Knowledge-building

Educational studies in Legitimation Code Theory

Edited by
Karl Maton, Susan Hood and Suellen Shay

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2016
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloguing in Publication Data
A catalog record for this book has been requested

ISBN: 978-0-415-69233-5 (hbk)
ISBN: 978-1-315-67234-2 (ebk)

Typeset in Galliard
by Wearset Ltd, Boldon, Tyne and Wear

1 Legitimation Code Theory

Building knowledge about knowledge-building

Karl Maton

A practical theory

'"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay"' (Conan Doyle 1892/1981: 268). Sherlock Holmes thereby declared a desire to neither proclaim without evidence nor assume the facts will speak for themselves. In contrast, research into education and society all too often falls for this false dichotomy of speculation or description. Despite Kant's famous argument of 1781 suggesting theory without research is empty and research without theory is blind, the two frequently remain divorced or, at best, not on speaking terms. Researchers often seem faced with concepts that make sense until encountering the reality of data and empirical studies that lack explicit conceptual frameworks. Theory remains freely-floating, unable to fully connect with data; empirical descriptions remain mired in minute particulars, unable to reach beyond the specificities of their objects of study. Moreover, this is not the only forced choice faced by researchers of education and society: qualitative or quantitative methodologies, analysing practices or shaping them, generalizability or depth, humanism or science, behaviour or meaning, and so on. Typically presented as jointly exhaustive and mutually exclusive, false dichotomies abound. It is as if above the entrance to the field is inscribed the legend 'EITHER-OR' and in crossing the threshold one must leave behind any possibility of 'BOTH-AND'.

Such dichotomous thinking is deeply debilitating to knowledge-building about education and society. At the level of individual studies it gives rise to segmentation not only between theory and the data it purports to explain or the practice it aims to transform but also between potentially complementary frameworks, and between potentially complementary methodologies for enacting those frameworks. A perceived demand to make monotheistic choices leads researchers to prematurely renounce possibilities for explanatory power. At the level of the intellectual field, dichotomous thinking encourages the proliferation of strongly-segmented micro-fields, each addressing a discrete topic typically defined by various combinations of education sector (vocational, higher, etc.), institutional level (school,

university, etc.), subject area (music, physics, etc.), and disciplinary approach ('sociology of…', 'educational linguistics', etc.). Further, this endemic exceptionalism recurs geographically: each national system, by virtue of some unique characteristic, is held to require its own, strongly-bounded field of research. The resulting fragmented specialisms are often unable to speak to one another, negating the possibility of cumulatively building knowledge across disparate phenomena and through time. In short, disciplinary, theoretical, methodological and substantive sectarianism is driving segmentalism within the study of education and society.

This book contributes to avoiding false dichotomies and overcoming segmentalism by illustrating an approach – Legitimation Code Theory (LCT) – that enables both the exploration of knowledge-building and the cumulative building of knowledge. Since LCT emerged at the turn of the century the framework has evolved into a multidimensional conceptual toolkit (Maton 2014b). Research enacting the framework is growing exponentially.[1] Its integrative potential is illustrated by education, where the theory is serving as a basis for empirical studies:

- into diverse practices (research, curriculum, teaching, learning, evaluation, attitudes, beliefs, identities, etc.);
- across the disciplinary map (from physics to ballet, engineering to jazz, educational technology to journalism);
- in all forms of institution (schools, vocational colleges, universities, etc.);
- at different levels of analysis (education system, discipline, institution, course, classroom, single text, individual wording, etc.);
- across national contexts (African, Asian, Australasian, European, North American, Scandinavian and South American countries);
- with other approaches (including numerous models, systemic functional linguistics and critical realism); and
- using a range of methods (such as qualitative interviews, quantitative surveys and documentary analysis).

As this diversity of topics, complementary frameworks and methodologies suggests, studies enacting LCT are animated less by a command to choose 'either-or' and more by pluralistic engagement with possibilities for generating greater explanatory power. To paraphrase Pierre Bourdieu, social research is something much too serious and too difficult to allow ourselves to mistake rigidity – 'the nemesis of intelligence and invention' – for rigour and thereby deprive ourselves of potential resources (Bourdieu and Wacquant 1992: 227). Consequently, where the segmentation of much educational research affords only a fragmented account of education, studies enacting LCT are building on one another to embrace a growing range of issues (Maton 2014b: 196–217). They speak to each other through the theory. The framework thereby enables the possibility of a more integrated account of education.

LCT is being used not only to interpret the world in various ways but also to change it. Concepts from the framework reveal different dimensions of what Bourdieu called the 'rules of the game': the bases of achievement underlying social fields of practice. Such bases are often unwritten and unspoken, they 'go without saying' in ways that, when accessible only to actors from specific backgrounds, generate social inequality. By making such organizing principles visible, LCT enables these bases of achievement to become accessible to more actors, promoting social justice. They can be taught and learned, or changed. Accordingly, LCT concepts are being embedded, both explicitly and tacitly, within transformed and transformative practice, such as pedagogy and professional development.[2] Furthermore, uses of LCT are not confined to education. Studies are exploring and shaping diverse social fields of practice, including law (Martin *et al.* 2012), museums (Carvalho 2010), theatre (Hay 2014), and armed forces (Thomson 2014). It thus also holds open the possibility of generating an integrated account of society.

A guide to Knowledge-building

The rapidly-growing body of work enacting LCT is helping to overcome segmentalism in understanding education and society – it contributes towards knowledge-building. The current volume, *Knowledge-building*, illustrates how LCT enables such research and practice. Specifically, the book is structured into two main parts that offer complementary insights. Part I represents a kind of 'primer' in using LCT concepts in research and praxis by analysing projects that overcome false dichotomies between theory/data, quantitative/qualitative, theory/practice, and different disciplines. Part II provides a series of empirical studies, within and beyond education, that illustrate the explanatory power of the framework. Together, they offer insights into how research is enacting LCT across a diverse range of issues.

For the reader new to LCT, *Knowledge-building* can serve as an entry point on its own. This chapter introduces the framework and summarizes key concepts used in the book; each chapter briefly defines the concepts being enacted; and an 'architectural glossary' in Chapter 12 describes how concepts interrelate within the framework. Nonetheless, this book also builds on its precursor volume, *Knowledge and Knowers* (Maton 2014b). That volume delineated more of the conceptual framework and at greater length. It also demonstrated how LCT cumulatively builds knowledge by extending and integrating existing ideas within concepts that enable greater fidelity to more phenomena with improved cohesion and economy. However, space precluded extensive discussion there of the processes for putting the concepts to work. As I shall discuss, LCT is a *practical theory* of practice. Concepts can be enacted in empirical studies to engage in genuine dialogue with data and embedded within transformed practices to generate

praxis. In *Knowledge and Knowers* showing *how* this can be done was but touched upon and discussion of studies was necessarily limited. In *Knowledge-building* the processes and products of enacting LCT in research move more to centre stage.

Part I: The craft of LCT

Part I of this book comprises four chapters in which research practice is foregrounded in reflexive analyses of major studies. They are somewhat unusual in focus, revealing what is typically hidden in published research: how finished products are reached. Moreover, they do so in an unusual fashion. Rather than discussions of method abstracted from research, each chapter reveals how theory, method and data were intimately related within the unfolding context of a real research study. However, rather than descriptive travelogues of the journey of a project, each chapter analyses the practices whereby the research was conducted, drawing lessons for future studies. These chapters thereby contribute to making visible the craft of LCT and making more available the gaze that guides research practice that is appropriately using the framework.

As indicated by their main titles, Part I chapters address how to enact LCT in: qualitative research (Chapter 2), mixed-methods research (Chapter 3), praxis (Chapter 4), and interdisciplinary research (Chapter 5). These issues are concretely addressed through discussion of the processes shaping major research studies into: the effects of constructivist pedagogy on student experiences (Chapter 2); low uptake of school music qualifications and the differential integration of educational technology in classrooms across the secondary school curriculum in the largest one-to-one laptop programme yet conducted (Chapter 3); the creation of mobile e-learning environments for informal learning contexts, such as museums (Chapter 4); and knowledge-building in secondary school History and Biology classrooms (Chapter 5).

At the same time, as indicated by their opening motifs, each chapter discusses how to use LCT to transcend a false dichotomy underlying segmentalism. Chapter 2 charts the processes unfolding through a qualitative research study for creating a 'translation device' that enables genuine dialogue between theory and data. Chapter 3 illustrates how to integrate qualitative and quantitative methodologies by tracing the evolution through mixed-methods studies of an instrument that embeds LCT concepts into the heart of quantitative data collection and analysis. Chapter 4 re-analyses the processes underlying the creation of 'languages of enactment' that embed LCT within practice to enable 'informal learning of principled knowledge'. Chapter 5 describes the strategies evolved through an interdisciplinary research project that enacted LCT and systemic functional linguistics in complementary analyses of shared data. I should emphasize, however, that each chapter offers insights beyond its specific focus. For example,

describing how a quantitative instrument was evolved in Chapter 3 reveals characteristics of LCT of relevance to research using any method, and discussing interdisciplinary research in Chapter 5 involves strategies that are applicable to studies using LCT only. Throughout Part I the focus is thus on explicating the craft of LCT, the principles underlying the practical processes shaping research projects, to enable future studies of different issues to contribute to knowledge-building.

Part II: Composing with LCT

Part II of the book shifts emphasis from processes towards products of research. These six chapters are more than mere 'applications'. LCT is an explanatory framework rather than any specific substantive account and, as Archer (1995: 6) states, 'an explanatory framework neither explains, nor purports to explain, anything'. Concepts and conjectures – the framework and outcomes of its enactment within specific studies – are not identical. LCT invites use to generate explanations and such use is anything but passive. As Bourdieu argued:

> …just as music may be made not to be rather passively listened to, or even played, but to open the way to composition, so scientific works, in contrast to theoretical texts, call not for contemplation or dissertation, but for practical confrontation with experience; to truly understand them means to activate in relation to a different object the mode of thought they express, to reactivate it in a new act of production, just as inventive and original as the initial one.
>
> (Bourdieu 1996: 180)

LCT is, metaphorically, music made to open the way to composition. Rather than recitals of a score, the chapters of Part II thus offer six examples of composition. They demonstrate the creative nature of research that involves the selection, assembly and enactment of concepts into uncharted waters. This recontextualization of elements of the framework may, in encounters with the specificities of objects of study and mediated through the dispositions of researchers, rework the concepts to capture, where successful, something new but essential for that study. Such shifts in meaning can then 'speak back' to the theory, potentially highlighting the need for conceptual refinement or new developments.

