workplace. Together with the academic and Work managers, an individual at Work creates a set of desired outcomes and procedures to follow in order to achieve these, for example for managers of small and medium enterprises (Stephenson, 2001). From the university's side, because of the wide range of possible curriculum constructions in different contexts, there are a set of generic 'graduate attributes' which workplace students must achieve.

Assessment is in the form of a portfolio of learning. The curriculum follows the needs of the workplace and aims to contribute to enhancing its organisation in providing 'flexible learning opportunities relevant to future and existing Work' (Reeve & Gallacher, 2003: 386). Boud is at pains to point out that disciplines may have a place

but only where they support the Work project. Compulsory academic modules are more likely to be about how to construct a portfolio or the nature of lifelong learning.

The above WBL is strongly Work-orientated with concomitant strong learner choice as to content and pacing, though this would be directed to some extent by the needs of the Work managers and academic accrediting boards. The university requirements would tend to be generic and of the nature of increasing complexity over time of study, understanding variables and their influences, thinking and reflecting with increasing autonomy, making abstractions and generalisations and transferring knowledge from one issue to another (Stephenson, 2001: 98). *Recontextualisation* of knowledge by the academy is weak and the focus is strongly on Work knowledge which is given a high relative *status*. Though similar to competency-based education in the Dutch Hogescholen the focus is on the development of mature Work professionals rather than school leavers, and the site of study is almost exclusively the workplace. The 'students' and their Work managers have a greater degree of control over the hybrid curriculum than was the case in the Dutch example.

In these examples the *hybrid forums* would be academics, Work managers and the targeted professionals. The process of curriculum development is Work focussed with only relatively minor interventions from the academy in the form of generic needs and the designing of portfolios; there is little academic recontextualisation. The *hybrid objects* consist of identified Work problems and ways to approach solving these which are attuned to broad academic needs and are thus *real* rather than simulated. These objects are expected to have significant impact on the workplace, and we would expect a dominance of Work framing.

Though apparently skewed in favour of Work, WBL does set up a fertile and *productive* hybrid space for the development of new kinds of tertiary courses.

6.4 Discussion and conclusion

6.4.1 Patterns of responsiveness from the cases

The patterns emerging from the empirical research are summarised in Table 2. In all the cases there is a degree of hybridisation and productivity of new knowledge which

is additional to and extends Work and academic knowledge, though not necessarily both to the same extent. As the focus was on interaction, the concept of 'force' leading to the interaction was not explored further. The type of hybrid object (whether it was real or simulated) was included in the column listing recontextualisation and symmetry.

All the cases involved some form of hybrid planning forum which brought representations of Work and academic knowledge into a developmental space. Sometimes this was done indirectly through academic representation of Work, as was the case in programmes and integrated tasks. In other cases, Work representatives were directly involved in the forum. Where learning was Work (as in Work-based and competency-based systems), learners now act as Work representatives, and are also involved in co-designing the curriculum. This inclusion supports the idea that academics in these programmes afford high status to Work knowledge.

The composition of the hybrid forum itself is not predictive of productivity. Even where there are robust and representative hybrid forums in many of the cases, for example in problem-based learning, integrated tasks, context studies and competency-based education, these did not result in particularly productive outcomes.

The nature of the hybrid curriculum objects developed ranged from academically skewed asymmetric forms through symmetric academic/Work forms to Work skewed asymmetric forms and this pattern was related to the status afforded to academic or Work knowledge and productivity.

	Hybrid forum	Symmetry of knowledge within hybrid object (recontextualisation)	Relative Knowledge status	Productivity of object
1, 2: University arts and sciences modules.	Academics only (with limited Work involvement in sciences).	Asymmetrical, strongly academically skewed modules.	Academic high.	Low.
3. Integrated tasks in engin-eering.	Academics only (though academics do take on a Work knowledge role).	Asymmetrical, academically skewed simulated hybrid projects; but Work knowledge is partially afforded.	Academic high but Work is afforded status too.	Low to moderate.
4. Problem-based learning in medicine.	Academics and Work.	More symmetrical hybrid scenarios but tend to academic skewing.	Academic high but Work is afforded status too.	Moderate.
5. Finnish industrial design project.	Academics, students and Work.	Symmetrical hybrid around real Work problems.	Equivalence.	High.
6. British Context studies.	Academics and Work.	Asymmetrical Work skewed hybrid workshop scenarios.	Work is high though some academic knowledge status is afforded.	Low to moderate.
7. Hogeschool competency-based education.	Academics and Work	Asymmetrical, strongly Work skewed knowledge hybrid around real problems.	Work knowledge is high and only little academic knowledge status afforded.	Low.
8. British and Australian work-based learning projects.	Academics and Work.	Asymmetrical, strongly Work skewed knowledge hybrid around real problems.	Work knowledge and only little academic knowledge status afforded.	Low.

Table 2: comparative analysis of the responsive case studies

Certain predictions were made about the effects of difference on productivity in Table 1, through setting out three types of cases. Academic disciplines involved in the cases were assigned to the different types according to their projected relationship with Work. The expectation was that historical differences between different academic disciplines would promote or hinder their ability to respond to Work needs. Where the

disciplines are too distant or too close to Work, then responsiveness would occur but we would not expect it to be very productive. Where difference is moderate it becomes a resource, as previous contextual constraints fall away in the developing intermediate space and we would expect responsiveness to be more productive. The Nooteboom-inspired productivity diagram, with its three zones, can be recognised in the cases, as is shown in Table 3.

Prediction	**Representative case**	**Expected level of productivity**	**Actual Productivity**
Type 1 hybrid unit: Difference between Work and academic knowledge is strong and interactions are poorly developed (one-sided)	Cases 1 and 2: University sciences and humanities.	Low	Low
Type 2 hybrid unit: Difference between Work and academic knowledge is moderate and interactions are relatively well developed	Cases 3 and 4: Integrated tasks in engineering, problem-based learning in medicine	Moderate to high	3 and 4 moderate;
Type 3 hybrid unit: Difference between Work and academic knowledge low and interactions are poorly developed (one-sided)	Cases 5, 6, 7 and 8: Context studies in environmental sciences, the Finnish industrial design project competency-based education in the Hogescholen and Work-based learning in Britain and Holland	Low	**5 is high**; 6 low to moderate, 7 and 8 low

Table 3: Predicted and actual productivity

Case 5, the Finnish business project, needs to be addressed because it does not match the predictions based on the Nooteboom-inspired diagram. Further explanation beyond simply disciplinary type and degree of initial difference for both case 5, and in a more general sense with the other cases, is called for.

6.4.2 Actor strategies in combining Work and academic knowledge towards productivity

As explained earlier, van Oers' (van Oers, 1998a; Cf. Chapter 3, section 3.2) concept of vertical recontextualisation is one in which knowledge from one origin is used to extend and develop knowledge from another. In so doing there is a merging of the two knowledges and the construction of a new hybrid object with transformed elements from both knowledge origins. This is not just using the same knowledge in a new context but involves actually questioning the nature of the knowledge being moved, the nature of the new context and its existing knowledge forms, and hence how a new knowledge object which speaks to both its own origins and the new contextual constraints and existing knowledge can be developed. This is a development in van Oers' terms because the new hybrid object does something better than either of the constituent knowledges can do on their own. I likened van Oers' concept of vertical recontextualisation to ideal-type Work/academic interactions which are productive because there is a mutually developed and hence mutually satisfactory hybrid curricular outcome. As with vertical recontextualisation this hybrid object also does something better than either Work or academic knowledge can do on their own or when they are only partially hybridised. It provides for a teaching object with a dynamic interplay of Work and academic knowledge in which students both learn more about the workplace but also more about academic knowledge.

The Finnish Polytechnic's innovation and improvement project (case 5) illustrates van Oers' concept of vertical recontextualisation well, and thus also my concept of a productive hybrid object. When the students study what the firm does and how they do it, they are working predominantly at the level of horizontal recontextualisation; students are simply researching and identifying the structures of the organization; the organizations themselves are specifying and connecting the different strands of academic work but there is no extension or changes suggested yet. In the next stage students critically analyze the workings of the organization, and through mobilizing

their subject knowledge and brainstorming in groups, attempt to extend and improve on the organization. The improvements are then further presented and negotiated with the organization itself. This is an example of vertical recontextualisation and of productivity in the design of curriculum units. The mirror image process of subsequently developing the academic curriculum through Work knowledge serves to further embed and develop productivity further. Hence this case is presented as an ideal-type case of what a responsive curriculum unit should look like.

This case manages to score highly on productivity, not because of initial difference which is quite low, but because of actor strategies from the academics in recontextualising both Work and academic knowledge.

This ideal type responsive case can be contrasted with a less productive and hence, in my terms, less ideal responsive case which begins at an equivalent level of knowledge difference to the Finnish case. The context studies cases, though hailed as being innovative and contributing to student's employability skills by, amongst others, the UK Higher Education Authority, is less than ideal. Real work problems are imported into the academic context as a workshop or set of workshops; the Work knowledge is imported and hybridised with a general academic structure, the workshop, but academic knowledge itself is poorly represented, if at all. Work knowledge is not used to overtly develop academic knowledge lectures and texts but to develop employability skills which can then later be represented in personal portfolios and CVs. Context studies could be made more productive by extending them into projects and guiding students in mobilising their academic knowledge in attempts to say something more about the Work issue, much as was done in the Finnish case. In fact in future developments the context studies author indicated that she wanted to experiment with more mainstream applications, in which students worked on the context study as a project with more integration between the Work study and mainstream, academic theory

Another innovative curriculum design, which was enthusiastically supported by the Dutch business lecturers concerned, was competency-based education. It is unproductive not just because business studies, like environmental studies, were weakly classified and thus already had a relatively close connection with the real

world, but also because the real Work scenarios were not used to develop subject knowledge or vice versa, except to only a very limited extent, as had occurred more extensively in the Finnish case.

For traditional arts and sciences and Work in the form of programmes, low productivity was predicted and this is the case. The focus is strongly introspective, focussing on the nature and acquisition of academic disciplines and differences between the disciplines and academic practices and Work is pronounced and difficult to bridge in any meaningful way.

Ensor (2002; 2001) investigated programme development and change in response to government's calls for greater work and societal responsiveness in the traditional universities. Not surprisingly, the notion of what a programme should be was often different and various contextual issues came into play (for example, at one university programmes were in part a vehicle to rescue ailing departments by networking them into a programme; others opted for interdisciplinarity and others for professional orientation). She concluded that programme initiatives have changed university degree structures, and promoted thinking about linkages between subjects and the outside world. But the organising principle for programmes was predominantly that of vertically structured subject disciplines. Where Work practices were brought in, for example, desktop publishing in applied language studies, they appeared as separate modules. The sense we can derive here is of a fairly strong degree of subjectification of more Work-related knowledge in the interpretation of policy, and the separation of Work and academic knowledge such that there was limited room for change from either side. Although the changes were widespread, higher status disciplinary knowledge dominated and the degree of influence of Work on the curriculum, whether in the form of outcomes or projective modules, was small.

However, academics in different institutions approach responsiveness differently, depending on their 'dispositions' (Moore, 2003) which may lead to some level of productivity despite initial large knowledge differences.

Knowledge reduction

Knowledge reduction was described in Chapters 3 and 4 as a device which could be used by actors to transform and hybridise knowledge from one community with that of another. It emerges in different forms in Wenger's (1998) description of knowledge movement in claims processing and in Latour's (1999) analysis of the development of scientific knowledge.

The integration of Work and academic knowledge often takes the form of reducing the knowledge in a community to generic competencies which can be taken up relatively easily. In cases 7 and 8 academic competencies are reduced to generic skills. In cases 4 and 6, this reduction happens for Work competencies. The processes of knowledge integration and the production of hybrid objects are made easier when the knowledge of one community is reduced. If reduction is too drastic, however, then productivity is limited.

Although reduction made insertion easier it also muted knowledge difference and academics did not ask the sorts of questions about Work and academic knowledge which could have led to a more productive outcome and knowledge object, as was done with the Finnish project.

In university arts and sciences Work is reduced to the concept of interdisciplinary programmes and interdisciplinary outcomes. The logic here derives from the understanding that at Work people think around issues that necessarily cross subject boundaries, rather than in discrete subjects. Reduction is strong and Work as something different is hardly raised at all as an issue.

In problem-based learning in medicine Work knowledge, at least in the first year, was not so strongly reduced and a moderately productive academic/Work hybrid could be identified. Problems arise in terms of productivity where academics begin to see PBL not so much as a Work/academic hybrid, in which knowledge difference can be used as a resource, but take an easier way out and use PBL to develop predominantly generic employability skills such as group work and problem solving. This tendency was observed in the interview.

At the other end of the spectrum, academic reduction is strongly represented in the Dutch Hogescholen business competency and the Work-based learning cases. Here academic knowledge is reduced to a set of generic descriptors which can be easily worked into almost any course of Work study. However, what is different about academic disciplinary knowledge and how it may serve to develop and expand on ways of doing at Work is not raised. This, it is proposed, along with initial structural difference, positions these projects as unproductive.

There is also an element of knowledge reduction in the context studies, but of a different sort. Some of the context of the workplace is reduced not so as to import it into disciplinary knowledge but rather into the pedagogic structure of a workshop; the Work knowledge is restructured as a teaching event or pedagogically framed (Barnett, 2004; Bernstein, 2000).

In case 5 (the Finnish industrial design project) a different process is followed. Where differences between Work and the academy were raised they were not reduced, as occurred in the above cases. Rather, the differences were problematised and used as a focal point for curriculum development. That is why the case scores so highly on productivity. So it is not just the existence of difference per se which promotes difference; it is also actor strategies in articulating and pushing these differences in particular directions.

The pattern emerging with actor strategies around knowledge reduction is that there is a trade-off between reduction to lower barriers to integration and at the same time maintaining sufficient knowledge difference as a resource for maximally productive outcomes.

Un-productive cases

Collaborative productivity in the Dutch competency-based education (Case 7) and work-based learning (case 8) is low as the resultant hybrid does not challenge, develop or incorporate much academic knowledge at all. Work-based and competency-based forums favour the absorption of academic knowledge into Work knowledge. The two business studies hybrids are also new areas for exploration of knowledge and are thus 'productive' hybrids. But in a different sense of productive:

the curriculum is like a product platform in that there are a wide range of possible courses which can be generated within this model, depending on the Work field. To understand how this model emerged, we need to look at the nature of the hybrid forums and strategies engaged in by academics. The academics in WBL take on a strong position that learning must occur at Work and this is evident in competency-based education too. Academics thus 'stand in the shoes' of those at Work and act as interpreters for the transformation of Work knowledge into structures in which learning is fore-grounded (which is already a hybridisation) and ensure that such learning is in accord with broad university learning principles (a further hybridisation). The point here is that academics take on strong positions as advocates and researchers of the development of the 'other' Work knowledge and thus act as powerful brokers. But they are brokers intent on making Work dominant.

Thus there is little effect on overall academic knowledge even though there are new hybrid knowledge products. They are likely to be limited and more in the nature of specialised stand-alone programmes.

As Gallacher (2003) suggests, the impact of work-based learning programmes on the orientation of the university and the nature of academic knowledge and delivery is limited and radical forms of WBL are viewed by universities as unsustainable; there are difficulties with ensuring thorough assessment and that certain academic standards have been met. These difficulties with work-based learning initiatives suggested by Gallacher are very much to do with the nature of academic knowledge. Initiating work-based learning may be simply too great a stretch to make within the traditional university. There might need to be a more fit-stretch initial component where learners are initially engaged in more traditional academic disciplinary studies which they then begin to mobilise in the workplace.

6.5 Conclusion

Broadly, initial difference does influence subsequent responsive outcomes, but the situation is not immovable; actor strategies can serve to shift situations with the potential for low productivity to higher levels, as was shown with the ideal-type Finnish business case. It was argued that a vertical recontextualisation approach to

Work integration would raise productivity, at least in applied disciplines. Pure disciplines, however, remain a problem. It seems as if moves to responsiveness are often seen as just too different to current practices by academics to have any meaningful effects, and are thus likely to be strongly reduced or even ignored. In terms of examining productivity generally in the university, something needs to be said about these pure disciplines, even if only in passing.

As I have suggested earlier, introducing new ideas into the academy, where knowledge and practices are already strongly embedded and seen to work, has much in common with the introduction of innovations in Work and society. There is, it has been suggested, a trade-off between the degree of difference raised by the innovation and its understandability and acceptability to the community concerned.

What might be seen to work in the currently quite strongly classified disciplines is to follow a 'fit' rather than 'stretch' strategy in introducing change. In 'fit' strategy (Hoogma et al., 2002) innovations are very much like what is already being done but also have some element of change which is acceptable to the community; stretch strategies tend to be quite different to what is already being done and are often rejected out of hand. Over time, and through the actions of actors involved, the original fit may provide a forum for experimenting with more stretch-like strategies. The forum becomes a learning space for the community in which quite different ideas may eventually be collaboratively developed and accepted.

The next Chapter, Chapter 7, analyses interactions and hybridity between Work and academic knowledge within a different context and with different research questions. Here the focus is more on the activities engaged in by actors, rather than in the effects of initial difference.

Chapter 7: Interactions between Work and academic representatives in hybrid forums at the micro-level

7.1 Introduction

In order to examine the overall research question of how Work responsiveness can be made more productive in grounded academic practices this chapter examines the micro-level hybrid forums. As was indicated in Chapter 1 Figure 1 and in Chapter 5, Figure 2 (methods) these hybrid forums involved interaction between representatives from Work and academics in formalised face-to-face interactions.

The sub-question which provides evidence for the examination of the overall question was the following:

> *What is the role of boundary and boundary-crossing activities in the opening up of hybrid spaces with the potential for productive outcomes?*

In this chapter the theoretical suggestions on the dynamics of interactions are interrogated through empirical evidence drawn from industry/academic advisory committee meetings and interviews.

According to the theoretical perspective developed in Chapter 4, we would expect that issues raised by the different communities show some level of knowledge difference. These issues may then disrupt knowledge in one community and a series of further boundary-crossing activities may follow. We might also expect that there would be some relationship between the degree of initial difference and whether or not successful boundary activities follow.

The advisory committees examined were all, except for journalism, of the hard-applied variety (Becher and Trowler, 2001). The epistemological nature of a subject is only one aspect of difference which arises in face-to-face meetings between academics and Work. The other aspects are those to do with how actors represent knowledge from their communities in ways which harden difference or, alternatively,

so that difference is mobilised as a resource for further developments. Such patterns will be identified in the analyses of the meetings.

7.2 Advisory committees

The transcript numbers in the text refer to the table of advisory committees listed in Chapter 5, Table 2. The role of the advisory committee is to decide upon curriculum issues so that the academic courses are more closely aligned to what industry wants, and to changes which are occurring in industry. Work and academic representatives act as representatives from separate communities of practice, each bound by common purposes which separate them from the other community (Wenger, 1998). Representatives may interact with one another within their community or with members of the other delegation, supporting or refuting ideas raised. Given that the communities and their representatives have separate interests and motivations one may wonder how they manage to get anything done at all. The fact that they do get work done is due to the way knowledge is put forward, and the difficulty with working across boundaries is counterbalanced by the high level of potential productivity of such boundary work. The meetings are hybrid forums in the sense put forward by Rip et al. (2004a) in that there is a trade-off between difference, which provides the raw material for new developments, and the possibilities that actors may be able to negotiate these differences to construct something productive.

Possibilities for productive difference sometimes arise because separation between the two communities is incomplete; for example some Work representatives hold both Work and training and developmental roles, either within their workplace or through part-time university teaching. These individuals hold simultaneous membership of the two communities and act as conduits for the flow of information between them (Callon, 1998).

There are issues which pressurise the different communities and affect their choices of how to interact, but are not explicitly raised in meetings. For example, the job security of academic staff depends on their having a certain number of students, and they may therefore be resistant to Work requests for quality rather than quantity (see transcript 12). This issue was only revealed through interviewing chairpersons and recording a

Work-only caucus (interview 2; transcript 12). Black-boxed issues may weaken the possibility of productive interactions because the actual issue of difference is not raised so that it can be worked on through, for example, counter-reifications.

Each advisory committee has a chairperson who can be drawn from the workplace or is a senior academic/HoD (head of department). Workplace chairs tend to predominate but either way the other delegation is usually represented by a senior leadership figure as well. The chairperson and one senior representative from the other community for three out of four of the advisory committees were interviewed as to how well they thought the committee functioned and what role they saw themselves as playing. This is reported on in section 7.3 of this chapter.

Choice of transcripts within the advisory committee meetings

All the meetings examined contained sections in which attempts at boundary crossing were made. There were also sections of the transcripts which were not so much about raising issues particular to one community (reifications) and hence signalling difference, but more about signalling agreement from Work about some element of academic practices. But much of the interactive work done in the hybrid forums also involved procedures and reports (see meeting structures below). These were not circumstances in which issues of practice and difference were raised and as a result tended to low productivity. In these instances, which occurred in all the meetings, there was little difference presented and little disturbance of knowledge in either community and so the potential for the production of hybrid forms of knowledge tended not to occur. An example of agreement and lack of disturbance is illustrated below in an excerpt from a civil engineering meeting. The topic raised is about the difference between how the two technikons in the region conduct their experiential learning component.

(Work 1–3 refer to different Work representatives in the same meeting)

> Academic HoD: The other technikon has this experiential model of six months fully at Work and six months where they come back to the technikon one day a week for academic work. Ours is one year full time at Work (with academic projects) and costs more.

Work 1: Cost is not an issue as we at industry can recoup it from the government.
Work 2: I will not employ students from the other technikon. It is ludicrous if students are on site far away and they have to return to the technikon once a week. And the content is totally different.
Work 3: This is an opportunity to lean on the other technikon and to say, as employers, we prefer your model.
Ac HoD: So whatever model we come up with it has to be identified with industry.
(transcript 2 in Table 2, Chapter 5)

The matter is closed here. There is no examination of possible differences between knowledge at the 'approved' technikon and at Work, and hence possibilities for boundary work and hybrid knowledge. In terms of 'success' such interactions could be termed as successful in that there was agreement or no contrary propositions were raised. These sorts of interactions, as they did not involve boundary-crossing activity, were not examined further.

As was discussed in Chapter 5, six committee meetings which showed various levels of boundary activity were analysed in detail. Excerpts from these six meeting transcripts were chosen for those moments where differences were raised, interactions occurred and different levels of success and productivity, ranging from unsuccessful to successful, could be identified.

7.2.2 Structure of the meetings

The advisory committee meetings on the three campuses were all well structured with agendas and space at the end for general discussion. As is often the case with meetings, participants were not particularly keen to engage with this last item after two to three hours of the meeting. I include one example of an agenda from a civil engineering meeting (from the meeting discussed in section 7.5 below) to illustrate their structure. Other meetings were similar in structure and process.

Advisory committee AGM agenda – Civil Engineering

Time: 3.30 6 November in _ room, _ building.

1. Welcome and introduction of new members
2. Matters arising from previous minutes
3. New matters
    - 3.1: Merger update
    - 3.2: Supervision vs. mentorship in the co-op model
    - 3.3: Update on the foundation programme
    - 3.4: Learnership implementation
    - 3.5: Update on research in the department
    - 3.6: Update on recurriculated experiential learning
    - 3.7: Update on departmental projects
    - 3.8: Report back from the national civil engineering HoD meeting
    - 3.9: Issues raised by the advisory committee members
4. General

Much of this meeting was taken up by procedures such as 'matters arising' and academic reports (3.1 – 3.8). In this meeting and the others there is thus often not all that much occurring which could be described as 'interactions around different conceptions of knowledge'. Where interactions and debate occurred, and the reports did sometimes elicit debate, I examined the nature of the interactions as described in sections 7.3 – 7.6 of this Chapter. For example, the particular interaction highlighted and analysed in section 7.5 of this Chapter is from item 3.6 of the above meeting.

Of interest too in the agenda is the merger update item[8]. From 2003 through to 2006 merger issues increasingly featured in meetings and to some extent shifted the emphasis away from Work and academic representatives interacting around the curriculum. From approximately early 2005 the advisory committees from the two technikons combined and there was difference in academic practices to be negotiated; content, pacing, extent of integration and assessment of subjects as well as the nature and extent of experiential learning all had to be aligned. Differences within the

[8] The historically black Peninsula Technikon merged with the historically white Cape Technikon in 2005. Durban Institute of technology (DIT) was a result of the merger of two largely race-based technikons in the period 2000 – 2003.

academic community did arise in the meetings I attended and analysed in 2005 but these were, thankfully, easily resolved in the meetings and through other forums. In other advisory committee meetings which were not the object of study, I was aware of major difficulties with the merger. It would have been interesting to have traced and analysed such interactions between institutions to be merged, but this was not my topic.

7.2.3 Analysing the interactions

The unit of analysis, following the work of Callon (1986), Geisler (2004) and Star & Griesemer (1989), was a unit of meaning within the flow and management of information through interactions between participating worlds, in this case specific interactions between Work and academic communities. Discourse analysis, as was discussed in Chapter 5, was the analytical method used.

The particular component of meetings examined was the articulation of reifications by one or both communities and, where these raised differences, the subsequent boundary-crossing activity between the communities. In all the transcripts there was some evidence of difference and attempts at boundary-crossing work. Whether or not the transcripts took a productive turn, as elaborated in my definition of productivity, depended on the extent to which hybrid objects emerged in third spaces flowing from the initial identification of difference and boundary work of the actors involved.

These events can be broadly outlined as steps in Table 1 in which the first step is the articulation of difference leading to boundary crossing and the second is the emergence of hybrid objects.

The (mutual) articulation of difference between Work and academic representatives which may lead to;	
The bridging of differences raised through the mobilisation of boundary devices which may lead to;	
The emergence of mutually developed hybrid objects.	

Table 1: Meeting steps related to productivity

In analysing the meetings three ideal-type variations relating to productivity were identified and categorised as unsuccessful, moderately successful and successful. These were characterisations developed for the purpose of analysis.

Some of the transcripts showed high levels of difference expressed by both the academic and Work representatives and boundary-crossing activity was particularly non-developmental. Hybrid objects emerged partially or not at all. I therefore categorised these meetings as unsuccessful. In other meetings differences raised between Work and the academy and boundary activity resulted in more developmental work at the boundaries; but success was, however, limited. These meetings, which were partially productive, I categorised as moderately successful. In the third type of meeting boundary work resulted in a series of developmental negotiations and future plans. These meetings were categorised as successful in comparison to the unsuccessful and moderately successful meetings.

One medical technology meeting was rated as least successful and one science meeting as most successful. It might be tempting to suggest that there is a pattern here which is based on the different types of field knowledge and their relative degree of contestation. Given the findings in Chapter 6 where disciplinary field was in part predictive of productive outcomes, there is good reason to think this might be the case. However, the disciplinary fields examined were predominantly of the 'hard-applied' type. Journalism was the exception and would be classified as soft-applied. Though this might therefore be expected to show a certain degree of closeness between Work and academic knowledge and hence lack of potential for productivity as compared to the other hard-applied cases, no such conclusions can be drawn from the single case; the analysis of the case revealed that it lay within the moderately successful category (Cf. Table 2, Chapter 5).

Further evidence for not focussing on disciplinary field was that there was inconsistency of success within the same fields; for example, other health and science meetings were rated as moderately successful rather than unsuccessful or successful. Thus the focus of the analysis, in keeping with the research question, could be on actor strategies around bridging difference within the meetings, rather than on field differences.

If field was not a variable then perhaps institution was. An examination of two advisory committee hybrid forums in a sister institution, the Durban Institute of Technology, showed that these meetings, like those at the Cape Peninsula University of Technology, also had detailed agendas, reports and limited room for discussion. Where discussion occurred there were instances of reification and boundary activity. Both the Durban hybrid forums (6, 15 in Table 2, Chapter 5) were similar to many of Cape Peninsula University of Technology forums and were analysed and coded as being moderately successful.

7.3 Perceptions of advisory committees from the point of view of the members.

7.3.1 Unsuccessful advisory committees

In overview, the responses of the Work and academic representative were that there is very little value seen in the functioning of the advisory committees and anger, frustration and irreconcilable differences were the order of the day. Both interviewees refer to the meetings as 'talking past one another'. There is also lack of trust and suspicion of the motives of the other community.

Medical technology Work chairperson interview 1

The chair is extremely enthusiastic about the potential of such meetings, even though this potential is not fulfilled. He sees himself as part Work and part academic orientated; he does some part-time teaching at the university and enjoys this enormously. He sees his role as acting as a mediator so that both sides can listen to one another. He has been part of the committee for over 20 years.

He understands the main problem as being that the academics are interested in teaching, esoteric research and maintaining their own positions as lecturers rather than being orientated to the needs and changes in the workplace. He describes, as examples, two recently achieved doctorates in the department, one on bats and the other on palm oil which, he believes, have little relevance to Work. If the department was linked to a medical school at a working hospital the situation may be improved. The main interest of the academics, as he puts it, is to take on as many students as possible without regard to the needs of industry. The academics do not seem to respond to suggestions put forward and the industry delegates are often 'tearing their hair out' with frustration. Departments, he believes, change their curricula willy-nilly without adequate consultation with the professions. As he puts it 'it started well then lost direction, … now we are talking past each other'.

Interviewee comments on my interpretations of the meetings in the transcripts

I raised, with examples, the idea of differences between Work and the academics and the potential for the development of hybrid objects which meet both their needs and

can be productive. In terms of my idea that there is difference between the lecturers and Work, he agreed and believed this is a problem with the academics. He describes how lecturers become beholden to the academy and lose their connections with Work. Although lecturers were supposed to be ex-professionals he believes they 'lose it' and say 'I have to get a masters to progress in the institution and this is now my priority (as opposed to understanding Work)' or 'I have to take my holiday'. He suggests they could spend some of their holiday in the workplace and this would serve to cross the divide between Work and the academy. He says the academics just do not follow up on decisions made.

In response to my idea of productive dialogue he states: 'Let me give you an example of productive dialogue. We say 'do not flood the market' and they take on 50 students. We do not have space for experiential learning and when he comes out he cannot find a bloody job!' He clearly does not see productive dialogue happening. In general he says that what I am doing in my interpretations is interesting but that the lecturers will look at it and say they are too busy to take any notice.

Medical technology academic coordinator interview 2

He understands his main role as compiling the agenda and setting up the meeting. He feels that not much happens in these meetings and he does not know what the other community's issues really are.

He believes that Work representatives expect Work-ready graduates but the role of education is different to this. He does not see anything as working well. He says that when they do try to respond to what Work wants, such as cutting student numbers, it is not recognised. Or, the sorts of issues Work puts forward are just not implementable without complete re-organisation. He interprets this as long term 'animosity' and goes so far as to say it is because of the old guard, often white representation on the committee which has little idea about new developments in education.

Furthermore, he does not trust the Work representatives as they are 'protectionist' and wish to wrest control of education from the universities of technology. He finds their behaviour (such as caucusing) 'upsetting'.

He thinks that the dean, who is not in this field, says things and makes promises in the meetings he does not keep and this further alienates the Work group. He is also critical of his own academic community and calls them 'lethargic'.

Interviewee comments on my interpretations of the meetings in the transcripts
I again raised, with examples, the idea of differences between Work and the academics and the potential for the development of hybrid objects which meet both their needs. In terms of difference between Work and the academics he describes how the technikons are no longer welcome at the professional bodies' educational committee meetings. As technikons are currently the only medical technologist training organisations, he finds this strange. He believes this is to do with conservatism within the profession, and their unwillingness to embrace new approaches to education, which he believes the technikons are trying to follow. He knows the professional body is currently talking to the traditional university medical schools about taking over medical technology from the technikons, and this exacerbates divisions between the Work and the academics.

7.3.2 Moderately successful advisory committees
In overview there are difficulties voiced about the committee's work, particularly from Work, but this is balanced by the view that there is much that is good in the meetings.

Civil engineering Work representative interview 3
She has been on the committee for four years. As the work-integrated learning co-ordinator for the Cape Province, she has a strong interest in what students learn in the academy and at Work.

She sees a clear difference between what academics should do versus what Work should do (subjects and facts versus practice). She sees this difference emerging where academics assess the students at Work according to a score sheet which focuses on how they did the presentation rather than the Work content the student has learned.

Her biggest difficulty was with the manner in which the meetings were conducted. She felt that the academics just presented what was happening and there was not enough discussion. What could work better, she believed, would be to have a time for Work representatives to caucus and then to present their own issues for debate. There could even be a questionnaire for Work representatives in order to gain representative Work opinions which could then be discussed at the meetings. She feels that a successful aspect of the meetings is the chance to bring together different workplace people and to hear what they are doing so that they can 'benchmark, network and exchange ideas'. In addition, it acts as an industry consultative body for major curriculum decisions

Interviewee comments on my interpretations of the meetings in the transcripts
I showed her a transcript from a recent advisory meeting in which there had been dispute over what sort of projects the students should do in their experiential year; she was involved in this dispute. The academics want the projects to be about preparation for further study, but Work is concerned that there is mismatch between academic-based projects and the projects they are actually doing at Work. In the meeting she poses the idea that projects done at Work should also be the academic projects, something I coded as a form of hybrid object. However, in later discussion the academics strongly supported their current academic projects as necessary for learning. She agreed with my coding and said that what she was attempting to do (in the transcript I showed her) was to mediate the often disruptive effects of students doing different projects for the academy and for the workplace.

Civil engineering academic head of department interview 4
He stresses that these meetings are more like AGMs and the real curriculum work occurs elsewhere in smaller, more focused meetings. However, big issues like experiential learning are discussed here. He feels that the fact that industry raises points of difficulty and questions the curriculum is a measure of the health of the meeting.

He sees his role as creating an enabling environment for Work representatives in these and other smaller, subject focused meetings. He sees the difference between the academic and Work roles as the following: the academics try to create a holistic

student with lifelong learning abilities, whereas the industries (he believes) want someone who can produce something.

This is also his biggest difficulty with the meetings; Work does not always recognise the need for students to learn through mentoring on the job and expects them to be ready-made 'rocket scientists' (this is a similar comment to that made by the medical technology academic chair in 7.3.1). There is also some tension between his attempts at integration across subjects and developing lifelong learning skills in the academic years and the expectations of Work about subject knowledge.

But there is also an emergent and growing group of workplaces who do have structured mentoring, something he is very pleased about ('Wow! For the first time students are actually being mentored at Work!'). So he thinks that discussions that involved these Work representatives on experiential learning worked very well. He views the emergence of difference between the representatives around which projects students should do at Work as 'real engagement, not something airy-fairy'.

He believes that as the meetings continue there will develop an even closer rapport and more positive developments between the participants.

Interviewee comments on my interpretations of the meetings in the transcripts
I showed the HoD the transcript and my interpretations about the sorts of projects students do in their experiential year. He agreed with my interpretation: 'Mmmm I think your interpretation is correct … I think your comments are spot on'. He thinks Work comments about some form of hybrid project work are 'hell of a valid' but that students still need, and also appreciate, academic work in their experiential year.

7.3.3 Successful advisory committee

Overall, both representatives are highly committed to and enthusiastic about the meetings. There are no difficulties raised from the academic side but there are some difficulties raised from Work.

Analytical chemistry Work chairperson interview 5

The chair is experienced in chemistry laboratory and workplace training management. She holds a senior project leadership position in the workplace and is also chair of her professional body. She sees her role as a go-between for academics and Work representatives, and as persuading as many of the relevant Work representatives as possible to attend the meetings. Overall, she understands her role as developing better quality graduates both to fill the shoes of those retiring from the workplace and to play a role in expanding the industry. She has been on the committee for ten years.

By and large she is happy with the meetings. She is critical of the Work delegates who do not attend regularly or do not engage, sometimes using the meeting as an excuse to escape from Work. She tries her best to ensure that the right people attend regularly. She finds that academics are responsive to industry requests and try to come up with methods to incorporate them ('there is openness and willingness'). She believes that the academics see themselves as needing to produce the best possible employable graduates in order to ensure their own future as university employees ('they are customer orientated'). She cites the previous meeting (the meeting analysed later as successful in transcript 10) as a good example of how well the meetings work as 'academics responded immediately to the request (from industry) to make changes'.

The difficulties she experiences with the committee are that it lacks power; decisions taken have to be implemented by the academics and sometimes (though she does not believe this is deliberate) they are indecisive. Furthermore, she wants issues to be followed up so that there is continuity between the meetings. She sometimes finds it frustrating that issues raised and discussed are re-raised or work that was supposed to have been done is incomplete.

Interviewee comments on my interpretations of the meetings in the transcripts

I take the chairperson through the transcript presented here in section 7.6 and ask her for her comments. She agrees that differences between the needs of Work and the academy are raised in the meeting and that these differences serve to promote dialogue. She agrees that through discussion a new 'in-between idea' arises (modules and recurriculation) and that discussion continues in a highly productive way. I ask

her if she thinks that the discussion became a little too academic and she agrees, saying that sometimes Work sits back because they perceive talk as being about academic issues and not very pertinent to their experiences.

Analytical Chemistry academic chairperson interview 6
She sees her role mainly as picking up what industry wants rather than giving them information about the university, and showing Work representatives how the university has implemented changes suggested. She is very happy with the meetings, believing that the academics find these extremely useful and are open to implementing what has been suggested; 'we never turn around and say we cannot do that; we had a lot of feedback from industry on computer literacy and we definitely responded to that'.

She does not see anything as having been unsuccessful and only wishes to have fewer meetings.

Interviewee comments on my interpretations of the meetings in the transcripts
She comments that the development of an in-between idea in the form of 'recurriculation' worked well in the meeting and that differences raised were translated into productive interactions, and that how I had interpreted the meeting was 'what happened'.

7.3.4 Discussion of the advisory committees
In this section I was, firstly, interested in whether the categorisation of advisory committee meetings into unsuccessful, moderately successful and successful was reflected in the comments of significant representatives from Work and the academy in these committees. I found this to be the case. For example, where advisory committees were clearly dysfunctional and there were divisions and near irreconcilable differences between representatives of the two communities, this sentiment was reflected in the interviews. On the other hand, successful and productive meetings, characterised by a willingness to deal with difference and work together on productive initiatives, were also reflected as such in the relevant interviews.

Secondly, I wished to get feedback on my interpretation of the meetings in terms of differences raised leading to hybridity and the potential for further development, except where there was no attempt or wish to negotiate around these differences. I simplified my coding with difference replacing reification, hybridity and boundary crossing with ‘in-between things’ and ‘work in-between’, and explained what was meant by brokering. The respondents supported my interpretations and there was no counter-interpretation evident.