The chapters of Part II thus illustrate the active appropriation and reorientation of concepts. At the same time, they exemplify (though do not circumscribe) the manifold diversity of problems, topics, contexts and practices that LCT can be enacted to explore. These chapters explore: how 'ethnographic' forms of story-telling can encourage segmentalism in the humanities and social sciences (Chapter 6); the nature of building knowledge through a vocational curriculum, focusing on the example of design at

university (Chapter 7); how English literacy studies cultivates legitimate forms of literary knowers through the years of schooling (Chapter 8); the significance in physics education of understanding the forms of knowledge appropriate to solving specific kinds of problems (Chapter 9); the nature of academic writing in music education, specifically in jazz studies at university (Chapter 10); and the role of tacit pedagogic practices in informal learning contexts, specifically masonic lodges in France (Chapter 11).

Each chapter briefly outlines the concepts being enacted in the research being discussed. Nonetheless, to provide a common touchstone for the recontextualization of LCT by these studies, I shall briefly introduce the framework before summarizing key concepts drawn on in this book.

Introducing Legitimation Code Theory

What kind of theory is 'Legitimation Code Theory' and how does it enable knowledge-building? These questions are intimately interrelated. LCT analyses of research across the disciplinary map are revealing the complex diversity of organizing principles at play in enabling cumulative knowledge-building (Maton 2014b). Lessons learned from these studies are, in turn, drawn upon to improve the framework's own capacity for building knowledge. Limits of space here preclude extensive discussion of these manifold traits and their embodiment in LCT.[3] As a way into introducing the framework I shall thus focus on the issue with which this chapter began: the false dichotomy between speculation and description that pervades studies of education and society.

One way LCT enables knowledge-building is by bringing theory and data into genuine dialogue. Concepts can be enacted in research into real-world problems to generate explanations that reach beyond any specific context of study. As discussed above, Part I chapters in this volume demonstrate how this is achieved in research practice. Here I shall highlight some overarching characteristics of the framework that make it possible. Put simply, LCT is a *practical theory* in at least two senses. First, LCT is neither divorced from nor reducible to empirical studies. Figure 1.1 develops Archer (1995) to distinguish 'meta-theories' offered by ontologies, 'theories' embodied by explanatory frameworks, and 'substantive theories' generated by research studies. LCT is an *explanatory framework* rather than a

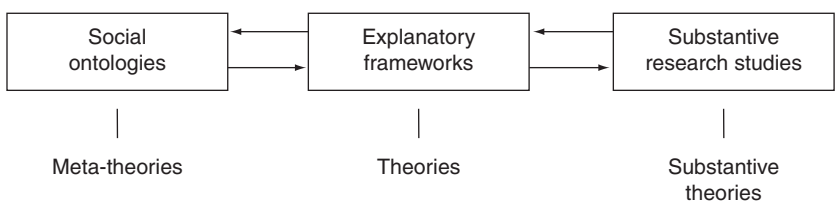

Figure 1.1 Meta-theories, theories, and substantive theories.

meta-theory or collection of substantive theories (Maton 2014b: 14–17). However, as the arrows in Figure 1.1 highlight, LCT maintains dialogic relations with both ontologies and studies. Thus, while engaged in fruitful exchanges with meta-theories (such as critical realism), LCT is a conceptual toolkit and analytic methodology rather than a paradigm or '-ism'. Similarly, while LCT evolves in relation to studies, the framework is distinct from their substantive accounts. Thus, LCT is neither overly distanced from nor identical with any specific context of research.

Second, LCT avoids both theoreticism and empiricism. On the one hand, it is designed not for freely-floating theoretical discussion but rather for practical engagement. The theory 'is not a sort of prophetic or programmatic discourse which originates by dissection or by amalgamation of other theories for the sole purpose of confronting other such pure "theoretical theories"' (Bourdieu and Wacquant 1992: 161). Rather, the framework develops within and for empirical research into substantive problems. On the other hand, against empiricism, the findings of this research are not locked within those issues. LCT enables research to go beyond endless and ad hoc empirical descriptions to explore the organizing principles underlying practices, dispositions and contexts. The framework allows researchers to get, metaphorically speaking, 'under the surface' of appearances. Analyses of their organizing principles can systematically reveal underlying similarities and differences with other practices, as well as change over time. Moreover, the theory is generative. As I discuss below, LCT reveals a particular 'setting' of organizing principles underpinning a set of practices as one of a range of possible modalities, each of which could generate alternative practices. It thereby reaches beyond 'what is' to 'what could be'. In getting 'under the surface' of appearances to generatively explore possibilities, LCT thereby helps to avoid the context-dependence and segmentalism of empiricist models.

Bourdieu, Bernstein and beyond

Moving beyond appearances involves both ways of seeing and analytic tools, both a gaze and a conceptual framework, issues concerning both knowers and knowledges. Introducing these two facets also highlights the contributions of approaches central to the development of LCT. The framework draws insights from a range of sources including philosophy, linguistics, physics, anthropology and cultural studies. However, its most directly foundational influences are the sociological theories of Pierre Bourdieu and Basil Bernstein. LCT develops rather than displaces their approaches, albeit in different ways. Though neither neatly divided into nor confined to these issues, one aspect of their legacies is that Bourdieu's 'field theory' illustrates the kind of dispositions or gaze necessary, and Bernstein's 'code theory' models the form of concepts required to overcome segmentalism.

Beyond Bourdieu's gaze

Bourdieu repeatedly emphasized the difficulty of moving beyond our sensual, commonsense experiences of the world. These understandings are taken for granted as self-evident, an illusion of immediacy and transparency that naturalizes and essentializes social inequalities (Bourdieu *et al.* 1991). To break from this view, he argued, requires a new way of seeing and thinking:

> The task is to produce, if not a 'new person', then at least a 'new gaze', *a sociological eye*. And this cannot be done without a genuine conversion, a *metanoia*, a mental revolution, a transformation of one's whole vision of the social world.
>
> (Bourdieu and Wacquant 1992: 251; original emphases)

This 'new gaze' involves a break with thinking in terms of separate and visible empirical entities in favour of a realist and relational mode that conceives phenomena as realizations of underlying organizing principles.[4] Put simply, this is to view empirical practices as patterned, a particular pattern as one of a number of possible patterns, the constitutive characteristics of a pattern as deriving from its relations with other patterns, and the organizing principles of each pattern and the system of possible patterns as discernible through analysis. More grounded discussions of this mode of thinking are provided in Part I of this volume, and concepts that embody the mode are outlined below. Here my point is to highlight Bourdieu's insistence on the significance of a specialized gaze. This valuably warns against an unthinking, semi-mechanical or shallow application of theory, as if slavishly following a recipe. It foregrounds the *craft* of social science and the need to shape actors' dispositions, to convert a theory into a mode of thinking, acting and being (hereafter 'gaze'), in order to 'master in a practical state everything that is contained in the fundamental concepts' (Bourdieu *et al.* 1991: 253).[5]

LCT integrates this significance of gaze, but goes further to show that dispositions by themselves are not enough for knowledge-building (Maton 2014b: 125–47). A realist and relational gaze is invaluable, but without concepts capable of shaping, enacting and sustaining that gaze, it becomes limited and limiting. This can be explained using Bourdieu's own ideas. Bourdieu described actors' dispositions as durable and transposable: they take repeated and often lengthy exposure to circumstances to create or change. Apprenticeship into a new gaze thus typically requires prolonged experience, immersion in exemplary models, and intimate pedagogic relations with an expert. Accordingly, it may be available only to a few select initiates. Moreover, simply using Bourdieu's concepts is not enough to reshape one's gaze, for they do not embody that gaze: they do not realize his intention to be realist and relational. For example, one cannot analyse the organizing principles of a habitus separately from empirical description

of the practices to which it gives rise. Though 'habitus' is defined as a 'structured and structuring structure' (1994: 170), the forms taken by this structure cannot be revealed. That is to say, the concept does not offer a relational system of generative principles that can show a specific actor's habitus as characterized by, for example, the structure 'X' among a range of possible structures such as 'W, X, Y and Z' (Bernstein 2000; Maton 2012b, 2014b). One can describe the practices to which this actor's habitus gives rise but not the specific form taken by the habitus that generates them. Thus, one cannot get 'under the surface' to systematically describe similarities, differences or changes in habituses. The concept may be defined by Bourdieu in realist and relational terms, but it does not enable realist and relational analysis (and the same can be shown for his other 'thinking tools'). Thus, even prolonged use of Bourdieu's concepts is insufficient to shape, enact or sustain a realist and relational gaze.[6] Unsurprisingly, few scholars have conducted analyses akin to those of Bourdieu – few share his dispositions. Furthermore, another obstacle to knowledge-building arises even when actors do acquire the requisite gaze: the resulting dispositions are again durable and slow to change and thus not particularly responsive to lessons to be learned from different data. Tellingly, once established, Bourdieu's framework changed relatively little. Application to a growing range of topics was not matched by evolution of concepts towards greater generality and complexity.

These limitations can be overcome by recognizing that in addition to being cultivated through apprenticeship, gazes can also be trained through conceptual means. LCT is not only a craft, it is also a science. While the gazes of crafts and arts are typically gained through cultivation, the gazes of science are gained through mastery of knowledge and skills. A key medium here is theory. Thus, where Bourdieu highlighted the need to convert theory into a gaze, LCT additionally converts that gaze into theory. It extends Bourdieu's notion by articulating an explicit, systematic, principled and hierarchically organized conceptual framework. Through providing concepts capable of shaping, enacting and sustaining a realist and relational mode of thinking, LCT thus makes the basis of the gaze more explicit, more democratically available, more responsive to data, and more amenable to change (Maton 2014b: 125–47). This is neither to diminish the significance of gaze nor to reify knowledge. Concepts do nothing by themselves; their potential for knowledge-building is realized by actors. Rather, it is to highlight that a gaze alone is not enough and to foreground in addition the form taken by theory itself.

Beyond Bernstein's codes

A framework that models the form required for a realist and relational theory is that developed by Basil Bernstein (1971, 1977, 1990, 2000). In *Knowledge and Knowers* (Maton 2014b), I show how LCT cumulatively

builds on Bernstein's theory by extending inherited concepts to embrace a greater range of phenomena within a systematic and economical framework. Here, I shall simply highlight that Bernstein's approach illustrates how to avoid theoreticism and empiricism. Of particular note are his notion of 'codes' and 'devices'. Bernstein's concept of 'pedagogic codes' demonstrates how to move beyond empirical appearances to explore the organizing principles of dispositions, practices and contexts, in this case as combinations of strengths of boundaries ('classification') and control ('framing'). His model of the 'pedagogic device' then shows how to (metaphorically) dig deeper to explore the mechanism generating those organizing principles. There are thus layers to the framework that move beyond appearances to successively excavate the underlying relational systems of which they are instances and thence the mechanisms generating those systems. However, this is not to abandon the empirical. 'Code' concepts can be enacted in substantive research and what Bernstein (2000) termed 'external languages of description' explicitly translate between those concepts and the specificities of empirical data (see Chapter 2, this volume).

The form taken by this framework is fundamental to the architecture of LCT. Moreover, LCT goes beyond the concepts inherited from Bernstein in a number of directions. First, LCT explicitly broadens the referents of 'codes' beyond the 'pedagogic'. All practices are construed as *languages of legitimation* or claims to legitimacy whose organizing principles are conceptualized as *legitimation codes*.[7] The term 'legitimation' also foregrounds both sociological issues of cooperation and struggles over status, and ontological and epistemological questions of the potentially legitimate nature of practices. Second, LCT inaugurates a fundamental change that enables a more relational framework by reconceiving 'codes' in terms of both typology and topology. Traditionally, 'codes' have been described (using combinations of 'strong'/'weak' classification and framing) as if comprising four boxes for categorizing practices. As I discuss below, LCT realizes the relational potential of this mode of theorizing by redescribing code concepts as axes of Cartesian planes that map out a topological space of infinite possible positions. This foregrounds the *relative* nature of strengths of elements (as 'stronger'/'weaker') in *relation* with other elements as well as enabling a more dynamic view.

Third, LCT deepens and diversifies the 'codes' and 'devices' available to research. Much of Bernstein's framework remained at the tantalizingly suggestive stage of types which, as he stated (2000: 124), are limited in their generative power. Conceptualization of the organizing principles generating such types was limited to 'pedagogic codes' (classification and framing). LCT extends and integrates 'classification' and 'framing' within the broader concepts of *specialization codes* (see below) in a way which also recasts other concepts identified by Bernstein (2000) as landmarks in his framework (see chapters 2–5 and 9 of Maton 2014b). Moreover, LCT explores a series of additional organizing principles, such as *semantic codes* (see below), *autonomy codes* and *temporal codes*, which shed new light on practices. In parallel,

LCT extends Bernstein's 'pedagogic device' to capture the multifaceted nature of the generative mechanism underlying social fields of practices as a multidimensional *Legitimation Device*. I now turn to introduce some of these concepts.

Specialization and Semantics

LCT comprises a multidimensional conceptual toolkit. There are currently five dimensions: Specialization, Semantics, Autonomy, Temporality and Density. Each dimension comprises a series of concepts centred on capturing a set of organizing principles underlying dispositions, practices and contexts. (See Chapter 12 for explanations of the concepts that together comprise a 'dimension'.) Each set of organizing principles represents a species of *legitimation code*: 'specialization codes', 'semantic codes', 'autonomy codes', etc. Each dimension also identifies a different *aspect* of the Legitimation Device, the means whereby these principles are created, maintained, transformed and changed. In this book, concepts are drawn from two dimensions, Specialization and Semantics, whose principal concepts are summarized in Table 1.1. Space precludes discussing here all their constitutive concepts; see Maton (2014b) for 'structures' and 'devices' and Chapter 12 (this volume) for their interrelations within the framework. Here I introduce the 'codes', 'planes' and 'profiles' of Specialization and Semantics that are central to subsequent chapters of this volume.

Table 1.1 Basic concepts of Specialization and Semantics dimensions

Specialization		*Semantics*
	explores practices in terms of	
knowledge–knower structures		*semantic structures*
	whose organizing principles are given by	
specialization codes		*semantic codes*
	comprising strengths of	
epistemic relations and *social relations*		*semantic gravity* and *semantic density*
	which are mapped on the	
specialization plane		*semantic plane*
	and traced over time on	
specialization profiles		*semantic profiles*
	to explore the workings of the	
epistemic–pedagogic device		*semantic device*
	which is an *aspect* of the Legitimation Device	

Specialization codes

The concepts of *specialization codes* begin from the simple premise that practices are about or oriented towards something and by someone. One can, therefore, analytically distinguish: *epistemic relations* (ER) between practices and their object (that part of the world towards which they are oriented); and *social relations* (SR) between practices and their subject, author or actor (who is enacting the practices). For knowledge practices, these become epistemic relations with proclaimed objects of study and social relations with authors or actors.

Each relation may be more strongly (+) or weakly (–) bounded and controlled or, simply put, more or less emphasized as the legitimate basis of practices, beliefs and identity.[8] These two strengths may be varied independently to generate *specialization codes* (ER+/–, SR+/–). As shown in Figure 1.2, the continua of strengths can be visualized as axes to create the *specialization plane*, a topological space with four principal modalities:

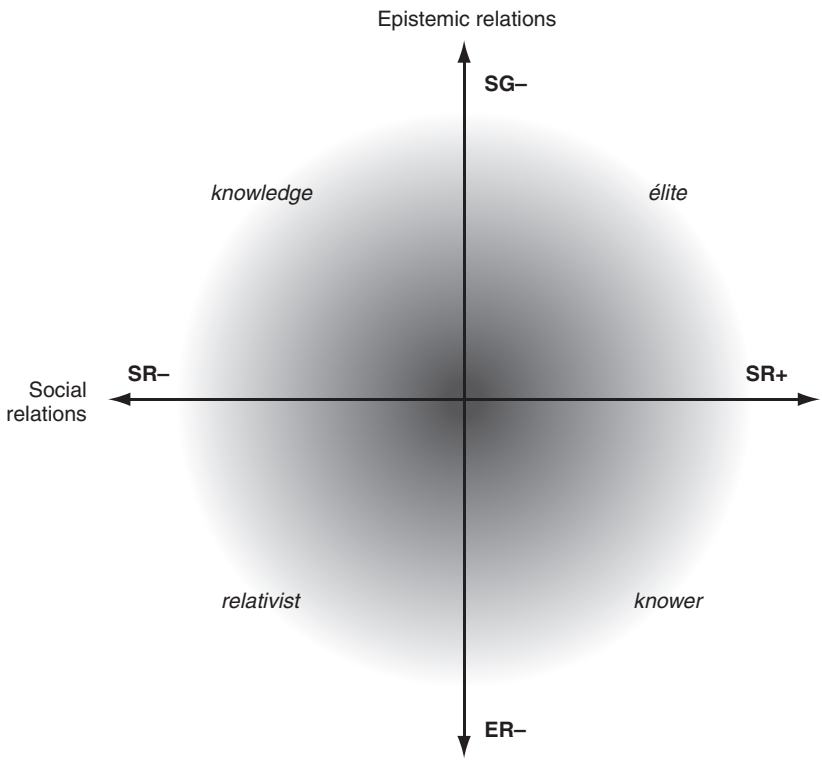

Figure 1.2 The specialization plane.

- *knowledge codes* (ER+, SR–), where possession of specialized knowledge, principles or procedures concerning specific objects of study is emphasized as the basis of achievement, and the attributes of actors are downplayed;
- *knower codes* (ER–, SR+), where specialized knowledge and objects are downplayed and the attributes of actors are emphasized as measures of achievement, whether viewed as born (e.g. 'natural talent'), cultivated (e.g. 'taste') or social (e.g. feminist standpoint theory);
- *élite codes* (ER+, SR+), where legitimacy is based on both possessing specialist knowledge and being the right kind of knower; and
- *relativist codes* (ER–, SR–), where legitimacy is determined by neither specialist knowledge nor knower attributes – 'anything goes'.

Specialization codes conceptualize one dimension of the 'rules of the game' embodied by practices, dispositions and contexts. In the four codes listed above what matters is: 'what you know' (knowledge codes), 'the kind of knower you are' (knower codes), both (élite codes), or neither (relativist codes). A specific code may dominate as the basis of achievement, but may not be transparent, universal or uncontested. Not everyone may recognize and/or be able to realize what is required, there may be more than one code present, and there are likely to be struggles among actors over which code is dominant. One can thus describe degrees of *code clash* and *code match*, such as between: learners' dispositions and pedagogic practices; education policies and subject areas; different approaches within an intellectual field; curriculum and pedagogy of a subject area; and many others. For example, the study re-analysed in Chapter 2 (this volume) explored how Chinese students brought knowledge-code dispositions from past educational experiences to an Australian university context dominated by knower-code practices, creating a code clash with deleterious consequences for the students. Similarly, a major study discussed in Chapter 3 showed that a large-scale policy initiative successfully integrated educational technology into subject areas that matched its knower-code intentions but produced less integrated outcomes in subjects characterized by other specialization codes.

As well as matches or clashes, the dominant code may also change, such as between subject areas, classrooms, and stages of a curriculum (or, for dispositions, through education or over the lifecourse). These *code shifts* effectively change the 'rules of the game'. For example, the school music curriculum in English schools involves shifts from a knower code at primary schooling to a knowledge code during the early years of secondary schooling, and then towards an élite code for formal school qualifications in upper secondary schooling (Chapter 3, this volume). Such code shifts can have profound implications, such as rendering previously successful actors unable to continue to achieve or, in this example, reducing the take-up rate of a qualification.