7.4 Unsuccessful interactions

The medical technology advisory committee meeting described here focused largely on ideas put forward by academics to change the structure of the currently offered diploma. This has been made possible by changes in policy which allow the previously named technikons to operate as universities. Policy moves towards a single higher educational system allowed the ex-technikons to look to offering degrees, and this emerges strongly as a talking point in the medical technology transcripts. Offering degrees, however, means greater academic accountability of the whole programme. No longer can students simply be at Work and be judged largely by Work supervisors during the experiential component of the programme. Experiential learning now has to be properly designed and assessed against academic criteria and this raises all sorts of issues between Work and the academy about the length of experiential training and who is in control. Also, related to the new status as universities, there is a greater degree of academic freedom in the design of programmes, something which was previously more tightly controlled with one national curriculum for all technikons. But there are tensions which arise here which relate to the long-held view from the Work representatives that the academic staff neither consult enough with them nor listen to what they have to say (see 7.3 interviews 1 and 2 for more background detail). Furthermore, there is the issue of control of the training and accreditation of medical technologists. The professionals already feel this is too strongly and inappropriately controlled by academics and are suspicious of moves to offer a degree which they feel increases academic control. The issue of student numbers is also a point of contention between academics and Work. The academic departments need high student numbers to justify current staffing through gaining government subsidy and fees for students enrolled. In addition,

academics are possibly also responding to an earlier policy call for an overall increase in higher education student numbers[9]. The industry, however, has limited capacity to absorb graduates and to offer experiential and internship positions.

This meeting is chaired by the HoD of the newly merged campuses. The meeting begins with a description of options for future degrees and diplomas in the field, one of which is a three year basic study followed by a one-year honours which would also include internship. This is given in the form of a presentation by one of the academics which is followed by discussion, the end part of which is shown in the transcript. On its own this does not seem to be too contentious but it raises issues about who controls the final professional accreditation of students as medical technologists. Currently, internship and registration is done by the professional body, but the four-year academic model with internship included would cut them out of the loop. The announcement of this four year academically-controlled degree is soon followed by a request from Work that the academics leave the room. The reason for this becomes clearer when you look at some of the discussion just before the academics leave the room; it is quite heated.

The number of the transcript refers to the meeting numbers in Chapter 5, Table 2. The text presented is excerpted then collated from different parts of the meeting in order to illustrate examples of reifications and differences raised and opportunities for boundary-crossing work. It must be borne in mind that this is a rhetorical and not a linguistic analysis and my interest, as already pointed out, lies in examining the flow of information in boundary-crossing activity.

7.4.1 Medical technology

Transcript 12a Medical technology

Text (ac = academic representative; wk = Work representative)	**Interpretation**	**Coding**
[approximately 40 minutes introduction, presentation and discussion on qualification types]		

[9] Enrolment in higher education in South Africa is substantially lower than in developed countries. Educational strategists see increasing enrolment as an engine for development. But, there are currently calls for an increase in quality first.

Text (ac = academic representative; wk = Work representative)	Interpretation	Coding
Ac 1: We could have a 360 credit bachelor's degree with 60 credits for work-integrated learning, then an internship of 50 extra credits and 70 credits for a research project and management subject.	How the academics see the qualification	Academic reification
Wk 3: I would like to know, if there are thirty students a year doing internships, then where are we going to place them? There is just no capacity in the laboratories .	30 internships per university is just too much.	Work reification
Wk 1: I would like to request something. That we at work caucus by ourselves (as) we come from different areas … and we have actually (not) discussed this for a long time … and I would like to share ideas, if you don't mind. It is not that we do not trust you. If you (the Work representatives) just stay behind, and, what we want to do, is to discuss the issues.	The academics do not seem to understand the situation on the ground There is no attempt to broker these differences. Instead Work claims it needs time and space to discuss issues by themselves. But it becomes clear that Work believes the academics do not understand Work contexts, or worse.	
Ac Chair: I think, I am thinking back now, two or three years back (when) we worked in different groups and I do not want this to happen again.		
Wk 1: I do not want it to happen (either). I just want to, you know, inform them about issues that we have to make very definite decisions about…. It is very difficult to share these views (in the current set up).		No attempt at boundary crossing activity
Wk 2; Having a recognition of the internship for honours! Forget it!		
Ac Chair; Ok lets go (this is to the academic staff)		
Ac 1: I just want to say it is going to be a 360 credit across the board then it is going to be__		
Wk 2: Forget it! Forget it! You're dreaming!		
Ac 1; No, just listen to me__		
Ac Chair: Ok ladies and gents there was a request		

Text (ac = academic representative; wk = Work representative)	Interpretation	Coding
from the employers to leave. So in the spirit of working together, any problems they need to discuss … [approximately 30 minutes of Work caucusing transcript 12b]		

There is a reification of the academic in terms of the structure of programmes with an internship component, then a strong counter reification from Work (there is no capacity in laboratories for internships). This is not followed by any attempt at boundary crossing. Rather, Work decides on an apparently counter boundary crossing move, to caucus amongst the Work community only. During the caucus they network and make more robust the idea of difference and difficulty with the academics, shown in transcript 12b below. As it is only Work talking I have not attempted to code boundary-crossing activities using the three column approach. I have excerpted sections of the conversation to accentuate the main points of difficulty raised by Work and underlined these.

Transcript 12b

[preceded by a few minutes talk on the role of laboratory technicians]

Wk 1: This talk of SAQA confuses everyone. Can't we stand together and think of using the board exam and experiential learning together? We shouldn't fight in front of the technikons … we distrust the lecturers. We are trying to ask them for advice but what is happening is that they are looking at it from their own agenda, what is in it for them. It scares me that they are churning out too many people. We must look at the quality of the technikons that are producing them.

Wk 4: You have to accommodate all these students from the technikons in internships, how many are there? 11 x 30, I don't know. They have to be accommodated somewhere. Unless we get agreement from the employers and the private sector that they will take on these students, then the internship just cannot be accommodated as part of the qualification.

Wk 5: According to what they suggest in the internship year, it is not only practical they have also got another subject. When is it going to be done?

All: Yes, Yes!

Wk 4: Another thing that worries me about the internship is the subjects … they want to add another 60 credits to the internship (with something like) management … is it qualified? I feel a bit concerned about the internship part.

Wk 6: I agree with what you say but all of us are working under huge pressures in terms of staffing, and in terms of training capacity. What worries me, are there enough certified training labs? This is going to be a huge problem.

Wk 4: I would prefer a national exam separate from the technikons. They have this 30% possibility of making changes (to the course content); they can just change things or leave things out. It is all ad hoc. The national exam must be in our hands. The liaison committees don't listen to us and we complain (about issues) … I have been doing this for about 20 years. But one thing we will have control over is our national exam.

Wk 1: Are lecturers up to scratch? There should be criteria for technikon lecturers

Focusing on the underlined statements, Work representatives experience difficulty with the academic institutions in terms of:

-The quality of course content

- The suitability of lecturers to teach in the field
- The large numbers of students taken on by the department.

All of these issues relate to policy. Firstly, the transformation from the highly regulated and collegiate technikon system to more independent universities has allowed them to implement independent changes to curricula. Secondly, lecturers are encouraged to seek higher academic qualifications rather than Work experience. As pointed out earlier, the academy is encouraged to take on students to increase revenue in what was perceived as an increasingly competitive higher education field.

The separate meeting is not, however, necessarily a negative move as it may serve to better define the boundaries and differences between the two communities and thus

'provoke the construction of boundary objects' (Duncker, 2001:358) when the two communities come together again later. What emerges, as transcript 12c indicates, are the raising of reifications and the opening moves of boundary-crossing behaviours. Starting from the initial return of lecturers into the meeting room, Work representatives immediately bring forward some of the difficulties they have with academics raised in transcript 12b.

Transcript 12c

Text	**Interpretation**	**Coding**
Wk7: We want the 480 exit qualification and (we want) some discussion about it. (But we feel) there are too many universities of technology of varying quality. [brief discussion about quality and old QA bodies and the professional body]	Consensus on the type of qualification but attack on the academics' abilities	
Wk4: If we go for the 480 credit qualification that is great. But we must have specialist lecturers who have been in the laboratory recently. Things have changed, you cannot have people who have not been in the lab for 5 years, the whole thing will fall flat.	Further critique of academics' abilities.	Reification of Work. Cementation
Ac chair: There should be a closer relationship between employees and lecturers. One thing (to enable this) is the possibility of putting students into the laboratory from year 2 on a rotating basis, for short spots. I see this in a positive way, there are ways.	Attempts to bridge idea that academics lack Work knowledge with idea of 'rotating spots'	Brokering followed by attempted standardis-ation
Wk4: How? For sixty students there are only three laboratories. Let us be honest, we do it (mentor students) but it is chaos unless we have dedicated tutors. Don't add to the problems!	Academic ideas strongly rejected and boundary Work fails	Further reification of Work
Work community: Yes! Yes!		Cementation of Work

Text	Interpretation	Coding
		differences
Ac chair: Work must cooperate more closely, it (rotating spots) is a possibility	Further attempt at brokering	
Ac7: Lecturers need practical experience. The professional body needs to tell universities to release lecturers for service at work, and not accept excuses about lecturers having to be involved in exams etc. Also, if the labs need training staff then they must organise this. It is a total thing, we need to work together and Government needs to co-ordinate.	Critique of academic work and difference with Work; suggestion of prof-essional body to act as bridge between Work and academics.	Proposed boundary device – standardisati on
Ac: Our dean employs lecturers with MScs in microbiology. He takes on as many students as he wants and nowhere does it say he must have a lecturer who is registered as a medical technologist with x amount of experience in the lab. We must have this in writing from the government.	'node' involving instructions for academics emerges	extending of boundary device to written object
Wk 4: I agree with you. I am just wondering, don't you guys get sabbaticals, perhaps you could use these to work in labs?	New attempt to bridge Work and academic difference	Brokering, boundary object
Ac1: No, we do not get them.	Idea is rejected and not followed up	
Wk8*: this autonomy of universities is a problem, they just do what they want …	Strong critique of academics and difference emerges.	Reification
[discussion on medical doctor training, community work]		
Ac chair: So the consensus from employers is that we go for a 480 exit qualification. I want to know from the academics how they feel about it.	Consensual, bridging structure of 480 qualification invoked	Qualif-ication as standardised boundary device

Text	Interpretation	Coding
Ac1: I am happy. What do we have to do to unpack this.		Cementation
Wk1: Where will the internship be? There is a difference of opinion. We cannot discuss this in a few minutes.	Internships are traditionally a Work function and they feel it is being taken over by academics who are not competent;	Work reification
Wk4: We now have 480 credits plus the internship with academic components within this. How, how, how this is going to be done is the main question. To discuss it here, no, no it is fruitless. I cannot talk for other fields like cytology [this discussion on the relationship of the internship to credits and the qualification goes on but is not resolved for about 25 minutes].	More on difference and lack of confidence in academics. Idea of specialisation again raised	Work reification. Cementation
Wk4: … let us workshop properly. We have more or less decided on what we want but lots of people are not here and we need to discuss and workshop with them to get buy-in. We need to understand each other because we are missing each other even within this conversation here [gives examples] We talk past each other. We must sit down and make sure that whatever we decide on is agreed by all. We come together for a day and rush through things, then we remember we did not think of that and that …	Initial brokering becomes more on difference and lack of confidence in committee processes	Work reification Cementation
Wk8: We must meet with everyone in the different workplaces first to see what we need in the Western Cape and bring these caucuses to this meeting.	Possible solution to the impasse but also a critique of the committee's	Reification and potential boundary

Text	Interpretation	Coding
	functioning	process is raised
Ac chair: OK		
Wk9: For recognition of the medical technology degree we will need an equivalent degree of four years with different committees for the specialisations. As a way forward let us agree on four years (for the qualification) then get the committees to work on how to do it. [work agreement].	Boundary process supported and extended within Work community . specialisations	Brokering; 480 degree as boundary structure
Ac1: We wanted to get acknowledgement of the internship on the NQF levels, to move it from just internship and registration. It will never be recognised unless it is done at a tertiary institution … they will laugh at us if we try to do it at work	Importance of academic work rather than that of Work specialists is raised	Academic reification
Wk1**: But how are we going to do this? We in the professions feel threatened, no (I do not mean that, rather), we do not have faith in some of the university of technology lecturers who are going to conduct exams. Will specialists be involved?	Strong difference and lack of faith in academics is raised	Work reification
[again this is not resolved and new agenda items and report backs ensue with no discernable boundary crossing]		

There is much potential for more extended boundary work here with the boundary object of the 480 credit qualification. This standardised object (Wenger, 1998) is something which can be populated with ideas from both Work and the academy, and can serve to articulate these ideas. But it fails to do this. Rather, strong differences emerge around who is responsible for internships, the lack of recent Work experience of lecturers and, underpinning these issues, a lack of confidence expressed in academic knowledge from Work. For example, issues of strong difference and lack of confidence of Work with academics arise, firstly, when Work 8 (Cf. * mark in the

transcript) shifts an ongoing discussion on how academics may gain Work experience to one of lack of confidence in the academic world. Secondly, a similar lack of confidence emerges as academics try to get a toehold into the idea of internships – Work responds with 'we do not have faith' (Cf. ** mark in the transcript).

I have called these strong reifications which serve to cement differences and oppose rather than provoke boundary-crossing 'deifications', as opposed to the more potentially developmental reifications (Cf. Chapter 4). When an object from one community is deified a high level of difference is expressed which puts the object beyond the reach of the other community; the outcome is that the difference is too large for boundary work to successfully ensue. Deification is not just the existence of distance between ideas, but the active construction by members of the same community of knowledge differences between them and other communities.

In order for boundary work to occur there would need to be some level of confidence that the other is prepared to respond in some productive way to what is being proposed. And that the 'other' has the ability to do this. For Work, the degree of difference between what they would like implemented and what they think academics can and are able to do is too high. This difference is accentuated by the expressed need for some type of written order from the professional body or government that academics engage more with Work. The introduction of some formalisations which at first appear as boundary devices may be more of the nature of controlling objects. These are not conducive to the creative and productive work of boundary activity in Work/academic interactions and may need to be abandoned in favour of more negotiated and hybrid ideas developed in the meetings.[10]

As an observer I did not feel too negative about this meeting even though there were significant differences between the Work and academic communities. I found the meeting provocative and noted that boundary activities were emerging. But both the Work and academic representatives I interviewed were extremely negative about this and other advisory committee meetings. Boundary activities could not gain much of a

[10] Nooteboom (1999: 142) expresses a similar sentiment about the difficulty of formal rules of engagement in the development of innovations in industry.

foothold and I put this down to the reifications instantiating too large a difference between the communities.

I have highlighted how strong reification throughout a meeting, buoyed perhaps by lack of confidence of Work in the academy, thwarted effective boundary-crossing activity; where the seeds of such activity did begin they were quickly and effectively silenced. But even in more successful meetings overall, there may be instances of less successful activities.

7.4.2 Civil engineering meeting

Overall this meeting is an example of a moderately successful meeting, but the excerpt shown here a less successful section of the interaction. This excerpt again illustrates deification, but with substantively less difference shown by representatives than was the case in the previous transcripts. Reifications are particularly strong from the academics, and despite an attempt at brokering and boundary crossing from Work, there are no substantive boundary moves. The discussion is about when students should exit the institution for their experiential year in the workplace. Currently, students do one year of academic studies and a sandwich year of Work in year two, followed by their final year, year three, in formal instruction at the institution. As can be seen in the transcript, the academics are keen on this system as it exposes students to the field which they believe may enhance learning in year three. The Work representatives, however, would prefer students to have more theoretical background before they do their experiential year.

This excerpt is preceded by moderately successful discussion on mergers, research into Work experiences of students and a discussion on computer-assisted drawing packages. It is followed by discussion on experiential learning modules.

Transcript 2

Text	Interpretation	Coding
Wk1:We should rather do the experiential learning after the second year academic because after year 1 the students do not have enough (knowledge of	After one year students have not learnt	Work reification + attempt to

Text	Interpretation	Coding
engineering) so that we cannot actually do much with them in that experiential learning year. It would be most useful (for us) if they have that experiential learning experience after two years.	enough to be useful at Work.	enrol academics.
Ac1: For academic reasons we want our students to go out to experiential after one year. Because the experiences that they learn on site we need in (order to teach) the following subjects (in year 3). Otherwise they (the subjects) have no meaning whatsoever for the students. So academically it is vitally important …		Academic reification + attempt to enrol Work.
Wk1: I think we can accommodate that by giving them a month or two site experience **…** but the actual usage (way that we use the students) in that experimental learning year is limited because they do not know a lot.	Suggests an in between idea.	Brokering and boundary object.
Ac4: They should reinforce their year 1 subjects in experiential learning as well as gather information for studying the basic subjects further (in year 3).		Academic reification. Cementation.
Wk1: I accept your purpose.		Work enrolled.
Ac5: Of course they must be used for production (in industry) but the main purpose of that (experiential) year is to learn.		Academic reification. Cementation.
Wk2: With that in mind, between the two points of view, all the students on experiential learning need to be mentored. This is where we have the biggest problem because this chappie (who comes in after one year academic training) knows so little we literally have to hold his hand. So we do find it more difficult to mentor these students. It would be easier	Some frustration is expressed with the sandwich model.	Work reification.

Text	Interpretation	Coding
for us for the guy to have bit more knowledge. Let us leave that for later discussion (chair agrees with this).		

Though this meeting is generally amicable, unlike the meeting recorded in transcript 12, a strong degree of difference emerges around when students should do their experiential year. For Work, students with two years 'academic training' would be preferable as they can do more useful work with less mentoring. On the other hand, this sandwich experiential structure is seen as essential for student learning by the academics. I would code the academic reification here as another example of deification; the difference raised is strongly expressed and cemented and the outcome is that attempts at brokering are resisted. The final comment from Wk 2 concerning the degree of mentoring needed does, though, suggests some frustration about academic practices. Transcript 2 is probably at the boundary between unsuccessful and moderately successful interactions.

7.5 Moderately successful interactions

These meetings are characterised by brokering from participants and strong potential for the development of hybrid objects, but they only develop partially. Brokering refers to the work a representative from one community does to 'stand in the shoes' of those in the other community and to produce an early, hybrid object. Part of the problem seems to be the high degree of structuring of the meetings, and the often overfull agenda.

7.5.1 Mechanical Engineering

An account of the previous meeting, based on interviews and minutes, suggested that it was a difficult meeting and there was much criticism of the technikon graduates. The main criticisms raised by industry about the quality of students were: they cannot always successfully apply what they have learnt in practice; they lack good fundamental knowledge of engineering; they lack good teamwork and project management skills; and they tend to lack confidence.

The academics respond by saying that it is hard to keep up with changes in industry, and issues such as confidence and teamwork are hard to teach. The head of department has, in response to this, set up a special committee of industrialists to examine curriculum issues raised in this previous meeting. Not all the industrialists are interested, saying they do not want another committee. In the end, however, five industrialists are chosen and are asked to examine the areas raised in the meeting. They are called the 'generic committee'.