Such changes need not be categorical – one can also describe *code drift* or change *within* codes (in Figure 1.2, movement within a quadrant of the plane). This highlights a key attribute mentioned earlier above: the

specialization plane embodies *both* a typology of four codes *and* a topology of infinite positions in which epistemic relations and social relations are continua of relative strengths. The concepts are fully relational. Each is 'strong*er*' or 'weak*er*' in relation to other practices (rather than dichotomously 'strong'/'weak'). One can thus also analyse processes of *strengthening* and *weakening* relations (ER↑/↓, SR↑/↓) creating code drift and code shift. The tools thereby enable organizing principles of practices to be analysed without effacing the manifold diversity typically found in data. The four codes are not homogenizing categories. A set of instances (of, say, practice) can be represented as a scatter pattern across the plane, showing the diversity of codes present and which code dominates the context. Changes in this pattern can also be plotted through time, tracing changes within and between codes. LCT thereby embraces both complexity and simplicity, both empirical instances and generative principles, and both inter- and intra-category change, within a relational theorization.

LCT is also a generative framework. As mentioned earlier, concepts are not limited to exploring what has been, they can also envisage what could be. Each set of practices can be analysed as a realization of codes whose 'settings' can be varied to generate other possible codes that would be empirically realized as different practices. For example, the strongly bounded and controlled educational knowledge and 'one-size-fits-all' teaching that characterizes 'traditional' pedagogy can be conceptualized as emphasizing epistemic relations and downplaying social relations: a knowledge code (ER+, SR–). Varying the strengths of these relations generates at least three other codes (ER–, SR+; ER+, SR+; ER–, SR–). The empirical realizations of these codes as pedagogic practices can then be generated. Taking a readily recognizable example, a knower code (ER–, SR+) would comprise weaker boundaries around and control over legitimate knowledge and stronger boundaries around and control over kinds of knowers, and is thus likely to be characterized in pedagogic practice by (among other attributes) blurring boundaries between academic subjects and more individualized teaching and learning. Thus, even if 'traditional' pedagogy had been the only practices ever experienced, other forms of practice can be generated (such as, in this example, 'constructivist' pedagogy). The possibilities are numerous: the specialization plane offers far more than four positions; both epistemic relations and social relations comprise constituent relations that generate different forms of each specialization code (see below); and other organizing principles (e.g. semantic codes) can be analysed. Thus, LCT is a sociology of possibility that embraces the unimagined or obscured.

There is more to specialization codes than can be covered here. Further levels of delicacy include the '4–K model', which distinguishes different kinds of epistemic relations and social relations to conceptualize *insights* and *gazes* (Maton 2014b: 171–95). These concepts characterize different forms taken by specialization codes and enable analysis of their differential effects for issues including knowledge-building and social justice. Chapter 10 (this volume), for example, draws on the distinction between knower codes based

on *cultivated*, *social* and *born* gazes to explore the basis of achievement in student assessments in jazz education. A further level of delicacy in the 4–K model explores different kinds of *lenses* that modify 'insights' and 'gazes', again with differential effects. Moreover, as Table 1.1 shows, in addition to 'codes' concepts, Specialization includes: the *epistemic–pedagogic device*, the generative mechanism over which actors struggle for control that 'sets' the comparative values of specialization codes and thus establishes the basis of hierarchies in a social field; and *knowledge–knower structures*, which describe the forms taken by social fields characterized by different specialization codes. Both offer complementary insights into the basis and effects of practice, as illustrated in Maton (2014b).

Semantic codes

The dimension of Semantics (Table 1.1) explores practices in terms of their *semantic structures* whose organizing principles are given by *semantic codes* that comprise strengths of *semantic gravity* and *semantic density*.

Semantic gravity refers to the degree to which meaning relates to its context. The stronger the semantic gravity (SG+), the more meaning is dependent on its context; the weaker the semantic gravity (SG–), the less meaning is dependent on its context. Semantic gravity traces a continuum of strengths with infinite capacity for gradation. One can also dynamize this continuum to analyse *weakening* semantic gravity (SG↓), such as moving from the local particulars of a specific case towards generalizations, and *strengthening* semantic gravity (SG↑), such as moving from generalized ideas towards concrete and delimited cases.

Semantic density refers to the degree of condensation of meaning within practices. The stronger the semantic density (SD+), the more meanings are condensed within practices; the weaker the semantic density (SD–), the fewer meanings are condensed. The strength of semantic density characterizing a practice is not intrinsic to that practice but rather relates to the *semantic structure* within which it is located. For example, the term 'gold' commonly denotes a bright yellow, shiny and malleable metal used in coinage, jewellery, dentistry and electronics. However, within the discipline of Chemistry it is related to an atomic number, atomic weight, electron configuration, and much more. Many of these meanings involve relations to other meanings as part of compositional structures, taxonomies, and explanatory processes; for example, its atomic number represents the number of protons found in the nucleus of an atom, identifies it as a chemical element, and situates it within the periodic table. Thus, 'gold' in Chemistry is located within a complex semantic structure that imbues the term with a greater range of meanings. (Another way of conceiving semantic density is 'relationality': the more relations with other meanings, the stronger the semantic density; see Maton and Doran 2015a, 2015b.) Semantic density traces a continuum of strengths with infinite capacity for gradation. This continuum

can also be dynamized to describe *strengthening* semantic density (SD↑), such as moving from a simple symbol or practice towards a more technical concept or complex practice, and *weakening* semantic density (SD↓), such as 'unpacking' technical concepts into simpler terms.

All practices are characterized by both semantic gravity and semantic density; what differs are their strengths, which may be varied independently to generate *semantic codes* (SG+/–, SD+/–). As shown in Figure 1.3, these continua of strengths can be visualized as axes of the *semantic plane* with four principal modalities:

- *rhizomatic codes* (SG–, SD+), where the basis of achievement comprises relatively context-independent and complex stances;
- *prosaic codes* (SG+, SD–), where legitimacy accrues to relatively context-dependent and simpler stances;
- *rarefied codes* (SG–, SD–), where legitimacy is based on relatively context-independent stances that condense fewer meanings; and
- *worldly codes* (SG+, SD+), where legitimacy is accorded to relatively context-dependent stances that condense manifold meanings.[9]

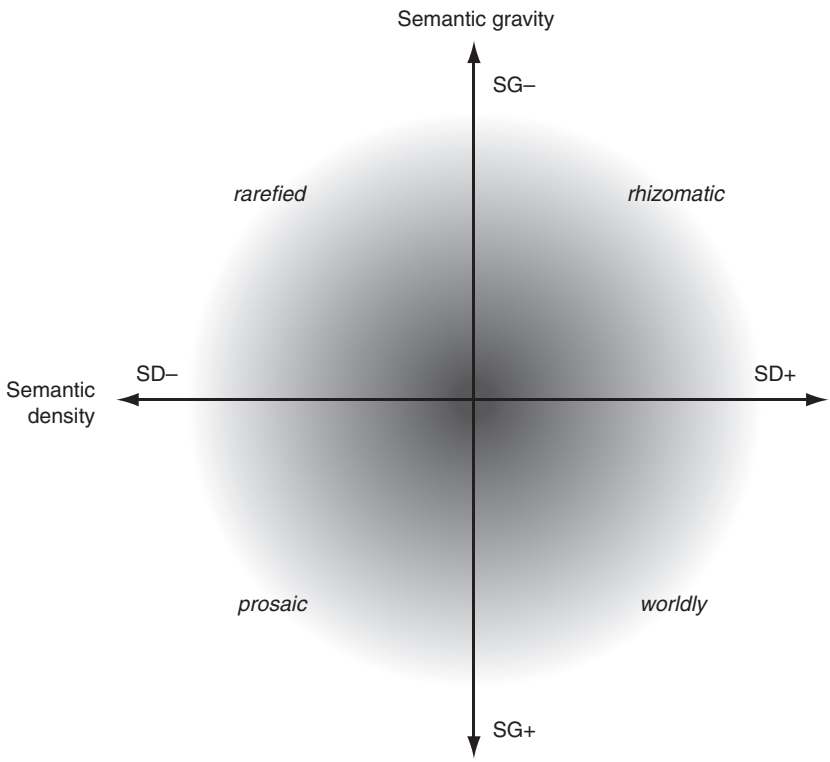

Figure 1.3 The semantic plane.

The capacities of 'specialization codes' outlined above are also applicable to these concepts. Semantic codes can be enacted to analyse the 'rules of the game', reveal similarity and difference, explore degrees of code clash and match, and show change over time (code shifts and drifts) in dispositions, practices and contexts. They too combine the advantages of typologies and topologies, offering both four principal modalities and an infinite range of positions on the semantic plane (Figure 1.3). Moreover, they too enable the generative theorization of practices that are unrealized empirically or have become obscured. For example, education debates have been dominated by a recurring opposition between 'theoretical' and 'practical' knowledges. Semantic codes reveal this opposition as a false dichotomy: these forms represent *rhizomatic codes* (SG–, SD+) and *prosaic codes* (SG+, SD–), respectively, and exclude the possibility of *rarefied codes* (SG–, SD–) and *worldly codes* (SG+, SD+). Such blind spots have consequences, such as presenting a false choice to professional and vocational educators between 'theoretical' or 'practical' curricula (Shay 2013). Using semantic codes highlights that professional and vocational practices can involve not simply context-dependent but also condensed and complex forms of knowledge: *worldly codes* (SG+, SD+). Chapter 7 (this volume), for example, argues that design courses at university move through a series of stages from rarefied codes towards worldly codes. In short, the distinctive organizing principles of professional and vocational practices have been rendered invisible by dominant visions of education. The generative nature of LCT makes the invisible visible and thereby amenable to analysis, in turn allowing these bases of achievement to be explicitly taught and learned.

A further affordance of the concepts is enabled by the analytic method of *profiling* (Maton 2013, 2014a). Tracing the strengths of semantic gravity and semantic density of practices over time (such as the unfolding of an intellectual field, classroom practice, curriculum, or a text) reveals a *semantic profile* and an associated *semantic range* between their highest and lowest strengths. Figure 1.4 offers a heuristic representation of three simplified

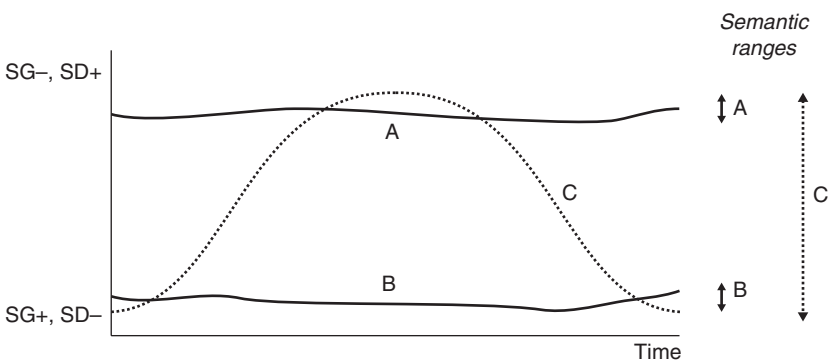

Figure 1.4 Three illustrative semantic profiles.

profiles and their ranges: a high *semantic flatline* (A), a low *semantic flatline* (B), and a *semantic wave* (C). The value of profiling is being illustrated by a growing body of research that is revealing further 'rules of the game' for achievement and bases of cumulative knowledge-building across different kinds of practices (Maton 2013). Studies of student work products are suggesting written assessments structured as semantic waves are rewarded across subject areas and levels of education (e.g. Maton 2014b; Wolff and Luckett 2013). They are also highlighting how these can vary over time and across subjects. Chapter 8 (this volume), for example, analyses the changing semantic profiles demonstrated by writing in school English literary studies at different stages of schooling. Similarly, studies are revealing the falsity of viewing academic literacy as either generic or subject-specific by showing how subjects are characterized by semantic waves but with distinctive profiles (Szenes *et al.* 2015). This method is, however, not confined to analysis of assessments. Studies of classroom practices are revealing the semantic profiles that enable and constrain knowledge-building in different subject areas (e.g. Martin and Maton 2013). Moreover, studies of research are highlighting the debilitating effects of the false dichotomy with which I began this chapter: between a high semantic flatline of decontextualized theorizing and a low semantic flatline of context-dependent empirical descriptions. In contrast, they reveal the potential for knowledge-building of theories that trace semantic waves and embrace a greater semantic range (Maton 2014b).

Profiling can also be used for specialization codes: tracing strengths of epistemic relations and social relations generate *specialization profiles*. Such shared capacities among concepts from different dimensions of LCT raise the question of how the concepts are related. Table 1.1 places Specialization and Semantics side by side because LCT dimensions are 'simultaneous': they explore not different practices but rather different organizing principles that may underlie the same practices. Specialization codes and semantic codes can be used together to analyse the same empirical data and offer complementary insights into the same phenonema. For example, Chapter 6 (this volume) enacts specialization codes and semantic gravity to analyse 'ethnographic' writing, and Chapter 7 and Chapter 8 enact semantic gravity and semantic density to explore the basis of cultivating a knower code in design and school English, respectively. Similarly, the *semantic device* that 'sets' the comparative value of semantic codes, and the *semantic structures* of social fields generated by the interplay of those codes (see Maton 2014b), can be explored alongside their equivalent concepts from Specialization. Conversely, each dimension can be used separately; indeed, each concept can be enacted alone. For example, Chapter 9 analyses student work in physics using 'semantic gravity' to reveal a 'Goldilocks zone' for context-dependence in student answers: too strong or too weak can lead to failure. The basis of choosing how many and which concepts to enact cannot be legislated in advance – it is a matter of possessing the right gaze, to which I now return.

Gaze at the future

The explanatory framework of LCT – of which two species of legitimation code have been outlined – embodies depth realist and relational modes of thinking. Concepts embrace but also move beyond sensual appearances to explore their organizing principles, reveal this patterning as one of a range of possible patterns, and excavate in turn their generative mechanisms. Each organizing principle and each patterning are relationally defined. Moreover, they enable studies to conceive practice relationally by bringing together analyses of the legitimation codes of dispositions, contexts and practices (e.g. Chapter 2, this volume). LCT thereby converts a realist and relational gaze into theory and offers a conceptual means of shaping, enacting and sustaining that gaze. However, just as the gaze is insufficient without concepts that enable the gaze, so the potential of those concepts may be unrealized if researchers do not acquire the gaze. Doing so is not simply a matter of learning definitions – it also requires practice at putting the practical theory into practice. As Bourdieu (2004: 40) argued:

> The difficulty of initiation into any scientific practice (whether quantum physics or sociology) lies in the fact that a double effort is required in order to master the knowledge theoretically but in such a way that this knowledge really passes into practice, in the form of a 'craft', 'knacks', an 'eye', etc., and does not remain in the state of a meta-discourse about practices.

Such craft work is typically obscured in discussions of both theories and methods. Where it does appear, practices are often couched in vague, mysterious or ethereal terms, as if learned through a magical process of initiation. This book aims to help begin make the craft more explicit. The *modus operandi* embodied by LCT becomes most apparent in the context of substantive studies. Without the questions and data that animate the course of real projects, discussions of method quickly become detached from the everyday practicalities of research. Accordingly, as outlined earlier above, Part I of this volume explicates practical principles of LCT through analysing the development of real projects, and Part II provides examples of results of studies. Together they also demonstrate there is more to the craft of LCT than enacting realism and relationalism. Here I shall briefly highlight three additional attributes, namely LCT as *problem-oriented*, *dialogic* and *conjectural*. These characteristics are related: the centrality afforded problem-situations emphasizes the value of dialogues for explanatory power and highlights the conjectural nature of the resulting knowledge claims.

Problem-oriented

Ensuring the problem-situation – the combination of a specific object of study, research questions and forms of data – remains at the heart

of decision-making is a core principle of LCT. Here inspiration is drawn from Bernstein's call for less allegiance to approaches and more dedication to problems (1977), Bourdieu's strictures against theoreticism and methodologism (1996), and Popper's insistence that 'What matters is not methods or techniques but a sensitivity to problems, and a consuming passion for them' (1963: 95). Theory constructs a problem-situation – without theory, there is an infinite flux of possible data. However, where this relationship is one way and theory entirely defines data in its own image, the resulting ideas become relevant only to that imaginary world (Maton 2014b: 177–84). Thus, key to the craft of LCT is constructing problem-situations in ways that enable dialogue between theory and data, so that each problem-situation can in turn shape the selection, assembly and enactment of concepts in research. This is also crucial for knowledge-building that neither remains locked within nor neglects the specificities of objects of study. One strength of 'legitimation codes' is their capacity to be applied at many levels of analysis to explore diverse kinds of phenomena. However, the concepts are realized differently in each case. Accordingly, as Part I of this volume shows, LCT offers means for mediating between theory and the specificities of each problem-situation, in the form of 'translation devices' between concepts and data (Chapter 2), context-sensitive data collection instruments (Chapter 3), and 'languages of enactment' for relating concepts and practice in determinate contexts (Chapter 4).

Foregrounding problems also guards against theoretical and methodological fetishism. It highlights that one only needs as much theory as the problem-situation demands – not all concepts are required for all substantive studies. Moreover, as Part II chapters demonstrate, the craft of LCT is to begin from real-world issues and engage with real-world data, rather than embroiling the framework in the intellectual gymnastics of theoretical polemics, 'an impotent and sterilizing metadiscourse' (Bourdieu 1996: 180). Real-world data keeps you honest and grounded. Methodologically, emphasizing problems ensures pluralism does not slip into relativism. While studies enacting LCT deny such false dichotomies as qualitative/quantitative, the aim in doing so is not to fetishize multiplicity but rather to generate explanatory power about a problem-situation. As Chapter 3 illustrates, the choice and enactment of techniques must, therefore, always be appropriate to the problem at hand. Accordingly, in discussing how LCT overcomes dichotomies, Part I chapters engage not in theoretical or methodological debates but rather ground discussion of the craft of LCT in real examples of substantive research.

Dialogic

Foregrounding problem-situations underlines the significance to knowledge-building of a dialogic stance. While monologic theories can become extremely ornate, their baroque frameworks are soon dogmatic, narcissistic

and evermore detached from reality. In contrast to inward-looking for theoretical purity, a dedication to problems encourages looking outwards for explanatory power, to other theories, methodologies, objects of study, and data. Dialogue is also crucial for overcoming the false dichotomies that bedevil studies of education and society. To avoid reducing one side of a dichotomy to the other requires respecting the integrity of each side and making explicit how they can be related. Accordingly, as Part I chapters discuss, constructing these relations as dialogic is characteristic of LCT. Developing 'translation devices' enables dialogue between theory and data, and provides a means for substantive studies to 'speak back' to the framework (Chapter 2). Evolving complementary quantitative and qualitative instruments brings the results of different methods into dialogue to strengthen validity and reliability of findings and shed more light on phenomena (Chapter 3). Creating 'languages of enactment' enables dialogue between theory and specific arenas of practice that generates praxis (Chapter 4). Developing processes for bringing analyses using different theories into productive dialogue enables complementary insights to be related, provoking theoretical innovations (Chapter 5). Moreover, in the craft of LCT such dialogic relations are not merely proclaimed tenets but realized as practical strategies for research. For example, Chapter 5 outlines three dynamics for facilitating dialogue between theories within interdisciplinary projects: *zooming* between a bigger picture and more specific cases; *refocusing* between fuzzier and precise analyses; and *alternating* between parallel analyses by each theory and joint analyses. These dynamics provide practical ways to maintain an 'essential tension' between theories being too close or too distant, avoiding tendencies towards monologic reductionism or detachment that often characterize 'interdisciplinary' research.

Dialogue is not confined within studies; it also characterizes the wider community of research enacting LCT. As discussed earlier above, the chapters of Part II illustrate how the framework embraces diverse phenomena, from research to student work, from physics to jazz, and from schooling to university and informal learning beyond education. Rather than each topic being segmented by empiricist models, LCT allows a wider conversation among these studies. Though time and space precluded illustration in this volume, the field of research enacting LCT is wider than a single book and findings from these and many other studies are being brought into relations to help provide a more encompassing and integrated account of education and society.