The generic committee is interesting in two main ways. Firstly it acts as a bridging point between what industry wants and what academics should be teaching but which operates outside of the confines of the advisory committee meeting. The committee, though, is co-ordinated by the technikon departmental secretary to ensure that they do in fact meet. Secondly, it sets out to coalesce the somewhat fragmented nature of the advisory committee; many of the industrialists only meet each other at annual meetings and so do not have a chance to formulate and discuss changes they would like to see co-operatively. In a sense one could see the generic committee as a sort of proto-community of practice with the common goal of aligning curriculum more closely with their respective industries. Although the Advisory Committee as a whole is what Wenger (1998) calls a boundary practice, a practice specifically aimed at boundary-crossing activities, the generic committee's aim is to 'broker' (Ibid.) connections and address conflicts between industry and the academy.

At the start of the meeting analysed here the generic committee first reports back to the whole advisory committee thus:

- Study should start with a profile of a technikon graduate which they believe should follow a more practical and less theoretical type of training.
- Students need to spend more time in workshops to gain a more logical approach to engineering Work.
- Students should spend more time on projects to close the theory/practice gap.
- Students need to learn how to evaluate and execute projects in teams.
- Students need more time on computer-aided design (CAD) and management.

- Students need to develop their self-confidence more.

The report from the generic committee indicates that it has not advanced much from what was discussed at the previous meeting. They have only marginally managed to cross boundaries into the academy by suggesting that students need more time on certain areas but do not give concrete proposals as to what form this may take in the classroom. The academics respond, again, by saying that it is hard to develop skills such as confidence and teamwork within the academic curriculum.

The generic committee is a potential boundary-crossing practice. But the committee is not entirely successful; what it comes up with seem to be rewordings of the problems rather than curriculum solutions. This outcome can be explained as a lack of resources in the generic committee to conceptualise curricular innovations, and lack of time to explore these where they do arise. Within the academic community there is a sense that they lack the knowledge and opportunities to develop some of the skills, such as confidence building and project work which industry needs.

The rest of the meeting tackles various issues and the following extract details an example, and possibly the only one, of negotiation of knowledge between the academics and the industrialists. Not a lot of negotiation takes place though.

Ac1- Ac5 refers to different academics talking and Wk1 – Wk2 to different workplace representatives.

Transcript 4

Text	**Interpretation**	**Theory coding**
Wk1: Project management is a huge course, they do seem to finish it in semester four. But it should start in first year. You should teach students to do Gant charts. In every subject he should do this and measure himself, he controls	Students are poor self managers and this is important in the workplace and needs to be developed early	Work Reification

Text	Interpretation	Theory coding
himself.		
Wk2: Excellent, excellent!	Agreement within the delegation and	Work reification Cementation
Wk1: Problem solving in graduates is poor. The artisan has a problem and goes to the technician but the technician does not know how to identify the problem and put it back as a proposal to fix it.	Specific context example describes students as poor problem solvers while problem solving is important in the workplace	Work Reification, Problem solving as a boundary object
Ac1: Problem solving? What should we do in class?	Academic takes on the idea of problem solving; Generic idea of problem solving again raised	Academic Enrolment; Context reduction
Wk1: Use a worksheet for continuous improvement in their work. The worksheet gives processes to approach a problem.	Work problem solving crosses into the curriculum in form of worksheet	Brokering via standardization
Ac2: When you are drilling you need to know the processes like the speed and size of the drill-head.	Gives support to idea of a problem solving process	Partial enrolment of academic
Ac3: The fundamental steps on problem solving, if we have these what else do we need?	Supports and requests elaboration of process but is not answered	More enrolment of academics
Ac4: Lists encourage people to follow recipes and this gives the wrong impression for doing problem solving (and Gant charts).	Counter proposal to problem solving process worksheet in form of critical problem solving	Academic counter reification

We can ask ourselves the question: what marks the difference between Work and the academy here? What is reified? It is the idea that at Work learners need to solve problems and they are currently not very good at doing this. Problem solving in the workplace is reified and presented as what sort of training should be done in the academy, and this is supported by another member of the Work delegation; Work attempts to enrol the academics. Problem solving is sufficiently novel to be taken on board by the academics but not so novel that it cannot be understood. A number of boundary-crossing processes then ensue to help develop this idea, to recontextualise it within the academic community. At first, problem solving is described contextually within the artisan and technician narrative. Then the academics delete the context and problem solving is described as some sort of an ideal, generalised type, as a first stage of movement from Work to the academic curriculum. We could say that the Work representatives have successfully enrolled the academics to the cause of promoting 'problem solving'. The next stage is the representation of this ideal type in some sort of standardized form, which further enables its crossing from Work to the academy. This process needs to be done by someone prepared to cross boundaries and take on some aspect of the other world - a broker. Brokers may be in a vulnerable position as they cannot be sure of the acceptability of what they are proposing to the other world.

Thus far the interaction is moving towards being productive in that an acceptable, hybrid object – a problem solving worksheet - is emerging via the broker. It is also possible to apply the idea of the interplay of novelty and intelligibility to the hybrid object; the idea of worksheets is familiar to academics, though not perhaps in terms of problem solving. It is familiar enough to be understood and taken on board but also novel enough to be interesting and worth pursuing, as we can see from the work put into it from both academics and Work representatives. But there is a problem with this representation from the academic standpoint. Educational discourse concerns itself with educating and not just handing out recipes. We thus get a counter-reification from the educational perspective, one that insists on a more critical approach to problem solving. Ac4 positions himself as a spokesperson for education and as such views the proposed standard object as insufficient. We can see the tension between Work and academic representatives in which the academics, though wishing to be responsive to Work, also have to adhere to academic ways of doing things.

Problem solving is a generic skill which could serve two main boundary-crossing purposes. Firstly, it acts as a run-through as problem solving, in some generic sense, is understood to occur at Work and in the academy within learning and teaching events. Secondly, it is a generic language of talking across boundaries with no particular community allegiance. In terms of run-throughs, as discussed earlier, this may be somewhat of a myth in that the contextual realisation of 'problem solving' is widely different between Work and the academy. We can observe these differences being quite strongly raised in the short excerpt. With respect to Dunker's (2001) concept of generic language, this is a manifestation of the early stages of communication between communities that do not yet have more sophisticated resources at their disposal.

Unfortunately, the conversation moved on to another topic at this point and there is no further discussion of the possible competencies needed by students. There is, perhaps, a missed opportunity here that could be filled by academics promoting the need for critical problem solving at Work through the use of example, in other words enrolling Work representatives to this perspective. It is highly likely that a critical problem solving worksheet is a novel idea for Work and its implications and usefulness are not immediately understood and absorbed. There is a need for brokering and the opening up of this developmental space in order for productivity of further new knowledge.

7.5.2 Civil engineering

The second transcript deals with a different advisory committee in a different department which is engaged in purposeful negotiations around curriculum design. Again we have industrialists who desire Work-ready graduates and academics who want to ensure a holistic academic education but also be responsive to the needs of the workplace. Experiential learning is relatively unguided. Students have to fill in a logbook of what they are doing at Work, which is inspected by one of the lecturers during a visit, and the student is interviewed. The student's immediate supervisor is also interviewed by the lecturer as to the student's progress and difficulties. Some students may have productive learning experiences and others may do relatively little learning. Experiential learning has been heavily criticized by the government education department for simply being 'time at Work' with limited, and un-quantified, tertiary-level learning. There is thus currently no government subsidy and

monitoring students is usually an add-on for already busy lecturers. Changes in approaches to experiential learning also relate to changes in policy. In order for the old technikons to become universities, and to offer degrees, they have to have more academically structured and assessed experiential learning if it is going to be claimed as part of a degree structure.

In order to remedy this situation, and to ensure that students are actually engaged in study and learning, they are now asked to do four academic projects in the experiential year: project management; structural drafting and detailing; road geometric design; and water and wastewater treatment. The projects are designed in the academy but are based on real, industrial case studies. The reasoning of the academics is that at least one of these case studies should relate to what the student is doing in the workplace. There is a problem in that the practical focus areas of workplaces in this engineering field are very varied.

In this transcript the projects are presented to the workplace delegation for their comment. As with the previous transcript, Ac and Wk refer to academic and workplace representatives.

Transcript 1

Text	**Interpretation**	**Theory coding**
Ac1: We have included a self-assessment to judge learning and teaching goals with a staged hand-in. We have noticed some improvement in report writing skills when learners return to the academy after their year in industry. Are there any questions?	Academic needs are elevated and there is an attempt to bring Work 'on board' though there is no attempt to connect to the needs of Work.	Academic Reification. Attempt to enrol Work.

Text	Interpretation	Theory coding
Ac2: There is no subsidy at present so we curriculated a course in order to get subsidy though we still have to mark these projects. We better prepare students for their return to the academy and they gain some soft skills.	Agreement within the academic delegation.	Academic reification. Cementation.
Wk1: What if we do not have these opportunities (to do the academic content of the projects) in our workplaces? I look at the wastewater and design and structure projects, we don't do them (in our workplace). So, we don't have to give them waste-water. Rather (I think) bring in something like tendering (in the projects as this is) something all established contractors have to study (and be able to do).	What students really need to know at Work is proposed as opposed to academic projects.	Work Reification and attempt to counter- enrol.
Wk2: Established contractors do this.	Agreement within the Work delegation.	Cementation.
Wk3: Is there outside moderation of the academic projects that are done by students in the workplace? You could get industry to moderate these projects, even if they weren't paid to do it. You could have industry as a first line of moderation of the academic projects. You could develop a whole bank of modules (so that what is done in all companies is represented). For example, we work with water but we do not do other things.	Work suggests a way to deal with different work specializations that speaks to both Work and the academy.	Brokering; Standardised boundary device.
Ac1: We do not want them to necessarily	The alignment is	Academic

Text	Interpretation	Theory coding
concentrate on industry needs (in the projects) but to give them exposure to stuff which prepares them for their return to the department in year three.	turned down.	Reification. Cementation of academic needs.
Wk1: In industry for learnerships[11] there are trained assessors. Why not use them (in your academic projects at work)? They are trained engineers (and also involved with training).	Original dissenter proposes way to help the academy with module development and marking.	Brokering. Simultaneous membership.

The academy here is trapped in a seemingly impossible situation. They need to make the experiential year more academic to gain government subsidy, and this is supported by the delegation, but it is hard to align project work and experiential work because workplaces have different specializations. What is initially presented, the academic projects, are a form of hybrid object in that they are derived from Work. But they have been recruited to fulfil academic needs, that of preparation for year three studies (self-assessment, report writing), and are thus weighted in favour of the academy. Nodes of important academic knowledge, reifications (for example, 'we better prepare students for their return'), are thus presented in the hope that Work will buy into this academic need and give support; in other words be enrolled to this academic project. But the proposal is initially rejected in favour of a more clearly Work-orientated project topic. It is perhaps too novel to be supported by the Work representatives without some form of boundary-crossing activity. The Work representative (Wk1) refuses to be enrolled and instead puts forward a counter-proposal, that of a general, essential-to-work 'bloc' of knowledge in the form of tendering. Work thus counter-reifies and this is supported by the workplace delegation (Wk2). Up until this moment the two communities are essentially talking at cross-purposes. What was needed was somebody who could attempt the risky process of brokering by placing, in this case, the idea of banks of modules from the academy into the workplace.

[11] Learnerships are a form of government funded apprenticeship. Learnerships differ from traditional apprenticeships in that they include generic components in language and mathematics which should enable learners to progress within the National Qualifications Framework.

The bank of modules, and the idea of moderation from industry presented by Wk3, functions as a bridging concept between what the academy wants and what Work wants. We can describe it as a standardised boundary device which enables conversations and the articulation of knowledge between both communities. But it is still not stabilized as a hybrid object without further discussion and elucidation. We could imagine that if the idea of the 'bank' and moderation is followed then there is an opportunity for the creation of a hybrid space in which further Work/academic interactions could occur (a possible zone of development for new knowledge). Ac1 again reifies the needs of the academy and this essentially closes discussion of the topic, though another member of the Work delegation (Wk1) supports the idea of modules and moderation. This final development is interesting as it illuminates a space where some Work representatives may serve both a Work and educational function as workplace assessors. Such 'simultaneous membership' (Callon, 1998; Star and Griesemer, 1989) as a mechanism for enabling knowledge development in parallel worlds can be rephrased in this argument as a boundary-crossing mechanism. The assessors speak to both the world of Work and that of the academy and can function as a potential hybrid structure. Again, somebody needs to broker this interaction.

As with the previous transcript, this transcript and my analyses were presented to Ac1 and Ac2, the academics involved in this interaction. Both agreed with my analysis, and went further to say that the idea of the bank of modules was not taken up as the modules are time consuming to develop and, as they are based on real events, there are often intellectual property issues which need to be resolved. Furthermore they informed me that the idea of using industrial assessors to help develop and possibly mark the existing modules/projects was taken up by the academics after the meeting, and structures were set up to promote this idea. Though the initial idea of modules was not productive, there has been productive development in an associated hybrid idea.

7.5.3 Analytical chemistry

This transcript is in-between moderately successful and successful advisory committee meetings. There is networking, boundary work and an emergent hybrid

object. But the boundary work and the emergent hybrid object do not develop particularly fruitfully in the course of the meeting.

The transcript begins with a Work reification that those at Work require good practical skills but that students often lack these skills (1). This is then responded to by a counter-reification of what the academics can and cannot do in terms of practical skills in the academy (2). But included here is boundary crossing as the academic suggests what Work could do to enhance practical skills, and this is a potential hybrid object; it will not become one until it is picked up and extended by the Work representatives which happens much later (14) where Wk2 extends the idea of the practical test to some extent by calling it a practical session. In addition the generic idea of there being a complementary role in training from Work is raised, and this sort of abstraction provides the possibility of further boundary work in the form of perhaps, a general practical course which can be adapted to specialist industrial needs. One suspects that this is not a particularly new idea, though, as the role of the academy has always been about generalist training (this suspicion is affirmed in interview 5 with the Work chair). What would be a new and hybrid object, though, would be how to better orientate this training to the different specialist needs, an issue which is not raised at this meeting.

Prior to this section there is a discussion on experiential learning. The system as it stands is that students do two years full-time theoretical study at the institution then one year experiential learning in the workplace. But some students have failed one or two subjects and wish to carry these over into their experiential year which means returning to the institution for lectures. Although this involves a small number of students (perhaps four– six) the academics wish to know Work's opinions on this. Five Work representatives respond in detail. They feel that the logistics are problematic as students may be working far from the institution or may be doing shift work and cannot themselves choose when to be off. Furthermore it is a matter of priorities; they would rather have fully qualified students and if anyone is going to do part-time study they would rather these were their full-time staff. One Work representative is less sure and believes they would like to do what they can to help students but this is not followed up. Four of the old Peninsula Technikon lecturers state that this is more an issue of the other Cape Town campus. The chair asks that

staff focus on the question and this merger issue of academic difference is not pursued further[12].

Transcript 9

Text	**Interpretation**	**Theory coding**
[This section of the transcript is introduced by the HoD academic reading a section from a letter from a cosmetics factory criticising the performance of his students in the workplace. The particular issue highlighted is the practical ability of students in the workplace.] ***1. Ac 1:*** This was her first attendance so our response is we are working on it; it is firmly on the agenda. What about a practical test? Can you (Ac2) lead the way?	Work complaint about what is important but not adequately taught Previous meetings have discussed this issue and it is a rolling agenda item	Academic suggests possible reification of Work
2. Ac2: We have tried to change our practical, yes, as far as is possible but I do not want to elaborate on that. Rather, I think industry should put students through a practical test. Don't just interview them, test them practically too. We go as far as we can (with our practical training).	Roles of academics and Work partly defined. A challenge is put to Work; practical test.	Reification of academic work Boundary device (test)
3. Wk1: Doesn't lack of confidence play a role here?		
4. Ac 3: We have 200 students in labs at the same time. We cannot look at specific students and we only have two staff	Academic community support for reification	Academic cementation

[12] In late 2004 the Peninsula and Cape Technikons merged to form the Cape Peninsula University of Technology.

Text	Interpretation	Theory coding
5. Wk2: I wonder if there is a way to resolve it … [talks of interviews] so it (interviews) sort of like tells you that the technikon has done its job (teaching students). (But) whether the student in a group practical environment is 100% focusing on what they are doing (is another thing). If they sort of know it's a group thing … they do not pay attention. I know that now recently we appointed a university student on a contract basis and she actually mentioned that they had done the practical but the students themselves did not do anything hands on [she talks of class size and demonstrations].	She believes technikons are doing what they can but that group and demonstration lab work means some students are not getting hands-on experience. Work community support for reification	Work cementation
6. Wk1: You mean it is up to the individual to make sure they get that (practical) skill?		
7. Wk2: Exactly, if you attend a practical you should at least be in a position to make sure you understand what that practical is all about at the end of that session … (when students don't know what the practical is about)it is the responsibility of the technikon (through) not exposing them to that practical.	Technikons are not doing practical training properly Work community support for reification	Work cementation
[5 minute discussion, odd jokes and laughter on student behaviour in practicals from academics].		
8. Wk4: They (the students when they reach workplaces) are not perfect products, some work still needs to be done.	Work begins to explore the need to help train students	Brokering, 'some work' as boundary object
9. Ac4: We need to increase the weight of practicals, students pass too easily and the demonstrators aren't always the best older	Academics explore how to improve practical	Enrolment

Text	Interpretation	Theory coding
students.	training and support Work reification	
10. Ac5: Put students in groups in practicals they are more proactive.		
11. Ac6: they struggle with titrations in practicals so in semester 3 we give a pre-laboratory test to pick up problems then we use WEBCT to prepare students better.	Suggestion to help with practical work in accord with Work	Partial enrolment of academic
12. Wk2: mmm!	Cross-community agreement	Cementation
[5 minute discussion of lack of and poor practical training at school and hence lack of preparation]		
14. Wk2: I think even the idea of, you know, building in the practical session during the interview, I think it will sort of, like, shake them up a bit; but that message needs to get to them prior to doing the practical. It won't help if they hear about it after they have done all their subjects and they are ready to go to industry.	Some sort of practical component, a practical session, is mooted after much discussion	Brokering. Boundary device moves to hybrid object
15. Ac2: My idealistic ideal of training an analytical chemist is that they must start in a laboratory. And report to the laboratory every day then take a break to attend class … when they come to the workplace they are not asked to write a one page essay on titrations. We must rethink our whole way of doing things.	Academic leans towards Work interests.	Enrolment of academic to Work.
16. Wk6: I think industry has got its own way of doing things it is very difficult for our students to know what is going on in industry, each industry will have to train the student the way they (need		Brokering

Text	Interpretation	Theory coding
to do it) … when the student comes to us we start him from the basics.		
17. Wk7: If you want quality work out of them you are going to have to put a bit more into training …(but) they have they arrive with the basic skills only, not advanced ones.		More brokering, boundary work in form of Work input
18. Wk8: They should arrive with the basic skills.		Work community reification
[15 minute discussion on the idea of putting practical into a module with clear outcomes with the merger; problems with class sizes; the idea that practical skills will be kept on the agenda	.	
19. Ac7: It would be useful to have a checklist of practical skills industry wants. We maybe work in isolation? If you can help we can update that …	New hybrid approach suggested	Brokering and initial hybrid

From here to the end of the meeting a new agenda item, whether experiential learning should be reduced from one year to six months to allow for more theoretical time, is presented by the academics. There is little discussion at this point from Work except for a weak response that one Work representative would prefer a full year for experiential.

A number of boundary-crossing activities can be observed, such as reifications of what the academics think that Work should be doing (a practical test) and of what Work thinks academics should be doing (teaching practical skills). This difference, or at least the idea, that industry should be more involved in promoting and developing practical skills, sets up a fertile space for the development of a number of possible suggestions to enhance practical skills; for example, using mentors in practicals,

group work, weighting for practicals, a practical test, internet-based resources, an industrial role in practical skills development and a practical test in the interview (again). The idea of enhancing practical skills passes back and forward between Work and academic representatives and becomes a node around which discussion ensues. The node develops sequentially, becoming more robust and produces some hybrid objects with the potential for further development; for example a practical test in interviews which could enhance the status of practical work in the academy, and a dual responsibility for training in the academic and Work laboratory.

7.6 Successful advisory committee interactions

7.6.1 Chemistry advisory committee meeting

This transcript is from the same advisory committee as transcript 9 but was recorded one year later. Interestingly, the community is made up of a largely different group of individuals from the previous meeting so there is little continuity of Work representatives between the meetings.

In this excerpt a recurrent theme of recurriculation and integration is developed. The full transcript has been excerpted to highlight the development of this recurrent theme.

The first stage in the development of new ideas is the raising of reifications in the form of Work needs for more geology in the chemistry curriculum; the reason for this is the increasing need for chemical analyses of ore samples. Yet there is not currently a geology component in the chemistry curriculum. This need is immediately brokered and expanded upon by one of the academics and a type of standardised object, modules, is put forward by Work. It functions as a boundary device, as something which talks to and satisfies the different needs of both Work and academic representatives, and we have seen this before in the earlier use of modules in transcript 1. But here the idea of specific, separate modules is extended by the academics into a more generalist move, namely integration into the curriculum. Integration then sparks further debate and an even more generalist object emerges, the idea of recurriculation.

Integration and recurriculation are not new terms but here they are used in specific ways, as tools for organising a curriculum which speaks to both academics and Work representatives within the context of a responsive chemistry curriculum. As such, they function as both hybrid and generative objects: Generative, because they both enable and extend the possibilities of dealing with all sorts of academic and Work issues (maths, numeracy, computer literacy, assessments, SETAS[13] and other Work requirements) and hybrid because they speak to both academic and Work needs.

This chemistry meeting in transcript 10 begins with the normal formalities. This is followed by the chairperson's request that we listen to an analysis of what a major mining company requires from the students it employs in its chemistry laboratories.

Transcript 10[14]

Text	**Interpretations**	**Coding**
Wk1 (mining representative): We have concerns about experiential learning being shortened. Our biggest problem is communications; we need good writing skills. We would like geology/mineralogy added into the course. The guys do not know the difference between minerals and rocks, that is a major concern, also (you need to) do something about English. ***Ac1:*** One question, you mentioned writing skills. What about oral skills? General Motors said it was oral not written skills which were the problem? ***Wk1:*** There is more writing at this stage. ***Wk Chair:*** Communications is a topic for later on the agenda. We took big and drastic steps on particularly verbal skills in the past. [brief talk on experiential learning and strategies].	Work raises a *difference* between current Work needs and the training students get	Work reification Academic reification

[13] Sector Education Training Authorities. The SETA discussed here supports a university entrance programme in chemistry as well as lower level Work training.

[14] The interpretations and coding have been put into eight-point font to save space as this is a long transcript.

Text	Interpretations	Coding
Ac 2: I think the introduction of geochemistry is a good idea. I think it is very important. Lots of industries require more information like mining, pharmaceutical, microbiology and so on. There are lots of areas where more information is needed. Should this go into the diploma or is there too much already?	Academics understand this difference and accept and extend it.	Enrolment of academics. Ac 2 Brokers
Wk chair: You could get someone from industry to talk about minerals …	Work support for the idea; suggests a short informal input	Cementation
Wk 1: No, it needs to be more formal …		
Ac3: It needs to be more formal and then we must test it; then it sticks.		Enrolment
Ac2: … but the curriculum is very full …		
Wk chair: Why don't we have **modules** on geochemistry, pharmacology, forensics etc? [brief discussion on what to include and how to do it].	***Modules*** are a sort of ***inbetween*** which could satisfy needs of Work and academics – modules speak to both of them.	Standardised boundary devices
Myself: What tends to happen is that people add in more and more onto the curriculum we keep on adding on modules and we should rather think of **integrating** this new stuff into the curriculum otherwise we just overload the curriculum.	idea of ***integration*** rather than addition is raised.	Academic reification
Ac 3: The last time we **recurriculated** chemistry was 15 years ago. We need to think about recurriculating the whole thing, it is a good time to do this with the merger {there is discussion here and a date is set in November to re-plan the curriculum and various Work people agree to join in].	New ***inbetween*** idea of how to meet needs of Work (geology) and large curriculum (academics) arises in meeting	Recurriculation as a standardised boundary device and hybrid object
Ac1: One concern of mine is that communications is seen as a service subject. We just add and add things to the curriculum. So I am very much into the idea of **recurriculation** … perhaps we should focus on 2	General idea is specified	

Text	Interpretations	Coding
subject areas and the language and vocabulary requirements … ***Wk chair:*** What action do you suggest? ***Ac1***: Lecturers should target topics and work out how I am going to develop language skills (in them) [discussion on which year students should study communications]. ***Wk 2:*** Will it (when and how to do communications) help in recurriculation? [15 minutes academic presentation on quality assurance and experiential learning, followed by separate 10 minute presentation on maths teaching]. ***Ac4***: You cannot teach maths or communications out of context, you must be using it in especially practicals all these things must be integrated for teaching to be effective. If we **recurriculate** then we must look at how to **integrate** maths and communications. ***Wk3:*** The whole idea of **integrated** assessment is important the whole move is integrated assessment and not assessment separately. You should remember this when you **recurriculate**. ***Wk2***: You must also look at the SETA when you **recurriculate** … how is it going to relate to them? What we do here must relate to them. ***Ac3:*** We cannot teach maths and numeracy out of context. Students must be using it in special and practical contexts. If we **recurriculate** then we must look at how to **integrate** this … [35 minute presentation and discussion on instrumentation and practical problems; the latter also includes some boundary work].	She is working out how to integrate language and subject knowledge Recurricualtion becomes a ***developmental term*** which enables the academics to bring in communication concerns raised by Work and also to better teach numeracy. Reiteration and accentuation about integration	Recontextualisation (van Oers) Process of cementation of hybrid device recurriculation . Hybrid terminology develops. Work is progressively enrolled to ideas of integration + recurriculation

Text	Interpretations	Coding
Wk3: Just from my side we have talked this afternoon about a lot of **recurriculation** and that sort of thing maybe we must look at what is in that practical that is being done … we must focus not so much on inputs and nice to know things but on outputs (in the spirit of OBE) …		

This meeting is productive and categorised as successful for three main reasons. Firstly, differences identified between Work needs and the current curriculum (the need for geology and written communications at Work) develop into a much larger, all encompassing initiative, recurriculation, to meet a number of other Work needs as well.

Secondly, the term recurriculation is a classic boundary device in that it can have different meanings for Work and the academic representatives (Star and Griesemer, 1989). For Work it provides an avenue for incorporating a whole raft of changing Work needs; for the academics it provides a better platform for curriculum review and for integrating previously disparate curriculum units. But recurriculation also does more than this; it articulates and puts together the different needs into a single unit of meaning. It is thus also a hybrid object.

Thirdly, the broad concept of recurriculation, through the integration of components both inside and outside the traditional curriculum, becomes part of the language of Work/academic integration. Other terminology, or sub-concepts, associated with Work/academic integration emerge in the transcript and may become mutually acceptable ways of talking about both Work and academic needs. Because these terms arise in the process of interaction between Work and academics they can be described as hybrid terms. Some of the terms identifiable in transcript 10 are: thinking holistically and contextually about the curriculum; testing Work knowledge in integrated assessment formats; using modules; and focusing on the sort of outputs we want rather than 'nice to know' inputs. I would suggest that these hybrid terms function as the beginnings of a language of articulation, an inter- or hybrid language

which I believe, along with the other reasons given, serve to situate this transcript within the successful category. The test of whether or not these terms/sub-concepts are in fact the beginnings of an interlanguage would be whether or not they are used in follow-up meetings as a vehicle for integration, and whether the terms are developed further.

7.7 Discussion: Boundary devices and interactions in meetings

As expressed earlier in Table 1, there is an idealised series of events in meetings which can now be augmented with the actual transcripts examined in Table 2. The important steps towards a successful meeting, i.e. a meeting where hybrid objects emerged, are, firstly, about the degree of difference raised and, secondly, about how actors deal with these differences.

It is clear from Table 2 that subsequent to the raising of differences there is divergence and at least two possible developments can ensue, either towards productive outcomes or not. Which path is followed depends on the initial difference but also on actor strategies in articulating and dealing with these differences.

In the unsuccessful/low productivity civil engineering meeting, experiential learning is clearly reified by the academics as being about learning. This is followed by an equally clear counter-reification from Work that experiential learning should rather contribute to the workplace.

Experiential learning here is an example of a run-through (others are internship in medical technology and practical in chemistry). Run-throughs (Klein, 1996) are objects which exist prior to the actual meetings and which run through both the communities of Work and the academy. They are cognate with Wenger's (1998) concept of overlaps and peripheries in Chapter 3. Run-throughs are corresponding versions of a generalised object in both worlds which provide an occasion for raising differences.

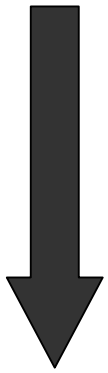
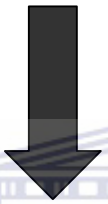
Mutual articulation (or not) of difference between Work and academic representatives which may lead to:		Difference was raised in all the meetings. In the medical technolgy meeting it was initially raised strongly.
The bridging of differences raised through the mobilisation of boundary devices *or* their use to harden differences.		In medical technology actor strategies focussed on cementing rather than bridging differences as occurred in the more successful meeting in analytical chemistry.
The emergence of mutually developed hybrid objects.		Degree of bridging was insufficient in the moderately successful engineering meetings to promote the emergence of hybrid objects, but sufficient in analytical chemistry.

Table 2: Matching meeting steps to findings

For the academics in the unsuccessful civil engineering meeting experiential learning involves students primarily learning to put their subject knowledge into practice or building a real life frame for subject learning; for Work representatives its primary role is to contribute to the workplace which would also involve some measure of academic learning, but this is incidental. Learners can do experiential learning and both Work and academic representatives can co-operate on the project even though it has different meaning and utility for the different communities. This is shown in transcript 2 in Section 7.2 where community representatives discuss and agree on the time period (one year rather than six months) for experiential learning even though, as is shown above, they clearly differ on its purpose.

Where one's concern is productivity the scenario changes as differences must be raised, rather than concealed, in order that new, mutually developed hybrid objects

which look to both the needs of Work and the academy can be developed. These processes are often not successful.

For example, in the civil engineering meeting under discussion, there is then some attempt at boundary crossing but both the original reifications are followed by additional supportive ones thus cementing rather than bridging the different positions. In the medical technology meeting the initial difference is around the academic and Work roles in internships, and there are again reifications and counter-reifications as to how it should be done and by whom, followed by additional support within each community for their positions and hence the cementation of differences. In medical technology there is a further set of strategies involving Work caucusing alone, further hardening the difference. The further construction of difference by the actors, over and above that which existed originally, leads to difficulty with further boundary crossing attempts. A similar pattern can be observed in the moderately successful meetings except that there is now more brokering and boundary crossing and this is partially successful towards the development of hybrid objects.

In the successful analytical chemistry meeting there is again reification of Work needs followed straight away with brokering and other boundary work. Then a much later counter- reification about what the academics can and cannot do does not impair further boundary work because bridges have already been formed. Rather than being used by actors to harden boundaries between them, differences are used as a resource for further developments. They create a productive third space orientated around a generalised boundary object (recurriculation) which becomes a progressively developmental hybrid object as both Work and academic actors contribute to its form and robustness. The very general nature of the boundary object allows for a wide range of subsequent hybrid developments, and even provides the seeds of a hybrid language, which may be productive beyond the bounds of this meeting.

Initial differences such as what role the academics and Work representatives should play in practical training (some Work representatives believe that this is entirely up to the academics to do), or how to include new knowledge areas in an already packed curriculum, may at first seem quite large and hence hard to bridge, if we were to exactly follow the Nooteboom-inspired graph. But the actions of the actors, the way

they construct this difference as immovable or as bridgeable through the use of boundary devices, matters too.

7.7.1 Mobilising differences through boundary devices

In this section the tools for analysing boundary crossing discussed in Chapter 4 are illustrated and expanded upon in light of the findings.

Brokering

Brokering involves representatives from one community attempting to temporarily stand in the shoes of those in the other community in order to transform their needs into some sort of acceptable form for the other. We might expect that a characteristic of unsuccessful meetings is a lack of brokering, or at least unsuccessful attempts to do this, and hence lack of hybrid development. This can be shown to be the case[15].

In the unsuccessful medical technology and civil engineering interactions run-throughs enable the raising of reification and counter-reifications. Some attempt is made to broker knowledge, but this is quickly closed through cementation of the reifications so that they become immovable. In moderately successful interactions brokering is slightly more substantial and tends to develop partially before counter-reifications are articulated but is eventually closed off as an avenue to productive hybridity through counter-reificatory actions. This was particularly the case in civil engineering, transcript 1. In the final, successful chemistry transcript brokering plays an important starting role in the development of later hybrid objects (the language of recurriculation). Counter-reifications are also substantially delayed here.

My version of brokering is slightly different to that put forward by Wenger (1998). In my version it is firstly the ability to recognise differences between community knowledge raised through reifications, and then to imagine intelligently and creatively, through standing in the shoes of the other, the implications of ones own reifications for the practices of the other. Speaking in terms of the other means that one needs to quite clearly understand the discourse of the other, and to adapt ones own community identity to this, which involves developing a ‘speakers dictionary’

[15] Duncker (2001: 361) would agree with this idea. She describes it in terms of the strength of local coupling and interdisciplinary links.

(Duncker, 2001: 361. Cf. Chapter 3, Section 3.5). Standing in the shoes of the other will often involve the broker in invoking other boundary devices such as standardised objects or context deletion in which the object is stripped of the social relations which give it meaning within a particular context.

Simultaneous membership

Simultaneous membership refers to some sort of dual identity of members typically of one community within the other. As with run-throughs they may also serve to accentuate differences in approach between the two communities and so promote the development of hybrid forums. The example of simultaneous membership identified in transcript 1 (Section 7.5.2) is that of workplace assessors who have both a Work production role and, at times, a training role. They could thus be said to have some form of common identity with lecturers who assess students in the academy.

Brokers can use these simultaneous memberships as a boundary device to develop a hybrid object, in this case some sort of structure at the workplace in which academics and Work assessors co-operatively design and assess experiential curricula.

Context deletion

In context deletion, an aspect of the reification is transformed through disembedding it from its original context and presenting it in a more generic form that can now be more easily inserted into a different context. In transcript 4 (Cf. Chapter 7, section 7.5.1) a particular Work problem solving skill becomes generic ‘problem solving skills’; and in transcript 9 in Section 7.5.3 a particular difficulty experienced with laboratory skills at Work is transformed into ‘practical skills’. Disembedding is related to and often precedes the re-representation of knowledge from one community in standardised formats in the other.

Context deletion in meetings can be contrasted with the process of reduction in the development of responsive curriculum units in Chapter 6. In curriculum units reduction may lead to asymmetric hybrid formations which are unproductive. However, in meetings reduction is part of a process rather than an endpoint; what was originally reduced can be later expanded upon in the new context through further actor strategies.

Standardised objects

Standardised objects are formats into which information can be put so that it is understandable by the communities involved. Though they are boundary objects they tend to be pre-existent structures within a community which can be harnessed in order to serve a bridging function to organise knowledge from one community to align it to knowledge in another community. In the academic community the standardised objects I observed were worksheets, banks of modules, integrated curricula and the process of recurriculation itself. We are not talking here about particular types and structures of modules, integrated curricula or recurriculation but rather about generalised and decontextualised types which later will become filled with more specific information. The movement of knowledge from Work into the standardised object may also be preceded by decontextualisation, such as when specific Work problem solving needs are transformed into the generic category of problem solving.

Once knowledge objects are made more mobile they can be inserted into standardised objects. For example, in Section 7.6.1, the Work reification that graduates need to know (geology, mineralogy and the difference between minerals and rocks) is transformed into the more general term of 'geochemistry' before being inserted into the standardised object of recurriculation.

The combination of reduced knowledge from Work and the standardised object from the academy creates a hybrid object.

Hybrid objects

When Work proposes an algorithmic problem solving worksheet, a representation of Work knowledge has crossed the boundary between Work and the academy. This is a responsive, hybrid Work/academic object which has arisen from Work reification of sufficient but communicable strength, via the boundary device of standardisation.

One can detect the beginnings of further hybrid object development when the problem solving worksheet is challenged as being too uncritical and deterministic for academic purposes. There is potential here for the further development of the idea of a problem solving worksheet which is critical but also meets Work needs. We do not know how

such a hybrid would develop nor what the final product would be but we can imagine this as a hitherto unexplored space which now constitutes a zone of new development of knowledge. In modern, changing workplaces, for example, novelty and creativity would be valued orientations and the idea of a critical worksheet could be further developed along these lines.

Hybrid objects within responsive interactions can be generative within the confines of a particular object, such as a worksheet or a module, and their generative nature is exhausted in the developmental process. When, for example, a representative in a Work/academic interaction suggests that interviews for Work should involve a practical test to encourage students to focus on their practical work in the academy, they are articulating a boundary device (this could be seen as a standardized object). The boundary device becomes a hybrid object when there is further support for the device and it gains some content and structure. The object is exhaustible because it can be constructed and finished and have little impact on other boundary work (though it may too be subject to evaluation and change).

A different degree of hybridity arises in transcript 10 on chemistry responsiveness. Responsiveness begins with the additive idea of a new module on geology, and various other additive suggestions involving geology. Academic reifications about the need for curriculum integration rather than addition complicate the situation as there needs to be some means of getting outside knowledge into something more academically recognisable; the standardised object of recurriculation does this through transforming the outside need into a more academic structure. Again, we have a hybrid object consisting of a component of Work knowledge, geochemistry, and an academic standardised process, recurriculation. The hybrid object is developed by both communities as it becomes populated with Work and academic knowledge; recurriculation becomes a repository of Work and academic ideas. The hybrid object 'recurriculation' becomes more robust as the possibilities it opens up for change and development of the curriculum circulate through the meeting. Robust hybrid objects are less likely to fall foul of counter-reification which prevents their development, as happened in the less successful meetings.

Secondly, the language of recurriculation develops to include terminology concerning broad concepts in Work/academic knowledge integration (holistic thinking and so on). These hybrid terms are the seeds of a language of Work/academic integration which encompass more than just geology integration; they begin to describe the contours of a hybrid space for the development of more sustained Work/academic interaction and a more responsive curriculum.

In regular and ongoing interactions increasing numbers of hybrid terms develop into what Duncker (2001) refers to as a speaker's dictionary. As the speaker's dictionary terms accumulate and emanate from different communities, a hybrid language or pidgin begins to develop which enhances cross-community communication. This, of course, takes time, developing during consecutive interactions. In the case of the Work/academic interactions examined here, the meetings are infrequent and there is insufficient continuity of exchanges for the speaker's dictionaries to fully evolve.