Conjectural and open-ended

LCT inherits problems and bequeaths problems, for every answer to a question in turn raises more questions. The explanatory framework cumulatively integrates and extends ideas from existing theories to offer concepts that will continue to evolve. Substantive studies enacting those concepts offer

explanatory conjectures open to refinement or refutation. 'Translation devices' for relating theory and data (Chapter 2) or practice (Chapter 4) make visible the analytic process, enabling rational discussion and offering conceptual tools for adaptation by future studies. Thus, each paper is neither the beginning nor the end, neither the first nor the last word on its subject. Each forms part of a broader conversation through time, one which builds on the past to offer a contribution to present understanding that is always provisional, and may be built on in the future. The centrality of problems and dialogue thus encourages an open-ended sense of knowledge-building to suffuse the craft of LCT.

Accordingly, this book is but a partial snapshot of a framework and a body of research that are in motion. There is much more to LCT than the concepts introduced in this chapter and there are many more topics and issues addressed by studies enacting those concepts than can be represented in this volume. Moreover, LCT foresees its own repeated refinement, deepening and extension through dialogues with concepts inherited from existing frameworks, substantive studies that reveal new issues to be addressed, and complementary frameworks that shed light on different facets of phenomena. Knowledge claims generated through LCT are thus an invitation to engage, to 'only connect', to speak to one another, to join in discourse and deed such that together we become more than the sum of our parts. There is no conclusion to the task of knowledge-building. So, as Sherlock Holmes would proclaim, let us tarry no longer in this chapter – the game is afoot!

Notes

1 To keep abreast of this work, see the LCT website: www.legitimationcodetheory.com.
2 Pedagogic enactments are less publicly visible than publications but growing quickly (see LCT website). Pedagogic studies are underrepresented here because they were few in number when this volume was first commissioned but have subsequently blossomed (e.g. Blackie 2014; Clarence 2014; Macnaught *et al.* 2013; Maton 2013; Weekes 2014).
3 For example, analyses enacting LCT reveal the significance for cumulative knowledge-building of a theory progressing as 'semantic waves' with a high 'semantic range' (Maton 2013, 2014a, 2014b: 125–47; Chapter 6, this volume), two traits which LCT itself then enacts in both research (Chapters 2 and 5, this volume) and praxis (Macnaught *et al.* 2013). I define these concepts further below.
4 Bourdieu uses 'realism' variously to refer to different stances. By 'realist' I refer not to empiricism but to depth realism that posits a stratified and emergent ontology, such as critical realism (Bhaskar 1975). I add 'realist' to Bourdieu's phrase because 'relational mode of thinking' does not make explicit his arguments for exploring the generative principles underlying empirical practices.
5 By using the term 'gaze' I am building upon Bernstein (2000) and Bourdieu, as well as connecting with the LCT conceptualization of different 'gazes' (Maton 2014b). In LCT the term does not imply a restriction to or privileging of the

ocular but rather refers to dispositions underlying 'know-how', modes of thinking, acting and being that are commonly referred to variously as 'feel', 'ear', 'nose', 'taste', 'sense', or 'eye'.

6 Ironically, Bourdieu's concept of 'habitus' cannot describe the organizing principles of the 'scientific habitus' he argues is essential for enacting his framework.

7 In the name of the framework, 'legitimation' is not classifying a subtype of 'code theory': LCT is a theory of legitimation codes.

8 See Maton (2014b: 31) for a distinction between *focus* and *basis* of practices. For example, knowledge claims may *focus* on a 'knower' issue (such as physical experience of pain) but on the *basis* of specialized knowledge (such as a medical report). Specialization codes concern the *basis* rather than the *focus* of practices – organizing principles underlying practices rather than their surface content.

9 These terms supersede earlier names for these concepts found in Maton (2014a).

References

Adorno, T. W. (1998) *Aesthetic Theory*, Minnesota: University of Minnesota Press.

Allen, I. E. and Seaman, J. (2010) *Learning on Demand: Online education in the United States*, Babson Survey Research Group and The Sloan Consortium. Online. Available HTTP: http://files.eric.ed.gov/fulltext/ED529931.pdf.

Archer, M. S. (1995) *Realist Social Theory: The morphogenetic approach*, Cambridge: Cambridge University Press.

Atkinson, R. K., Renkl, A. and Merrill, M. M. (2003) 'Transitioning from studying examples to solving problems: Effects of self-explanation prompts and fading worked-out steps', *Journal of Educational Psychology* 95(4): 774–83.

Australia Education International (2012) *International Student Numbers 2011*. Online. Available at: https://aei.gov.au/research/Research-Snapshots/Pages/default.aspx.

Bacot, J.-P. (2007) *Les sociétés fraternelles. Une histoire globale*, Paris: Dervy.

Barnett, M. (2006) 'Vocational knowledge and vocational pedagogy', in M. F. D. Young and J. Gamble (eds) *Knowledge, Curriculum and Qualifications for South African Further Education*, Pretoria: Human Resources Research Council Press.

Barnett, R. and Coate, K. (2005) *Engaging the Curriculum in Higher Education*, London: SRHE/OUP.

Bednarek, M. and J. R. Martin (2010) (eds) *New Discourse on Language: Functional perspectives on multimodality, identity and affiliation*, London: Continuum.

Bernstein, B. (1971) *Class, Codes and Control, Volume I: Theoretical studies towards a sociology of language*, London: Routledge and Kegan Paul.

Bernstein, B. (ed.) (1973) *Class, Codes and Control, Volume II: Applied studies towards a sociology of language*, London: Routledge and Kegan Paul.

Bernstein, B. (1977) *Class, Codes and Control, Volume III: Towards a theory of educational transmissions*, second edition, London: Routledge and Kegan Paul.

Bernstein, B. (1990) *Class, Codes and Control, Volume IV: The structuring of pedagogic discourse*, London: Routledge.

Bernstein, B. (1995) 'A response', in A. R. Sadovnik (ed.) *Knowledge and Pedagogy: The sociology of Basil Bernstein*, Norwood, NJ: Ablex.

Bernstein, B. (2000) *Pedagogy, Symbolic Control and Identity: Theory, research, critique*, revised edition, Oxford: Rowman and Littlefield.

Berry, J. W. (2005) 'Acculturation: Living successfully in two cultures', *International Journal of Intercultural Relations*, 29: 697–712.

Berteaux, R. (1996) *La symbolique au grade d'Apprenti*, Paris: Edimaf.

Berthelot, J.-M. (1997) *L'Intelligence du social*, Paris: PUF.

Bhaskar, R. (1975) *A Realist Theory of Science*, London: Verso.
Bhaskar, R. and Danermark, B. (2006) 'Metatheory, interdisciplinarity and disability research: A critical realist perspective', *Scandinavian Journal of Disability Research* 8(4): 278–97.
Blackie, M. (2014) 'Creating semantic waves: Using Legitimation Code Theory as a tool to aid the teaching of chemistry', *Chemistry Education Research and Practice* 15: 462–9.
Blommaert, J. (2009) 'Ethnography and democracy: Hymes' political theory of democracy', *Talk and Text* 29(3): 257–76.
Bohlman, P. V. (1997) 'Ontologies of music', in N. Cook and M. Everist (eds) *Rethinking Music*, Oxford: Oxford University Press.
Boudreaux, A. and Campbell, C. (2012) 'Student understanding of liquid-vapor phase equilibrium', *Journal of Chemical Education* 89(6): 707–14.
Boulton-Lewis, G. (1994) 'Tertiary students' knowledge of their own learning and a SOLO taxonomy', *Higher Education* 28(3): 387–402.
Bourdieu, P. (1994) *In Other Words*, Cambridge: Polity Press.
Bourdieu, P. (1996) *The Rules of Art*, Cambridge: Polity.
Bourdieu, P. (2004) *Science of Science and Reflexivity*, Cambridge: Polity.
Bourdieu, P. and Wacquant, L. J. D. (1992) *An Invitation to Reflexive Sociology*, Cambridge: Polity Press.
Bourdieu, P., Darbel, A., Rivet, J.-P. and Seibel, C. (1963) *Travail et travailleurs en Algérie*, Paris: Mouton.
Bourdieu, P., Chamboredon, J.-C. and Passeron, J.-C. (1991) *The Craft of Sociology: Epistemological preliminaries*, Berlin: Walter de Gruyter.
Brandt, C. B. (2008) 'Discursive geographies in science: Space, identity, and scientific discourse among indigenous women in higher education', *Cultural Studies of Science Education* 3: 703–30.
Brannen, J. (2005) 'Mixing methods: The entry of qualitative and quantitative approaches into the research process', *International Journal of Social Research Methodology* 8(3): 173–84.
Brown, A. (1999) 'Parental participation, positioning and pedagogy: A sociological study of the IMPACT primary school mathematics project', *Collected Original Resources in Education* 24(3): 7/A02–11/C09.
Brown, A. (2006) 'Languages of description and the education of researchers', in R. Moore, M. Arnot, J. Beck and H. Daniels (eds) *Knowledge, Power and Educational Reform*, London: Routledge.
Carey, S. (1985) *Conceptual Change in Childhood*, Cambridge, MA: MIT Press.
Carvalho, L. (2010) 'A sociology of informal learning in/about design', unpublished PhD thesis, University of Sydney, Australia. Online. Available at: www.legitimationcodetheory.com.
Carvalho, L. and Dong, A. (2007) 'Knowledge and identity in the design field', in R. Zehner and C. Reidsema (eds) *Proceedings of ConnectED International Conference on Design Education*, ISBN 978–00646–48147–0.
Carvalho, L. and Goodyear, P. (2014) 'Analysing the structuring of knowledge in learning networks', in S. Bayne, C. Jones, M. de Laat, T. Ryberg and C. Sinclair (eds) *Proceedings of the 9th International Conference on Networked Learning 2014*, ISBN 978–1–86220–304–4.
Carvalho, L., Dong, A. and Maton, K. (2009) 'Legitimating design: A sociology of knowledge account of the field', *Design Studies* 30(5): 483–502.

Chang, Y. H., Chang, C. Y. and Tseng, Y. H. (2010) 'Trends of science education research: An automatic content analysis', *Journal of Science Education and Technology* 19(4): 315–31.

Chen, R. T.-H. (2010) 'Knowledge and knowers in online learning: Investigating the effects of online flexible learning on student sojourner', unpublished PhD thesis, University of Wollongong, Australia. Online. Available at: www.legitimationcodetheory.com.

Chen, R. T.-H., Bennett, S. and Maton, K. (2008) 'The adaptation of Chinese international students to online flexible learning: Two case studies', *Distance Education* 29(3): 307–23.

Chen, R. T.-H., Maton, K. and Bennett, S. (2011) 'Absenting discipline: Constructivist approaches in online learning', in F. Christie and K. Maton (eds) *Disciplinarity*, London: Continuum.

Chi, M. T. H., Feltovich, P. J. and Glaser, R. (1981) 'Categorization and representation of physics problems by experts and novices', *Cognitive Science* 5(2): 121–52.

Christie, F. (2002) *Classroom Discourse: A functional perspective*, London: Continuum.

Christie, F. (2012) *Language Education through the School Years: A functional perspective*, Michigan: Wiley-Blackwell.

Christie, F. and Cléirigh, C. (2008) 'On the importance of "showing"', in C. Wu, C. M. I. M. Matthiessen and M. Herke (eds) *Voices Around the World: Proceedings of the 35th International Systemic Functional Linguistics Congress*, Macquarie University, Sydney: ISFC35 Committee, 13–18.

Christie, F. and Derewianka, B. (2008) *School Discourse: Learning to write across the years of schooling*, London: Continuum.

Christie, F. and Macken-Horarik, M. (2009) 'Building verticality in subject English', in F. Christie and J. R. Martin (eds) *Language, Knowledge and Pedagogy*, London: Continuum.

Christie, F. and Macken-Horarik, M. (2011) 'Disciplinarity and school subject English', in F. Christie and K. Maton (eds) *Disciplinarity*, London: Continuum.

Christie, F. and Martin, J. R. (2007) (eds) *Language, Knowledge and Pedagogy: Functional linguistic and sociological perspectives*, London: Continuum.

Christie, F. and Maton, K. (2011) (eds) *Disciplinarity: Functional linguistic and sociological perspectives*, London: Continuum.

Clarence, S. (2014) 'Enabling cumulative knowledge-building through teaching: A Legitimation Code Theory analysis of pedagogic practice in law and political science', unpublished PhD thesis, Rhodes University, South Africa. Online. Available at: www.legitimationcodetheory.com.

Clark, R. and Mayer, R. (2011) *E-Learning and the Science of Instruction: Proven guidelines for consumers and designers of multimedia learning*, third edition, San Francisco, CA: Pfeiffer.

Conan Doyle, Sir A. (1892/1981) *The Adventures of Sherlock Holmes*, London: Penguin.

Cross, N. (2004) 'Expertise in design: An overview' *Design Studies*, 25: 427–41.

Cummings, K. (2013) 'A community-based report of the developmental history of PER', paper presented at the American Association of Physics Teachers, Portland, Oregon.

DEEWR (Department of Education Employment and Workplace Relations) (2008) *Digital Education Revolution*. Online. Available at: www.deewr.gov.au/Schooling/DigitalEducationRevolution/Pages/default.aspx.

diSessa, A. A. (1993) 'Toward an epistemology of physics', *Cognition and Instruction*, 10(2/3): 105–225.

diSessa, A. A., Gillespie, N. and Esterly, J. (2004) 'Coherence versus fragmentation in the development of the concept of force', *Cognitive Science* 28: 843–900.

Dixon, M. and Simpson, D. (2011) *Cambridge Checkpoints 2001: HSC Standard English. Past Examination Questions and Responses*, Melbourne: Cambridge University Press.

Doherty, C. (2010) 'Doing business: Knowledges in the internationalised business lecture', *Higher Education Research and Development* 29(3): 245–58.

Dooley, K. T. (2001) 'Adapting to diversity: Pedagogy for Taiwanese students in mainstream Australian secondary school classes', unpublished PhD thesis, Griffith University, Australia.

Dorst, K. (2008) 'Design research: A revolution-waiting-to-happen', *Design Studies*, 29: 4–11.

Dreyfus, S. E. (2004) 'The five stage model of adult skill acquisition', *Bulletin of Science Technology & Society*, 24: 177–81.

Erduran, S. and Scerri, E. (2002) 'The nature of chemical knowledge and chemical education', in J. K. Gilbert, R. Justi, D. F. Treagust and J. H. Van Driel (eds) *Chemical Education*, London: Kluwer Academic.

Exley, B. (2005) 'Teachers' professional knowledge bases for offshore education: Two case studies of Western teachers working in Indonesia', unpublished PhD thesis, Queensland University of Technology, Australia.

Foucault, M. (1970) *The Order of Things*, London: Pantheon.

Friedman, K. (2003) 'Theory construction in design research: Criteria, approaches and methods', *Design Studies*, 24: 507–22.

Galceran, S. (2004) *Les franc-maçonneries*, Paris: La découverte.

Gallagher, M. K. (2011) 'In search of a theoretical basis for storytelling in education research: Story as method', *International Journal of Research & Method in Education*, 34(1): 49–61.

Geertz, C. (1973) *The Interpretation of Cultures*, New York: Basic Books.

Georgiou, H. (2009) 'An exploration of tertiary students' conceptions of familiar thermodynamic processes', unpublished Honours thesis, University of Sydney, Australia.

Georgiou, H. and Sharma, M. D. (2010) 'A report on a preliminary diagnostic for identifying thermal physics conceptions of tertiary students', *International Journal of Innovation in Science and Mathematics Education* 18(2): 32–51.

Georgiou, H., Maton, K. and Sharma, M. (2014) 'Recovering knowledge for physics education research: Exploring the "Icarus effect" in student work', *Canadian Journal of Science, Mathematics, and Technology Education* 14(3): 252–68.

Grenfell, M. J. (2012) (ed.) *Pierre Bourdieu: Key concepts*, revised edition, London: Acumen.

Grenfell, M. J. (2014) *Pierre Bourdieu*, London: Bloomsbury.

Grenfell, M. and Hardy, C. (2007) *Art Rules: Pierre Bourdieu and the visual arts*, Oxford: Berg.

Grenfell, M. and Lebaron, F. (2014) (eds) *Bourdieu and Data Analysis: Methodological principles and practices*, Oxford: Peter Lang.

Grize, J.-B. (1997) *Logique et langage*, Paris: Ophrys.

Grubb, N. (2006) 'Vocationalism and the differentiation of tertiary education: Lessons from US community colleges', *Journal of Further and Higher Education*, 30: 27–42.

Haines, J. (2008) 'The origins of the musical staff', *The Musical Quarterly* 91(3–4): 327–78.

Hake, R. R. (1998) 'Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses', *American Journal of Physics* 66(1): 64–74.

Halliday, M. A. K. (1985) 'Systemic background', in J. D. Benson and W. S. Greaves (eds) *Systemic Perspectives on Discourse, Volume 1*, Norwood, NJ: Ablex.

Halliday, M. A. K. and Matthiessen, C. M. M. (1999) *Construing Experience through Meaning*, London: Cassell.

Halliday, M. A. K. and Matthiessen, C. M. M. (2004) *An Introduction to Functional Grammar*, third edition, London: Edward Arnold.

Hammersley, M. (1992) 'Deconstructing the qualitative–quantitative divide', in J. Brannen (ed.) *Mixing Methods: Qualitative and quantitative research*, London: Avebury.

Hasan, R. (1984) 'The nursery tale as genre', *Nottingham Linguistics Circular* 13: 71–102.

Hasan, R. (2005) *Language, Society and Consciousness*, London: Equinox.

Hasan, R. (2009) *Semantic Variation: Meaning in society and in sociolinguistics*, London: Equinox.

Hay, C. (2014) 'Learning to inhabit the chair: Knowledge transfer in contemporary Australian director training' unpublished PhD thesis, University of Sydney, Australia. Online. Available at: www.legitimationcodetheory.com.

Hood, S. (2011) 'Writing discipline: Comparing inscriptions of knowledge and knowers in academic writing', in F. Christie and K. Maton (eds) *Disciplinarity*, London: Continuum.

Hornberger, N. H. (2009) 'Hymes's linguistics and ethnography in education', *Talk and Text* 29(3): 347–58.

Howard, S. K. and Carceller, C. (2011) *DER-NSW 2010: Implications of the 2010 data collection*, Sydney: New South Wales Department of Education and Communities.

Howard, S. K. and Maton, K. (2011) 'Theorising knowledge practices: A missing piece of the educational technology puzzle', *Research in Learning Technology* 19(3): 191–206.

Howard, S. K. and Mozejko, A. (2013) *DER-NSW Evaluation: Conclusions on student and teacher engagement and ICT use*, Sydney: New South Wales Department of Education and Communities.

Howard, S. K., Chan, A. and Caputi, P. (2015) 'More than beliefs: Subject-areas and teachers' integration of laptops in secondary teaching', *British Journal of Educational Technology*, 46(2): 360–9.

Howe, K. R. (1992) 'Getting over the quantitative–qualitative debate', *American Journal of Education* 100(2): 236–56.

Ivinson, G., Davies, B. and Fitz, J. (eds) (2011) *Knowledge and Identity: Concepts and applications in Bernstein's sociology*, London: Routledge.

Johnson, R. B. and Onwuegbuzie, A. J. (2004) 'Mixed methods research: A research paradigm whose time has come', *Educational Researcher* 33(7): 14–26.

Jordens, C. F. C. (2002) 'Reading spoken stories for values: A discursive study of cancer survivors and their professional carers', unpublished PhD thesis, University of Sydney, Australia.

Kant, I. (1781/2007) *Critique of Pure Reason*, London: Penguin.

Knight, N. K. (2010) 'Wrinkling complexity: Concepts of identity and affiliation in humour', in M. Bednarek and J. R. Martin (eds) *New Discourse on Language*, London: Continuum.

Labov, W. and Waletzky, J (1967) 'Narrative analysis: Oral versions of personal experience', in J. Helm (ed.) *Essays on the Verbal and Visual Arts*, Seattle: University of Washington Press.

Lamont, A. and Maton, K. (2008) 'Choosing music: Exploratory studies into the low uptake of music GCSE', *British Journal of Music Education* 25(3): 267–82.

Lamont, A. and Maton, K. (2010) 'Unpopular music: Beliefs and behaviours towards music in education', in R. Wright (ed.) *Sociology and Music Education*, London: Ashgate.