Enrolments

Enrolments are attempts by representatives of one community to convince representatives of the other to take on some aspect of their reifications. In transcript 2 Work attempts to enrol the academics into changing their approach to experiential learning so that students can contribute more productively in the workplace. Academics do not buy in here and instead counter-enrol Work to view experiential learning as predominantly a supportive learning experience for future work in the academy. Work 1 buys into this ('I accept your idea') but Work 2 resists enrolment and challenges the academic reification of experiential learning. In transcript 10 Work successfully enrols the academics to take on the idea of including geology in the chemistry curriculum as this would improve the training they give to their students and their 'Work-readiness'. Enrolment to this idea is something of a necessity for academics in technikons/universities of technology. Though in some cases enrolment may help enable productive outcomes, the caveat expressed in Chapter 3, Section 3.4.2 needs to be acknowledged. Enrolment may be more of a co-operative tool aimed at glossing over difference rather than one which raises differences as a precursor to boundary crossing.

7.8 Conclusion: Initial differences and actor strategies

The analysis in Chapter 6 began with a focus on initial difference and its ability to enable or inhibit further developments, with an initially diminished role for actor strategies. However, in performing the retrospective analysis, actor strategies emerged as an important contribution to productivity and a more dynamic model of difference and strategy was developed. In this Chapter the focus is again on initial difference and subsequent *actor strategies*. These take the leading role through either developing differences so as to make them immovable, or through mobilising boundary devices to use difference as a resource for hybrid developments.

Chapter 8: Responsiveness as mutual change and development

8.1 Introduction

In this chapter I will integrate my theoretical claims and empirical findings about knowledge interactions, then extend these claims to make a more general case for the effects of difference on productivity. This will allow me to propose a model for responsiveness in the higher education institution. I will begin with the overall empirical findings from Chapters 6 and 7 and look at what patterns emerged in Work/academic interactions. I will not summarise all the empirical findings and conclusions but will focus on where these findings lead in terms of a model for productive sequencing of interactions.

Being responsive to Work refers to the integration of Work needs and knowledge into the higher education curriculum. External pressures to integrate are interpreted within institutions and departments and space is opened up for the development of hybrid forums in which knowledge from Work and the academy can be brought together. There will always be differences between Work and academic practices and thus there is always work to be done in bridging these differences.

In general the case is made that responsive policy alone is inadequate as a blueprint for making future academic work more responsive. Firstly, it is designed to cover a wide variety of locales and disciplines and is not meaningful unless it is localised through interactions around specific disciplines and Work-fields. Secondly, because it does not recognise that Work and academic knowledge and processes are essentially different, it tends to throw often conflicting claims together without showing how they may or may not link to one another, thus creating difficulties for those attempting to implement such policies in grounded practices.

Though I have referred to Bernstein's theory of recontextualising fields my focus has been on something different. It has been on the two-way interaction of knowledge from different arenas, rather than on how knowledge from outside becomes

reclassified and ‘pedagogicised’. Barnett (2004) uses Bernstein’s concept of framing to describe the relative influence of Work and academic disciplines on the structuring of vocational knowledge. He poses the question as to whether or not it is possible for both forms of structuring to operate in vocational pedagogies. In my work I have attempted to show, through the concept of hybrid Work/academic knowledge development and the analysis of hybrid interactions, that it is possible to develop such a bi-directional structuring.

The theoretical turn here was to understand academic/Work interactions as creating mutually disruptive third spaces (or hybrid spaces) where knowledge and ways of doing from both communities could be decontextualised and recontextualised in terms of the problem at hand. Productive interactions were defined as those moments in which collaborative knowledge formations arose through the actions of the actors involved, though pre-existing structures will also play a role. Where difference raised by one community is sufficient, then there is the possibility of disrupting accepted practices in the other, but with still sufficient understanding for productive work to occur. This involves a trade-off between disruption which is sufficient to drive change but not too large so as to be destructive, nor too low so as to have little effect.

Concepts of boundary work drawn from actor-network theory, but also from activity theory and community of practice theory, have served to characterise and to some extent explain the processes of decontextualisation and recontextualisation within the third space, and how different knowledges may become articulated with one another.

Furthermore, there is evidence that the third space is not just a space for the formation of new knowledge objects, but also for further development of these objects, through the use and development by actors of hybrid processes in the form of interlanguages. This theory-informed generalization of my findings allows me to draw out further insights, in particular about productive relations between policy and practices. I will conclude with some general reflections, including a few suggestions for further research.

8.2 Overall findings

Responsive curriculum unit design occurs in hybrid forums. Here, knowledge from the academy and Work are integrated into hybrid objects with different levels of productivity. Analytic types of hybrid object based on the initial degree of difference between Work and academic knowledge can be mapped onto different fields of academic knowledge with varying closeness in their relationship to Work knowledge. The Nooteboom-inspired model, which suggests that optimal levels of difference result in the highest potential for productivity, was recognisable in the cases examined. Differences which were either too large or too small acted as impediments to productive curriculum design. But difference alone was inadequate in explaining productivity.

Further insights into the production of responsive curriculum initiatives involved actor-strategies in dealing with difference. Even where difference was not optimal actors could strive to use whatever difference was available in order to set up a hybrid space in which new forms of mutually developed knowledge units can be constructed. The ideal in terms of productivity is where academic knowledge is used as an entry point to developing Work knowledge beyond the walls of the workplace, and Work is used similarly in academic knowledge development. Much of the failure in productivity, even where conditions of initial difference were optimal or near optimal, can be laid at the door of lack of operationalisation of vertical recontextualisation strategies (van Oers', 1999b terminology). Knowledge of such strategies would certainly enhance academics' abilities to design responsive curriculum units.

There was also a tendency for either Work or academic knowledge to be reduced before being integrated with the other knowledge. Where this occurred, the reduced knowledge was more easily integrated but poorly represented in the hybrid curriculum object as it was absorbed by the other community's knowledge. It was furthermore suggested that there is a trade-off between degree of reduction, and hence ease of insertion, and resulting productivity. An awareness of this trade off is advantageous for the university responsive curriculum developer. In some cases, particularly in business studies, academic actors may work outside of their academic community as well, becoming researchers, developers and promoters of Work knowledge at the

expense of discipline-based academic knowledge. New, Work knowledge may arise here but this is not productive. Academic knowledge is so reduced as to be nearly invisible and hence does not serve to disturb and possibly enhance and develop Work knowledge. The relationship between initial difference, actor strategies and productivity in curriculum unit design is summarised in Table 1 below.

Initial Difference	**Actor strategies**	**Productivity**
Moderate or low	Difference amplified and made explicit by actors and worked on as a resource	High
High	Difference reduced for easier insertion	Low

Table 1: Initial difference, actor strategies and productivity in curriculum unit design

In more formalised between-the-walls type of interactions, the advisory committees, patterns of interaction were observed between representatives of Work and academic communities. Though hybrid in nature, and hence likely to encourage the representation of different reifications, much of the time spent in these committees involved the presentation of reports and discussions in which little or no difference was raised. These meetings were classified as unproductive.

In other instances, large differences between academic and Work knowledge were presented and were quite disruptive. Despite some attempts at brokering and boundary- crossing, hybrid objects only developed fleetingly, if at all. Where they did appear they were not developed further. Where differences were less strongly presented then there was disruption but there was also opportunity for actors of different communities to act as brokers and to mobilise boundary-crossing devices. Hybrid objects were now more supported and had the possibility of developing further.

One apparent difference between the findings in Chapters 6 and 7 was that in Chapter 6, disciplinary difference was seen to play a role in the productive outcomes of curriculum design, whereas this was not acknowledged in Chapter 7. However, the cases actually analysed in Chapter 7 were all of the Becher and Trowler (2001) 'hard-applied' type. Although this may be viewed as a oversight in the research, it was also advantageous in that it allowed the researcher to concentrate on differences between Work and academic knowledge and subsequent processes, rather than on the influence of different disciplines in the interactions.

The relationship between initial difference, actor strategies and productivity in face-to -face meetings is outlined in Table 2 below.

Initial difference (s)	**Actor strategies**	**Productivity**
Mutual differences are raised but not strongly	Actors acknowledge and partially work on difference, producing the beginnings of a hybrid space before counter-reifications are raised. Difference is then used as a resource within the space through mobilising knowledge reduction and standardised objects via brokers	High
Mutual differences are strongly raised	Counter- reifications ensue and actors work to cement differences	Low

Table 2: Initial difference, actor strategies and productivity in face-to -face meetings

In the meetings context deletion and reduction of knowledge served to contribute to productive developments, whereas in curriculum unit design it was viewed in a negative light. This apparent paradox can be explained by examining the different contexts and their time relations. Curriculum units had already been designed and were examined retrospectively. No future negotiation and developments were taken into account. Thus once an item had been reduced and absorbed it tended to stay like that, embedded within the hybrid object. It was, however, suggested that what started off as little change in the structure of either Work or academic knowledge could over

time become more so. This could occur through a 'fit-stretch' strategy (Hoogma, 2002) where the initial hybridisation was fairly close to existing conditions but this provided a platform for further developments through the actions and experimentation of those involved in the initial hybridisations. There is some evidence to support this suggestion (See my discussion of the case of context studies in Chapter 6). In hybrid advisory committee meetings, on the other hand, where reduction did occur, there was opportunity to develop and amplify knowledge which had been initially reduced during the course of the meeting; reductions are not fixed but are worked on by actors.

An additional point can be made about structuring. In innovation studies some sort of structure is necessary but over-structuring can also stifle creativity. In Work/academic meetings the presentation of fait accomplis or reports for approval is the sort of over-structuring that may be limiting. If interaction around differences is the desired process then the meetings need to be structured to enhance and develop difference and boundary crossing rather than one-sided reporting.

From these overall findings a generalised sequence of productive events can be proposed. In so doing the discussion moves from expounding the findings from the contexts analysed to putting forward a more generalised model.

8.3 A model for productivity

In the discussion in Chapter 7 (Table 2, Section 7.7) I initially extended the characterisations of productive interactions observed into a sequence of events. In performing this move I noted that the sequence could be used as a map; it can represent productive or less productive directions, and this is dependent on both initial difference as well as actor strategies.

I now select from the findings and extend on what was observed in order to put forward a general model for productive interaction leading to hybrid objects. It is a general model in the sense that it covers the variety of possible trajectories, but it is

also a model in a normative sense in that actors can read it as offering soft prescriptions for how to work towards productive bridging of difference.[16]
Table 3 combines the findings from Chapters 6 and 7. The top half, rows one to four are derived predominantly from Chapter 6 whereas the bottom half (steps five to eight) has its origins mostly in Chapter 7.

Referring to Table 3, the first step in productive interaction in responsive curriculum design is the representation of Work knowledge in some form of hybrid forum, where the possibility exists for knowledge negotiation between actors. Initial differences may now be raised in step two and the negotiations will follow different paths. Differences may be optimal, hybrid spaces may develop and the possibility for further boundary-crossing work using boundary devices may ensue. Whether or not this follows a high or low productive pathway now depends upon the strategies followed by actors in step five.

Where difference is initially too small to on its own create the potential for further work, this is not necessarily the end of the road for further productive interactions and outcomes. Actor strategies may come into play in an attempt to explicitly raise differences and use them as a resource for further mutual developments, a strategy of vertical recontextualisation (van Oers, 1999). Likewise, where difference is too large, avenues for further productive work are not necessarily closed. Actors may also choose a fit-stretch strategy (Hoogma, 2002, shown on the right hand side of the Table) in which Work knowledge is initially closely aligned to the prevailing academic knowledge. This would be the 'fit' part of the strategy. Conditions for fit strategy are not, however, static and actors can engage in additional learning and change. Over time, through experimentation and development, actors may be able to 'stretch' the existing regime to produce a more productive Work/academic hybrid.

[16] Making 'general model' type claims in social sciences within a constructivist paradigm is problematic. At best one can present generalisations based on patterns detected empirically which are working hypotheses for future work. Lincoln and Guba (2000) maintain that there is no such thing as a valid generalisation in social sciences and that one can only, at best, have what they refer to as a working hypothesis. Anderson (2005) makes much the same point by referring to a 'moderatum generalisation' in qualitative social science research. Both of these labels refer to generalisations which can explain current actions in the future but which also need to be continuously tested, adjusted and developed within new sites. The general model in Table 1 is such a generalisation.

In step five in the left-hand column interactions do not lead to very productive outcomes. Disruption of academic knowledge by Work is contained through mobilising 'recontextualisation principles' within the target educational context which reshape Work knowledge into more acceptable, educational forms. For example, a Work practice such as 'networking' can be transformed into an educational practice by reshaping it according to the academic recontextualisation principles of running a workshop with information sheets, timelines, organised groups with specific tasks etc; at least some of these rules are standardised formats of educational practices which serve to organise Work knowledge into a new format. The articulation of recontextualisation rules can be strong or weak and this may depend on the nature of the hybrid forums where interactions occur (it may also depend on the relative status of the academic knowledge and the strength of ties within the community. Where these are strong and dense, reifications are likely to be stronger and supported and cemented as knowledge circulates). Where interaction is limited and most of the work is done by academics, then academic recontextualisation principles are likely to predominate and Work practices are largely absorbed by educational practices.

This sort of absorptive transformation is productive in that a new set of practices has been constructed. But the Work knowledge has essentially been fixed in codified form according to semi-rigid rules; this codification presents little opportunity for further Work/academic interactions and development. The opposite process, where academic knowledge is reduced in more Work-dominated interactions can also be observed.

What is harder, and requires more work in the form of strategic action, is when transformation occurs in more interactive transaction spaces, and involves an examination and critique of the moved knowledge against the knowledge in the new context, as there may be dissension between the actors from the different contexts as to what is of value. Difference here is used as a resource rather than being muted and absorbed. This is the process shown in step five in the right hand column. Boundary devices would need to be articulated by the actors rather than the more asymmetrically applied recontextualisation rules (even though these may involve some boundary devices). There is the construction of a new object which is more symmetrical in that it looks to and develops both the needs of Work and the academy. Even so the hybrid object is not yet finalised; it may go through a number of further

transformations. It is thus potentially developmental, so I refer to this as developmental transformation to distinguish it from more closed forms of transformation such as absorptive transformation in step six of Table 3.

Both processes result in novel hybrids of Work and academic knowledge but the one is potentially more productive than the other, and may develop further (step eight).

As indicated there are three possible routes towards productive outcomes; vertical recontextualisation, boundary crossing with an optimal degree of difference and fit-stretch strategies. All three involve an interplay between initial difference between Work and academic knowledge and strategies used by actors from the different communities.

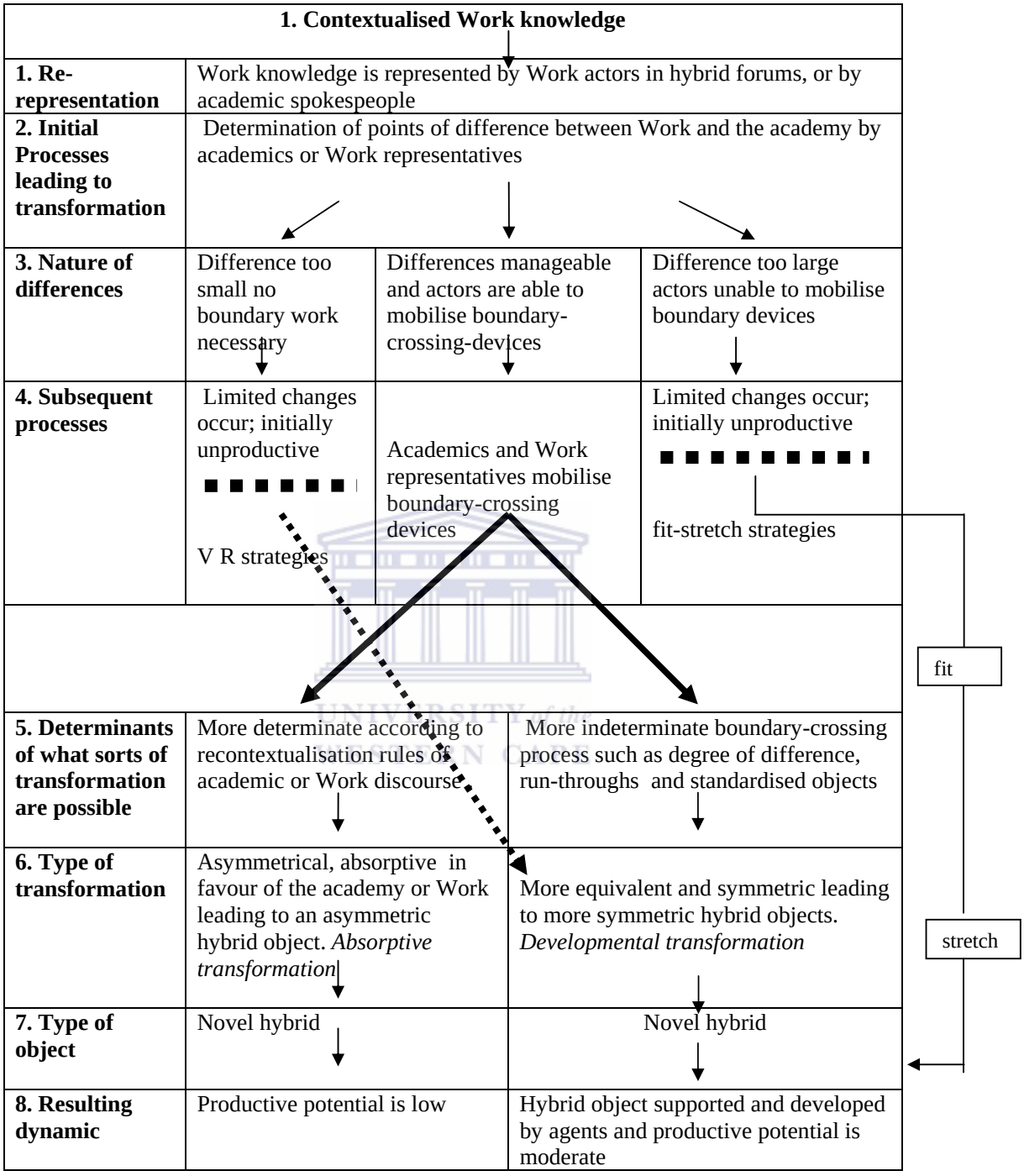


Table 3: A sequential model for the relationship between degree of difference and Work/academic knowledge transformation (VR refers to vertical recontextualisation)

8.4 Responsive policy and change agency

Chapter 2 outlined the policy backdrop for responsive curriculum development. Inevitably some issues were also raised about implementation of such policy, though these were not explored. Given the findings about interactions across difference and the sequential model for productivity proposed earlier, it is possible, over and above the research findings, to make suggestions about how Work responsive policy may most productively lead to changes in practice.

A more general point can be made about the productive implementation of policy, but for this thesis I will limit my argument to responsiveness policy.

Responsiveness policy exerts force on academic practices, outlining desirable directions universities should follow, and is a force for change and possible innovation, though not the only one. Implementation of policy is always a complex process, as Pressman and Wildavsky (1984) remind us, because it is at best a hypothesis that requires continual work as it interacts with different conditions on the ground. What actually happens on the ground will depend on the absorptive capacity of those on the ground to combine suggested practices with those currently in use. The degree of difference between policy and current practices, it is suggested, matters. Where it is too large there is likely to be resistance and where it is too small little change to current practices will occur. Where difference is interpreted as optimal (neither too large a difference nor too small) then subsequent, more grounded processes on knowledge negotiation and development may follow in some innovative way.

The potential for take-up of policy in practice is close to the innovative change arguments put forward by Rip (2004b) and Nooteboom (1999). The question asked in both innovative change implementation and policy implementation is how best to bring in changes when current practices are already embedded and seen to work? Even in innovative policy implementation, an optimal degree of difference between policy and current practice is useful, if the desirable output is for a new and innovative product.

There are three broad possibilities put forward for change in academic practices depending on the degree of difference between responsive policy and current embedded practices, using integrated programme development as an example, which are summed up in Figure 1 below.

Outcomes of policy interpretation in practice	Examples drawn from practice
Limited change as too proximal	The polytechnics already taught through structured programmes (though these were inadequately integrated across subjects) and the difference in policy was seen as too small to warrant change
Potential for change as difference is sufficient	There is difference between responsive policy and practices but it is potentially manageable and further action involving interactions between Work and the academy may ensue (work on curriculum units or in interactions ensues).
Limited change as difference is too high	The non-development of integrated programmes rather than subject led offerings in one university. Differences between policy, grounded practices and/or dispositions of actors is too large and policy rejected or superficially taken on board.

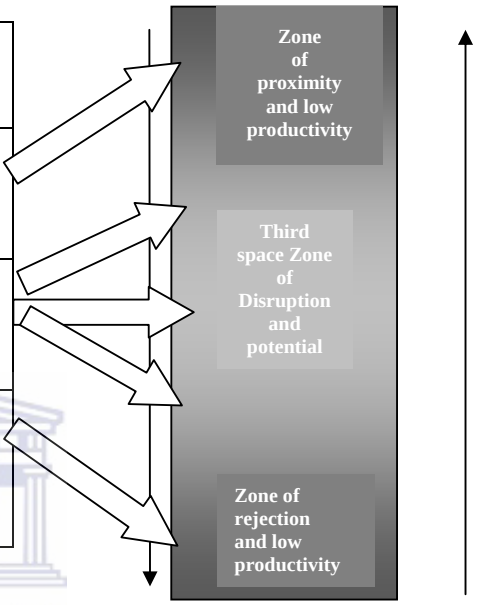


Figure 1: Policy take–up and degree of difference between policy and practice

The highest possibility of successful responsiveness to policy is expected to arise at optimal levels of difference between responsive, academic policy and academic practices. The hybrid object involves the integration of responsive policy directives with current curriculum practices. I can now propose a model in Figure 1 for the possibility of uptake of innovative, responsive policy in academic practice. The proposed model can be enriched and made more detailed by the inclusion of steps in the transformation of policy knowledge. These steps include the mobilisation of boundary-crossing devices by academic actors in the same way as was done in Table 3. The model, shown in Table 4 below, could predict the likelihood of productive and developmental implementation outcomes, given that certain conditions occur. The dotted horizontal line and vertical arrow in row 5 refer to the potential for even high difference between policy and practice to lead to some sort of hybridity.

As was suggested in the findings and in Table 3, the blockages evident in promoting change where policy is either too similar to current practice or too different can still be partially overcome. There is empirical evidence to show that actor strategies following on from of pre-existing dispositions of academics to, for example, the market, integration or generic skills, can, to some extent, unblock resistance to changes (Moore, 2003). There are also similar strategies to those suggested in grounded practices which can be used. Where, for example, difference is initially high on the right hand side of the Table at level 5, fit strategies could be mobilised where limited experimentation of one aspect of the policy only is explored. Where difference is perceived as not too large and actors attempt to carry on as before rather than engage with change, practices and policy can be carefully interrogated in order to identify points of difference as entry points to implementing change.

1. Elements of hybridised Work/academic policy within policy context			
2. Re-representation	Policy is represented by academic actors – policy moves from symbolic, substantive context to context of implemetnation.		
3. Initial Processes leading to transformation	Determination of points of difference between policy and the academy by academics		
4. Nature of differences	Difference too small no boundary work necessary	Differences manageable and actors are able to mobilise boundary-crossing devices	Difference too large actors unable or unwilling to mobilise boundary devices
5. Subsequent processes	No or limited changes. E.g. programme structure in old technikons	Academics mobilise boundary devices	No or limited changes. Largely symbolic policy. *Some* development is still possible
6. Determinants of what sorts of transformations are possible	Policy disrupts creating spaces and further boundaryprocesses ensue	More determinate and absorptive according to recontextualisation rules of academic discourse E.g. collection style integrated programmes at old universities put forward	
7. Resulting dynamic	Possibilities for hybrid forums leading to hybrid objects develops.	Possibilities limited	

Table 4: Proposed steps in the transformation of responsive policy into practice

Table 4 shows the steps that we would expect to ensue from the interaction between policy and practice. The ideal hybrid object would be at the bottom left of the table in

which responsive policy is innovatively combined with academic practices so that something new which speaks to both policy and practice is created.

Once responsive policy has been accepted and brought into academic practice in its changed form then the landscape for the development of hybrid Work/academic practice forums in Section 8.3 is set up.

8.5 Further research and reflection

The model for responsive policy in the preceding section is still speculative, but it indicates fruitful directions for research to develop such a model. Similarly, my analysis of curricula and Work-academic forums can lead to interesting questions for further research. I will give two examples, and end with more general reflections.

Insights into Work/academic knowledge developments in higher education could also be derived using a more structured, Bernsteinian approach in which the focus is on how Work and traditional academic knowledge is selectively recontextualised into the vocational academic curriculum.

Following Barnett (2004) the structure of the vocational units in Chapter 6 could be analysed in terms of, firstly, those elements of academic disciplinary knowledge which have been selected from the total repertoire in accordance with the nature of the profession. Thereafter one could examine how this new, hybrid classification becomes structured as a curriculum unit in terms of either the ways in which the academic disciplinary fragments are typically organised and taught, or, how learning is expected to occur in the workplace. Such an analysis should provide valuable insights for staff as to what sort of pedagogic object is being offered to students, and how this relates to further learning within the university and later in the workplace.

Within the hybrid objects developed in hybrid forums of the advisory committees the same process could be applied as to the nature of disciplinary selection. Thereafter, over time, as the object develops into a section of curriculum, the nature of its framing – either from Work or from the discipline or somewhere inbetween – could be examined.

In the advisory committee meetings it was noted that opportunities for boundary-crossing work arose but that this was not always followed up. What might help in such situations would be to have neutral individuals (i.e. individuals representing neither Work or academic communities) in the meetings who can identify opportunities, amplify these and attempt to act as brokers where either Work or academic actors are unwilling or unable to do so.

One part of meetings, co-ordinated by the neutral individual, could be the establishment of knowledge within the separate communities around a particular node, such as problem solving, or other identified key generic skills or practices. Community participants would be asked to bring forward their experiences of the sort of problem solving graduates would be expected to do in the workplace, and to reach some sort of consensus around these. But there would be attention to the identification and exploration of difference rather than to just ensure coherence.

There would obviously be knowledge transformation from the shop floor (and its equivalent from different subject teachers) but the opportunity for representatives to share their understandings of a topic should go some way towards dealing with problems of misrepresentation as there would be opportunity for representatives to question one another and match experiences. Once these reifications have been established it should be possible to match them for differences, and to predict what cannot be bridged, what does not need to be bridged and what is possible to bridge using boundary-crossing devices.

The role and usefulness of such 'boundary analysts' in enhancing the productivity of meetings would serve to extend the research done in this thesis as well as provide for a further research study into university boundary work[17].

[17] This suggestion is much like Engestrom's (2001) idea of a boundary-crossing laboratory. In such laboratories groups from related but different social worlds are brought together and problems between them discussed. These are then videotaped and analyzed by researchers and enabling and disabling actions highlighted by the researchers ('boundary analysts') at follow up meetings for further discussion. Although these laboratories have been criticized as being artificial, real issues are debated and workable solutions developed. In Engestrom's (2001) study of the problems encountered by health

Gibbons' (2004) thesis is that the university of the past was one in which what happened in the university was relatively impermeable. The university of the future is one in which 'the new contract will be based upon the joint production of knowledge by society and science' (Ibid.: 5). The actualisation of the new contract will, according to Gibbons, necessarily involve individuals in institutions engaging with boundary objects and transaction spaces where knowledge difference will be negotiated. If this is the case then the facilitation and management of hybrid forums and boundary- crossing between disciplines and Work will become core work within the university, even if this was done to some extent in the past, and particular skills and resources will need to be developed to enable productivity within these processes. The thesis ends using Gibbons' understanding of the university of the future as a stepping stone to some general reflections.

The research suggests that hybrid interactions need to be structured, purposeful and ongoing and involve the raising of difference on both sides if they are to be productive. But over-structuring can also stifle creativity so there will always be a tension between structuring and creativity.

The work in this thesis has focussed on understanding how boundary crossing occurs, some of the conditions which may enhance productive boundary work and how impediments to productivity might be overcome. The steps towards productive interactions in Table 3 of this Chapter can be used as a partial explanation of productive responsive curriculum work in Work/academic hybrid forums, and as a partial diagnosis of problems which arise in these forums, as academics attempt to negotiate new knowledge forms with their Work counterparts. In the light of this, particular skills and resources would need to be developed in the new university.

One set of skills and resources starts with the explicit naming of difference between academic and Work communities, and the establishment of 'third spaces' for the productive development of new knowledge. This was the focus of my study. Another set of skills and resources is necessary to move from exploration of new

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care practitioners in patient movement between primary health-care clinics and hospitals, a serviceable solution was developed in the 'laboratory' which met the needs of both the clinic and the hospital.

developments to exploitation and further development (as it is phrased in innovation studies, Cf. Nooteboom, 1999). In higher education this would involve putting the new hybrid Work/academic knowledge into practice through developing teaching and learning methodologies, materials and ways to evaluate its effectiveness. Exploitation is a necessary developmental stage. But it is also conservative in that new knowledge resulting from tensions around difference is not, at this stage, occurring. The once new hybrid knowledge would be presented as unitary knowledge and much of its hybrid origins hidden or black-boxed. As circumstances change, for example the nature of Work, the exploited knowledge would be likely to come into tension with other, different forms of knowledge and a new cycle of exploration and responsiveness would begin. Rather than waiting for tensions to arise before responding it would be advantageous to maintain, in some small way, difference, tensions and exploration so that the academic institution is in part pre-adapted and prepared for future responsiveness.

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Appendix 1: Semi-structured interview protocols on responsiveness (from Chapter 6)

The field of the questions is that of knowledge movement from worlds of work and society and its instantiation into another world, that of the higher education undergraduate curriculum. The focal points for the questions are the following:

1. The changing nature of society and the workplace.
2. Knowledge change between different worlds with different rules of operation.
3. Actors and settings in which knowledge moves.

Curriculum and the world

Do you see the world which your graduates are entering now and in the future as different from that of the past? If so, how has your curriculum changed in order to meet this challenge?

Are there any new means of constructing curriculum which break with the past (i.e. more transdisciplinary groupings involved in design, new mixes of expert and on-the-ground information, negotiated curricula with learners and workplaces)?

Is there any way of testing the effectiveness of curriculum as learners enter the workplace/society?

Is it possible to look at a good example of knowledge movement from outside the academy into the academic curriculum, and a corresponding case of where this did not work so well?

Transactions of knowledge

How is knowledge of the world outside the academy communicated to lecturers and course designers? In what sorts of spaces does this occur? Are there examples of knowledge put forward from individuals representing the world which was changed so as to become part of the curriculum then re-represented to these same individuals? What was their response? Was there any misrepresentation?

What are the forces and constraints which come into play in developing a curriculum in the academy? (e.g. subject structures, administration, educational policy).

If respondents showed interest in the project interviews were set up in which the following broad questions were posed:

- What are the characteristics of the workplace?
- How is knowledge between the workplace and the academy transacted?

- How is conversion from the one to the other done?
- How is progression ensured?
- What are the main skills learnt?
- What is problematic or works particularly well?

Interviews were recorded electronically or in writing and emergent patters of practice were identified.

Appendix 2: Example of Interview with senior Work representative in the civil engineering advisory committee. (from Chapter 7, section 7.3)

Berense Petersen at the Provincial Administration of the Western Cape offices; Greenmarket Square, Cape Town 21/10/05: 9 a.m. to 11 a.m.

J: the interviewer, myself; B: Berenese Petersen, the interviewee. ***Italics are used to highlight points of particular interest.*** The bracketed numbers are tape markers.

J: What is your background?
B: I am involved in the work integrated learning programme which runs across various branches. It is a big dept. I am the programme coordinator. I am not an engineer. The programme covers a range of tech courses.
J: How did you get involved with the advisory committee?
B: Because of my position. I have been doing it for 4 years, long enough (laughs)
J: What do you see your role as being?
B: I think attendance at the advisory committee gives one an insight into the thoughts and process in the technikon around recurriculation. *What is not very encouraging is that they almost always inform that forum at a late stage* of changes in the curriculum, they make changes and tell you, that is the impression I am getting. And I see the role of industry on that committee to be a participant in that process instead of them communicating information.
J: You would rather it was more of a workshop? More production of ideas?
B: Absolutely. Mmm
J: Do the academics approach the work they do in education differently from you in the province?
B: Let us talk about what happened in the last meeting. *We were informed to brace ourselves for the reduction of el from 12 to 6 months. And t*he reaction was, not acceptable. Because already the industry struggles with you know a student with a basic theory background, to teach him the skills on the job. And we believe you can never get enough, what, what, the time for the student to learn is already limited to the number of periods prescribed by the tech.
J: Where did 6 months come from?
B: No idea. Students come to us and ask if we can extend their 6 month contract so they can study part time. And I do not see why we must sit with the problem at the tech level the basic need is for students to gain experience in the workplace, you know. It sounds as if … *the reduction of training is something to do with money, and the funding per student. I think it also has something to do with transforming from technikons to universities*. You know being more academic. But the fact of the matter is the students, with whatever theory they have, they will not be ready unless they get practical training. You can almost not short change students. Our experience is observing students before and after their experiential year (and there) is a clear indication of the importance of practical training. They develop at an accelerated speed, almost ten times faster, than sitting with a book. You read and think you understand then you get to site and think you understand what you read, but you did not understand it. But doing it on site they say 'Oh ,wow that is easy'. Because what they see they learn and it makes sense. Consider going through the whole theory part, it is just accumulating facts on paper. *It is a problem* . If we could be part of that debate it would be so much more useful.

J: Would you like experiential learning to be more like a learnership? With students doing lectures there is not a clear distinction between time at work and in academy.
B: Absolutely. It is a way to go. I do not know what the problem is. But not giving students even less time on site to learn. (44)
J: Are there any other particular differences between the way academics and you think?
B: There is a change in thinking .. hard to say .. *because we have different roles to play and that is what it is essentially about, then academics teaching the facts of the field, the subject knowledge*. I think we have spoken enough about marrying the two. To quote an example of different thinking between us and them. The student comes with guide from the institution to experiential learning and it is very detailed and very good; they tell us what is expected and what areas to cover and how the student will be evaluated. They require the student to do a presentation once a semester which we incorporate and invite the technikon lecturers to come. We do not do the presentation in isolation from their work. *But the format of the score sheet the academic use for marking the presentation, it is very academic.* We would look at what did the student learn onsite. They present to us what they have learnt. We look at the content more than how the presentation is done. If you consider the score sheet it has the student's body language, did he handle the presentation equipment well, and so on. *Which for us is not important, the content is more so.*
J: What about the use of technical language?
B: Absolutely. They must use that language they have learnt in theory. Not just the presentation techniques.
J: Are there any other difficulties you have experienced in the meetings?
B: I think it is a very good exercise to bring role players together. But the agenda probably has to be looked at.
J: What are the successful things which have happened in meetings?
B: It is good for all the players in industry to meet each other. Ummm around a common topic which the technikon presents. We as role players have difficulties and we can learn, benchmark, network and exchange ideas. And through the Technikon that is made possible. *It would be much more difficult if we had to individually connect with each oth*er.
J: Do you see yourselves (the technikon and Work) operating coherently, are there big differences between you?
B: We are coherent. But I am not sure whether the meeting allows for sufficient time … we have a platform for the technikon to ask us) what is your experience, how do you find it, there is not a common topic, and the technikon listens and we present. *At the moment the technikon presents and we listen* .
J: At one meeting the work people left and caucused on their own.
B: *The industry group could maybe have their preparation meeting before the plenary with the academics).* Civil engineering forms the bulk of our project (in the province). I have a problem with Eric (her boss) being chair. I think the technikon should play that role. Otherwise we might as well operate as consultancy for the Technikon, or for industry at a coordinating level. I believe if you do something you must be committed and do that to the extent you exhaust the topic so you cannot just be … I see us as one role player amongst industry as opposed to being the chair. *I said they should pay you (Eric) as a consultant*! It is a freebie, we can be there and talk but I am wary to do the work of the technikon .
J: Is there any benefit for you then?

B: Sharing information. And an opportunity to meet the other players in industry around work integrated learning to hear how things are going. I would rather want to see we get the agenda earlier, or are invited to supply items well in *advance so that we are not just an audience.* More especially that we are not informed about decision already made (when we get to the meeting).
J: Thinking about the university, do you feel there are changes in the way they operate?
B: There are some that we are not aware of, that we are not informed of. We meet once or twice a year. There could be a system that as members (of the advisory committee) we form part of the communications channel. And that we get recognition as members of the body, that we are recognised in relation to it. They could formulate a questionnaire and ask us to give us your view on the following meeting. It does not always have to be a meeting. But if there are major decisions .. curricular changes … (we need to see) that industry is consulted. At the end of the day the technikon can show it has got information and interaction from all of the role players. At end of day technikons prepare students for industry. So it is important that industry has an active role to play.
J: Can I Show you stuff I do at meetings when I try and interpret what is going on? Can you read it and comment?
B: (She reads the transcript and the coding) The point I made was that in semester one the students do not have a choice of project. But the technikon is here and they are there at work. At work they get a scheduled task which they have to produce at the industry too. For them to produce another unrelated project (for the technikon) they have to take time off, which is a problem. My issue was, is it (the project) aligned to what they are doing?
J; That is what I picked up. Work suggests an in-between version, a different way to do it …
B; Mmmm
J: Then academics said we have to prepare them for later work in the Technikon then it got left, this issue.
B: Well, we are confident in what we are doing in civil engineering. We are doing road building, that is our environment, and we believe that students exposed to road building and maintenance, you know, construction, bridge design and whatever, if they cover that they should be well equipped to be a civil engineering technician in roads or anywhere else. But the technikon is saying if we limit the project they might lose out on something else and we have a different view. I appreciate the fact that we are only one part and the technikon has to cater for all students generally, they have a generic approach. In industry, maybe, students are working for a contractor and doing repetitive work in one area and the Technikon gives them projects to get around that one. But in our case, in Province, they get a solid training programme that covers everything they need. The project they (the tech) give them interferes. At the moment the project is loose standing from the actual training. We expect them to do a technical report at each phase. The technikon wants them to hand in their project and at the same time the student is maybe doing the technical report which is not a one or two pager. And hence *we are saying, that the technical report could be the technikon project.* We expect them to produce what is required according to industry standards.
J: This part about when to do their experiential learning. Ninham-shand (an industry) asked if it could be in year three. I liked Ninham saying this in-between idea of letting them in for short periods on site so they can experience work in year 1. But the academics rejected it. But Eric (province) came up with the idea that the student

chappie knows so little (after first year when he goes into work). Do you think what I did (in the transcript) to show that Ninham had an in-between idea was ok?
B: I believe we are training people in this category for what we classify as tech skills. And industry and the tech need to co-operate in producing quality. If we are serious then what industry says makes all sense. *We identify the person early and sponsor them for future employment*. So I support the idea of working and studying. We should handpick from school and get them to hand in projects related to the field of study. It could be holiday work or infiltrated into the academic programme. I think it is important for a technical student that theory and practice should be combined throughout the study period. (200).

Appendix 3: Example of Work/academic meeting transcript. (from chapter 7.6)

Analytical chemistry combined Peninsula and Cape Technikon. Department of Analytical Chemistry, Cape Town campus. 20/09/05: 2 p.m. to 5.30 p.m.

Jeanette is the Work chairperson. Each member is given a code name. Work members are marked with and asterisk*.

Conversations	**Interpretations**
***Ewan:** training and development at Anglo-American is always very important … we have created chief chemist (to work with this training) we decided to give feedback on our concerns. But first some background to Anglo labs. Of our 200 chemists 60% of them are technikon trained. We have concerns about exp. Learning, the phasing out of one year to six months – we need one year to assess the student to get a measure of who will get a bursary. The first five months gives us nothing and if it gets shorter we will stop bursaries. Our biggest problem is communications. We need good writing skills and this is a big concern. We have recently added quality to chemistry as we are ISO compliant … spend more time on statistics and we can look at more SHEE (?). Guys, when they arrive, are quite cold on this. It is not so applicable to here but we would like geology/mineralogy added into the course ***Jeanette:** A sort of Geochemical situation? ***Ewan:** Ja, guys do not know the difference between minerals and rocks. . That is a major concern and also in service and doing something about english	Ewan from Work raises a *difference* between current work needs and the training students get
Jenny:** One question, you mentioned writing skills. What about oral articulation? … General Motors said it was verbal articulation not writing (that was the problem). ***Ewan**: … there is more writing at this stage ***Jeanette*:** Communications is a topic for later on the agenda .. we took big drastic steps on this, particularly verbal communications. ***Merryl: This 6 months and one year EL. It started in KZN but we have not changed it. It takes three months minimal just to train someone ***Ewan**: Good, I will mention it . ***Jeanettt*e**: Last meeting we spoke about our strategic action plan and we should start with the CPUT vision and mission before our SAP. Are there any actions following Ewan?	Academics understand this difference and accept it
***Jenny**: I have an idea from the communications side … ***Merryl:** I think the introduction of geochemistry is a good idea. I think it is very important. Lots of industries require more information like mining, pharmaceutical, microbiology and so on. There are lots of areas where more information is needed. Should this go into the diploma or is there too much already? ***Jeanettte;** You could get someone from industry to talk about minerals … ***Ewan:** No, it needs to be more formal … ***Lecturer 1:** It needs to be more formal and we must test it. Then it sticks	Work (Jeanette)suggests a shorter less formal sort of input Work Jeannette after discussion

Merryl: … but the curriculum is very full … ****Jeanette:*** Why don't we have **modules** on geochemistry, pharmacology, forensics etc? ***Abdullah:*** We need more detail on the curriculum, some sort of starting point … there are different types of chemistry …. ****Jeanette;*** We need more detail, Ewan, on mining. ***Lecturer 1:*** There used to be chemical engineering technology and it was thrown out. It would have fitted in here. It can be made 1 or two lectures somehow. ****Jeanette:*** I think that when the industrial person comes there should be a test about it ***Lecturer 1:*** Students should see and handle these things (rocks and minerals) ***Meryll:*** Ewan and I can get some stuff together (on geology) ***Jeanette**: what about the other 5 industries? Perhaps one hour on each of them? ***Meryll****;* Maybe we do 3/5 of them? We are not the experts, who is going to do it? ***James:*** What tends to happen is that people add in more and more onto the curriculum we keep on adding on modules and we should rather think of integrating this new stuff into the curriculum otherwise we just overload the curriculum ***Lecturer 1:*** The last time we **recurriculated** chemistry was 15 years ago. We need to think about recurriculating the whole thing, it is a good time to do this with the merger [there is discussion here and a date is set in November to re-plan the curriculum and various work people agree to join in] ***Lecturer 2:*** As a university we need to bring in new teaching topics and research ***Jenny:*** It is coincidental that the focus is on communications. As one concern is that communications is a service subject. But we are all servicing the needs of students. So 'service subject' is a misnomer as it makes communications my job and not just everybodys.We just add and add things to the curriculum and student's home language is not English. So (I am) very much into the idea of recurriculation … perhaps focus on two subject areas and the language requirements of that area also vocabulary, e.g. in a chemistry assignment, what sort of referencing is needed … ****Jeanette:*** What action do you suggest? ***Jenny:*** Lecturers should target topics and work out how I am going to target it to develop students language skills communications it is not just Jenny doing the whole faculty. ***Meryll:*** So when we recurriculate… ****Thabo Work:*** When is communications … in the first or final year? ***Jenny:*** It is only in the first year but I get asked to do work in the bachelor of technology degree. You can't expect students to remember all the way through to the bachelor. Don't expect students to do something unless we give a mark for it. We have a terribly commercial attitude amongst our students .. if we do not give a mark for something they won't do it. How can we say something is valuable … it is not what we value but what you	suggest a formal intervention. ***Modules*** are a sort of ***inbetween*** which could satisfy needs of work and academics – modules speak to both of them. Accepted by academics and fruitful discussion ensues. Objection in terms of overloading curriculum, and the idea of ***integration*** rather than addition is raised. New ***inbetween*** idea of how to meet needs of work (geology) and large curriculum (academics) arises in meeting – ***recurriculation*** . Recurricualtion becomes a ***developmental term*** which enables the academics to bring in communication concerns raised by work and

get a mark for ***Jeanette:*** Notes for … is that all for communications? ***Jenny**:* That is it for me. ***Jeanette***: Comments and additions? ***Sipho:*** Just to support what Jenny has said I have done studies and one thing is that for language and technical usage you give 20 marks and for content it should be 80. So it forces them to write using and applying technical language. If they are taught in first year maybe that could help. ***Jenny:*** If it is acknowledged that things like referencing too which are quite abstract … ***Sipho:*** will it help in **recurriculation?** ***James**:* Yes, if you do the curriculum properly you need to align things the assessments and so on. ***Lecturer 1:*** It should be made one of the outputs of the programme it must be included in the outputs of all the different subjects and I think that will force people to pay attention to it… for each course a specific technical goal ***Meryll:*** If I could ask Ayesha (the minute taker) with regard to this recurriculation as a special thing so it not lost when we get to that point …I hope I did not leave anything out, any more contributions? We have realised that communications is a huge problem… ***Jeanette:*** The SAP? We were supposed to get a draft from the committee, it is on the internet [some laughter]. [short description from lecturers on position of the new vision and mission of the Cape Peninsula University of Technology] [Formal power point presentation on quality assurance in experiential learning from the academic chair.] ***Meryll***: … in industry there should be a supervisor and a programme of two to three months then they are assigned to jobs. We do not yet have an evaluation of the programme but we need it. I check with the supervisor if they are competent but as yet we have no measure to properly evaluate. ***Black*:** We have competency-based tools we use to evaluate our own analysts … you could use these.. ***Meryll***: We could give it a value? ***Jeanette***: Is it your intellectual property? ***Black***: I need to look at it we could give out copies (not electronic records). It has tasks in labs and students are judged competent … I do not know if this helps? ***Meryll***: Yes it helps. If they are judged not yet competent, what then? ***Black***: Then they are retrained and there may be 4 or 5 attempts but usually three until they are competent and all attempts are recorded. ***Meryll***: We use visiting chemistry lecturers rather than cooperative education staff as they need chemistry knowledge and it is also good to build relationships with industry … we look at their assignments, orals, log books and this goes into chemistry projects. [formal academic presentation on maths teaching]	also to better teach numeracy. (*Why does work not really comment on recurric?)*

Omar: We have one semester maths for diploma and one for bachelors… we do all we can manage … but large and diverse groups so it is difficult to adapt novel tutoring methods … so mostly lecturing … web, worksheets etc would help them in self tutoring out of hours. Research stats is mostly for their project work. ***Lecturer 2***: You cannot teach maths or comms out of context you must be using it in especially practicals all these things must be integrated for teaching to be effective. If we recurriculate then we must look at how to inetgrate maths and communications **Jenny**: Communication is invisible – you do no see the cart which carries the load. ****Work grey***: The whole idea of integrated assessment is important. The whole move is integrated assessment and not assessment separately. You should remember this when you recurriculate . ****Sipho work***: also look at SETAS when you recurriculate … how is it going to relate to them … what we do here must be relate to the SETAs … ****Jeanette***: The chietas (the chemistry SETA)… ***James***: There is a battle between Department of Labour and the Department of Education DoE and currently the DoE is winning. The influence of the SETAs in the higher education sector is receding, more in below matriculation levels. That does not mean to say we should ignore work done here though . ***Lecturer 1:*** We cannot teach maths and numeracy out of context. Students must be using it in special and practical contexts. If we **recurriculate** then we must look at how to **integrate** this … ETHICS AT WORK ****Jeanette:*** With work ethics preparedness I went round to HR people and asked what they would expect from a fully prepare student and they said don't talk to me ask the supervisors and managers of the labs. I found that you could not really tell in an interview if learners could communicate or know about safety, ethics and health. You only find out later .quality kept on coming up – how much do they know? Is this valuable information? What does the meeting suggest? ***Lecturer 1:*** I think it is valuable information. It is like policing. Ethics must be emphasised by everybody all the time or it is forgotten. ****Jeanette:*** Why not send out a questionnaire to each supervisor 'what do you want from students? Then make a list. ***Old lecturer***: Isn't this work ethics thing part of work preparedness and in service training? I really feel it is part and parcel of Work Practice from our side and from industry. ****Jeanette:*** Yes but they want to get students who do have it but they do not seem to_ ***Old lecturer:*** No, but I feel it is part and parcel … of …. Policy and it fits in here with work preparation. ***Jenny:*** I do stress management in class and I spoke to the WP people and there is an overlap here but what about credit … students won't learn unless there is credit. ***Meryll:*** I was at Bellville campus and I heard we need credit for stress and so on in the form of an assignment with marks but the problem is how do	

we actually fail the student? ***Lecturer 1:*** They fail if they haven't finished the course. ****Jeanette***: What action do we need to take over the last few points? ***Old lecturer***: All I can say with this workplace ethics is to make sure it is part of WP … that when they recurriculate they see that it is there **HoD**: What does the lecturer do in ethics? What does she discuss with them? ****Jeanette***: Interview skills, preparing to lead, time management, stress management and sex harassment . ***HoD***: What about in workplace ethics, couldn't you ask her to incorporate this? ****Jeanette***: What do you mean by workplace ethics? ***HoD***: Workplace ethics? I suppose it is something different … ***Jenny***: It is very much part of the workplace … the impetus came from the radiography department here … ***Hod***: What ethics are we talking about? ***Old lecturer:*** The way you are working … that stuff should be part and parcel of life skills – it is life skills. I.e. are you rude, are you, do you respect your boss appropriately; this to me is ethics … ***Merryl***: In the last two years I have seen two dismissals for crooking the books. ***Hod***; That is ethics I mean it is not medical ethics you know where you want to talk loud and stuff like that I am talking about that type of thing ***Merryl:*** Have you ever stopped to talk and think that your work is your honour? ****Jeanette***: For action then … ***Hod:*** What do we call it then, academic integrity … the results of your titration and things like that constantly ensuring that our students are aware of that that type of honesty academic honesty. It is a failing battle we know how they crook practicals (laughter). INSTRUMETNATION (report on and compare equipment at both campuses) ****Grey koe***: Just one thing from my side when students go to power stations we register them on the CHIETA learnership … we need assignments assessment instruments and standards to measure them against for that to be successful … otherwise it is a waste of expenditure (students have to pass for work to get payback from government). it means examples of doing things like demonstrating the use of spectrometer, calibrating an instrument etc not the process of how it is done but what is the outcome of what is achieved and that outcome matters to us … maybe the critical outcomes are not achieved in that practical on the job learning. There is always debate about what is done at university and in industry but if it is an instrument (with criteria) everybody knows what is required … assures success. ***HoD***: There is much to be said for this. Current EL assessment is weak on our side especially in terms of QA. I am more and more worried about the HEQC visit in the next few years. That body is known to have closed down	

programmes on this campus. It is extremely strict they want evidence we should all be aware of this. All must be tip-top not only for the practical (EL) but for the whole course itself.
Omar: Isn't it something we left out with the merger?
Hod; We need to be proactive to achieve this by the end of next year.
Jeanette: Even though this is linked to industry the audit will occur on campus …
Hod: Yes but we still need the EL standards and benchmarks our colleagues spoke about.
****Glasses work***: It is a sort of licensing to do tests well but it is not consistent. Supervisors must make it available … the whole history of the student ... they must store that information.
****Black work***: There is not much coming back to the university from industry except for the logbook .. supers do not look at it … the onus is on the students … they must know that it is very NB and the better its content the better it is … there is no rating at the end .but it must be substantial and audited.
Hod: We do good stuff but it is not documented …

PRACTICALS

Old lecturer: Practicals should be modularised – can you handle a pipette etc. now 1 super to 54 students … I just cannot mark 100 – 200 of them .. not enough space …
****Jeanette***: Perhaps an unacceptable question but aren't there too many students?
Hod: Correct, too many and too few good students … but it is the numbers game for subsidy .. we have to find balance between numbers and quality
****Black***: It is maybe an impractical suggestion, you've maybe heard already about taking some of the basic lab practices out of the practicals themselves and teaching them separately from the experiments; now we pipetting, titrating and weighing, transferring and the class is just doing those things so that when they go into the pracs you don't have to supervise the practical so vigilantly.
Old lecturer: All I can say is that I think the two campuses must go away and thrash this out and report back to industry because this is a problem that we have. Are we delivering the quality to industry that industry requires?
Hod: We are doing it some extent .. I do not think we are drilling the students
****Work x:*** Students can't change gas cylinders and things …
Hod: Burettes, pipettes … it is a big problem … but you're right … Oooogh (sighs).
****Jeanette***: Any more points?
James: As part of your institutional memory, I remember sitting in your meeting where this same issue was discussed and certain solutions were put forward one of which was that students would be examined in their interview on their practical ability, I do not know if you recall that?
Jeanette: Yes
James: There was WEBCT where Tobie suggested that students would try

the practicals on that a bit … just a point that there were a lot of good ideas that could be used … and it seems like we are going back to the same idea … and there all different people here … ***Jeanette:*** Yes but you missed a meeting in between and that discussion was only at the old Bellville campus .. but now with the merger we cannot impose the authority of one campus on the other … ***James:*** Good point but I still think the ideas were quite good ***Sipho***: I am just a bit worried about the fact that we have big numbers ***Jeanette***: If I can make a radical suggestion … why don't we go out if we've got this bottleneck and get sponsorship from industry for a lecturer who just focuses on certain aspects, I don't know if we can ... ***Beard***: The timetable … ***Jeanette:*** We could just have them coming for the first semester .. ***Old lecturer:*** There is something else we mustn't lose sight of that is our foundation programme being implemented now but it is not going to get rid of the problem yes, but we do need people so that we can make the practical groups smaller ***Jeanette***: Is it practically viable to have two people sponsored by industry and not by DoE? ***Hod***: I think it's a very good idea …. We build a partnership … it can only benefit industry ***Jeanette:*** We should actually write a motivation to our …. saying give us one lecturer here but we are looking at … we assume there is accommodation, etc. ***Hod***: I don't want to change the topic but I have to leave in 5 mins. The students who go through, it is about 30 % who leave with a qualification. now this is .. the institution is highly worried about this… but it has a big advantage talking about pracs. In other words the 70 who cannot pass won't be here ***Old lecturer***: But you do not want these people (laughter) ***Hod:*** Its got advantages and disadvantages but the institution is worried about this because they do not get a final subsidy on it … but it is has got a quality advantage ***Jeanette:*** I don't think (sort of) tongue in cheek, I hope not … but umm what I would see is addressing the bottleneck at level 2 now because the bottom line is producing scientists and more of them .. any other ideas … because it produces another bottleneck… Thabo you wanted to say? ***Thabo***: I just wanted to say this produces another bigger socio-economic problem. ***Grey***: just from my side we have talked this afternoon about a lot of **recurriculation** and that sort of thing maybe we must look at what is in that practical that is being done. Can we … are we doing it at the right level at the right time? Or are we doing it again when we get to the third year or can things be left out so we need to look at that programme as well so it might turn out that we can leave things till later as they are taught later ... I don't know … not only just to split the classes. Is it what we require? I know we … the diploma for many years and we moved over to OBE and we haven't done a lot in achieving it we are still concentrating a lot on inputs and not on outputs as such maybe it is the right time to see what is the outputs that are requirements and to forget about all the inputs of it is	

nice to know type of thing but are we producing the outputs that we want so I would suggest that we also look at it … in recurriculation … is done on the basis of . ***Jeanette:*** I must just add to what James has said earlier … umm … we mustn't just … action … it is not that I want to push people in a direction but I do feel that we discuss issues and that we must put issues on the calendar to come up later … for action. ***Hod:*** I would like to support that as I would like to add another dimension and that is the evaluation of practicals. Ehhh, at one stage we were … incidentally I was at that meeting that you referred to in that discussion with James … Merryl too … but at that meeting it was hinted that perhaps we should modularise chemistry into the theory and the practical part and Miss Ackerman has always been a great support of that and perhaps that is where we should start because you find a person going through chemistry two … but you can't fail him because he did so well in his theory. ***Jeanette***: Ya ***Hod:*** So we would like it is just a suggestion for discussion and Jean is not here today perhaps next meeting the pros and cons of evaluating it separately from the theory and the practical must be evaluated on skills and not on theory and we tend to forget just how bad we were when we started working (laughter) in labs. ***Omar:*** Can I suggest that we also look not just within our subject but things like statistical matters in maths is happening in various other subjects we start with some master programme that shows exactly what goes on at the various levels in the various courses and then move into the courses .. so what we lack at the moment is big plan which can show us what everyone else is doing ***Lecturer 1***: Recurriculation was the plan let us do this as soon as possible ***Jeanette***: Recurriculation for next year, 2006? ***James:*** It is starting in November this year, lets put some chemistry names down. COMPUTER LITERACY ***Lecturer 4***: At the moment it is done (computer literacy) by a part time lecturer on Bellville campus .. it should be included as part of the programme as a whole … like communications when we **recurriculate,** bringing in computer literacy s well as well as communications and numeracy . there is not enough involvement from other lecturers to say what they really want [There is description of a chemistry project competition funded by Work called the 'science idols competition' based on a popular television music show] ***Green*** When we **recurriculate** we must give our industry requirements ***Grey:*** We must put our minimum requirements on the table . [The chair wraps up and sets the next meeting date and thanks everybody]	