Lamont, A., Hargreaves, D. J., Marshall, N. A. and Tarrant, M. (2003) 'Young people's music in and out of school', *British Journal of Music Education* 20(3): 1–13.

Larkin, J., McDermott, J., Simon, D. P. and Simon, H. A. (1980) 'Expert and novice performance in solving physics problems', *Science* 208(4450): 1335–42.

Lawson, B. (2004) 'Schemata, gambits and precedents: Some factors in design expertise', *Design Studies* 25: 443–57.

LeRoux, B. and Rouanet, H. (2010) *Multiple Correspondence Analysis*, London: Sage.

Lin, H. S., Cheng, H. J. and Lawrenz, F. (2000) 'The assessment of student and teachers' understanding of gas laws', *Journal of Chemical Education* 77(2): 235–38.

Liu, X. F. (2001) 'Synthesizing research on student conceptions in science', *International Journal of Science Education* 23(1): 55–81.

Luckett, K. (2012) 'Disciplinarity in question: Comparing knowledge and knower codes in sociology', *Research Papers in Education* 27(1): 19–40.

Macnaught, L., Maton, K., Martin, J. R. and Matruglio, E. (2013) 'Jointly constructing semantic waves: Implications for teacher training', *Linguistics and Education* 24(1): 50–63.

Martin, J. L. (2013) 'On notes and knowers: The representation, evaluation and legitimation of jazz', unpublished PhD thesis, University of Adelaide, Australia. Online. Available HTTP: www.legitimationcodetheory.com.

Martin, J. R. (1992) *English Text: System and structure*, Amsterdam: John Benjamins.

Martin, J. R. (2000) 'Grammar meets genre: Reflections on the "Sydney School"', *Arts: The Journal of the Sydney University Arts Association* 22: 47–95.

Martin, J. R. (2007) 'Construing knowledge: A functional linguistic perspective', in F. Christie and J. R. Martin (eds) *Language, Knowledge and Pedagogy*, London: Continuum.

Martin, J. R. (2010) 'Semantic variation: Modelling system, text and affiliation in social semiosis', in M. Bednarek and J. R. Martin (eds) *New Discourse on Language*, London: Continuum.

Martin, J. R. (2011) 'Bridging troubled waters: Interdisciplinarity and what makes it stick', in F. Christie and K. Maton (eds) *Disciplinarity*, London: Continuum.

Martin, J. R. (2012) *Forensic Linguistics: Volume 8 in the collected works of J. R. Martin*, Shanghai: Shanghai Jiao Tong University Press.

Martin, J. R. (2013a) 'Embedded literacy: Knowledge as meaning', *Linguistics and Education* 24(1): 23–37.

Martin, J. R. (2013b) *Interviews with M. A. K. Halliday*, London: Bloomsbury.

Martin, J. R. (2015) 'Revisiting field: Specialized knowledge in Ancient History and Biology secondary school discourse', *Onomázein*.

Martin, J. R. and Maton, K. (2013) (eds) 'Special Issue: Cumulative Knowledge-Building in Secondary Schooling', *Linguistics and Education*, 24(1): 1–74.

Martin, J. R. and Matruglio, E. (2013) 'Revisiting mode: Context in/dependency in Ancient History classroom discourse', in Huang Guowen, Zhang Delu and Yang Xinzhang (eds) *Studies in Functional Linguistics and Discourse Analysis, Volume 5*, Beijing: Higher Education Press.

Martin, J. R. and Plum, G. A. (1997) 'Construing experience: Some story genres', in M. Bamberg (ed.) *Oral Versions of Personal Experience: Three decades of narrative analysis* 7(1–4): 299–308.

Martin, J. R. and Rose, D. (2007) *Working with Discourse: Meaning beyond the clause*, London: Continuum.

Martin, J. R. and Rose, D. (2008) *Genre Relations: Mapping culture*, London: Equinox.

Martin, J. R. and White, P. R. R. (2005) *The Language of Evaluation: Appraisal in English*, New York: Palgrave Macmillan.

Martin, J. R., Maton, K. and Matruglio, E. (2010) 'Historical cosmologies: Epistemology and axiology in Australian secondary school history discourse'. *Revista Signos* 43(74): 433–63.

Martin, J. R., Zappavigna, M. and Dwyer, P. (2012) 'Beyond redemption: Choice and consequence in Youth Justice Conferencing', in F. Yan and J. J. Webster (eds) *Developing Systemic Functional Linguistics*, London: Equinox.

Marton, F. (1981) 'Phenomenography: Describing conceptions of the world around us', *Instructional Science* 10(2): 177–200.

Mason, A. and Singh, C. (2013) 'Using categorization task to improve expertise in introductory physics', paper presented at the Physics Education Research Conference, Portland, Oregon.

Maton, K. (2000a) 'Recovering pedagogic discourse: A Bernsteinian approach to the sociology of educational knowledge', *Linguistics and Education* 11(1): 79–98.

Maton, K. (2000b) 'Languages of legitimation: The structuring significance for intellectual fields of strategic knowledge claims', *British Journal of Sociology of Education* 21(2): 147–67.

Maton, K. (2003) 'Reflexivity, relationism and research: Pierre Bourdieu and the epistemic conditions of social scientific knowledge', *Space and Culture* 6(1): 52–65.

Maton, K. (2004) 'The wrong kind of knower: Education, expansion and the epistemic device', in J. Muller, B. Davies, and A. Morais (eds) *Reading Bernstein, Researching Bernstein*, London: RoutledgeFalmer.

Maton, K. (2005) 'A question of autonomy: Bourdieu's field approach and policy in higher education', *Journal of Education Policy* 20(6): 687–704.

Maton, K. (2006) 'On knowledge structures and knower structures', in R. Moore, M. Arnot, J. Beck and H. Daniels (eds) *Knowledge, Power and Educational Reform*, London: Routledge.

Maton, K. (2007) 'Knowledge-knower structures in intellectual and educational fields', in F. Christie and J. R. Martin (eds) *Language, Knowledge and Pedagogy*, London: Continuum.

Maton, K. (2009) 'Cumulative and segmented learning: Exploring the role of curriculum structures in knowledge-building', *British Journal of Sociology of Education* 30(1): 43–57.

Maton, K. (2010) 'Canons and progress in the arts and humanities: Knowers and gazes', in K. Maton and R. Moore (eds) *Social Realism, Knowledge and the Sociology of Education*, London: Continuum.

Maton, K. (2011) 'Theories and things: The Semantics of disciplinarity', in F. Christie and K. Maton (eds) *Disciplinarity*, London: Continuum.

Maton, K. (2012a) 'The next generation: Inter-disciplinary research into strange new worlds', paper presented at 39th International Systemic Functional Congress, Sydney. Online. Available at: www.legitimationcodetheory.com.

Maton, K. (2012b) 'Habitus', in M. Grenfell (ed.) *Pierre Bourdieu: Key concepts*, revised edition, London: Acumen.

Maton, K. (2013) 'Making semantic waves: A key to cumulative knowledge-building', *Linguistics and Education* 24(1): 8–22.

Maton, K. (2014a) 'Building powerful knowledge: The significance of semantic waves', in B. Barrett and E. Rata (eds) *Knowledge and the Future of the Curriculum*, London: Palgrave Macmillan.

Maton, K. (2014b) *Knowledge and Knowers: Towards a realist sociology of education*, London: Routledge.

Maton, K. and Doran, Y. J. (2015a) 'Semantic density: A translation device for analyzing the complexity of knowledge practices through discourse, part 1 – wording', *Onomázein*.

Maton, K. and Doran, Y. J. (2015b) 'Condensation: A translation device for analyzing the complexity of knowledge practices through discourse, part 2 – clausing and sequencing', *Onomázein*.

Maton, K. and Doran, Y. J. (2016) 'SFL and code theory', in T. Bartlett and G. O'Grady (eds) *Routledge Systemic Functional Linguistic Handbook*, London: Routledge.

Maton, K. and Moore, R. (2010) (eds) *Social Realism, Knowledge and the Sociology of Education: Coalitions of the mind*, London: Continuum.

Maton, K. and Muller, J. (2007) 'A sociology for the transmission of knowledges', in F. Christie and J. R. Martin (eds) *Language, Knowledge and Pedagogy*, London: Continuum.

Matruglio, E., Maton, K. and Martin, J. R. (2013) 'Time travel: The role of temporality in enabling semantic waves in secondary school teaching', *Linguistics and Education* 24(1): 38–49.

McDermott, L. C. (1990) 'A view from physics', in M. Gardener, G. Greeno, F. Reif, A. H. Schoenfeld, A. diSessa and E. Stage (eds) *Toward a Scientific Practice of Science Education*, Hillsdale, NJ: Laurence Erlbaum.

Meidell Sigsgaard, A.-V. (2013) 'Who knows what?: The teaching of knowledge and knowers in a fifth grade Danish as a second language classroom', unpublished PhD thesis, Aarhus University, Denmark. Online. Available at: www.legitimationcodetheory.com.

Meltzer, D. E. (2004) 'Investigation of students' reasoning regarding heat, work, and the first law of thermodynamics in an introductory calculus-based general physics course', *American Journal of Physics* 72(11): 1432–46.

Meltzer, D. E. (2005) 'Investigation of student reasoning regarding concepts in thermal physics', *American Physical Society Forum of Education Newsletter* (Spring). Online. Available at: www.aps.org/units/fed/newsletters/spring2005/investigation.html.

Minstrell, J. (2001) 'Facets of students' thinking: Designing to cross the gap from research to standards-based practice', in K. Crowley, C. D. Schunn and T. Okada (eds) *Designing for Science*, Mahwah, NJ: Lawrence Erlbaum Associates.

Molle, D. and Prior, P. (2008) 'Multimodal genre systems in EAP writing pedagogy: Reflecting on a needs analysis', *TESOL Quarterly* 42(4): 541–66.

Moore, R. (2009) *Towards the Sociology of Truth*, London: Continuum.

Moore, R. (2011) 'Making the break: Disciplines and interdisciplinarity', in F. Christie and K. Maton (eds) *Disciplinarity*, London: Continuum.

Moore, R. (2013) *Basil Bernstein: The thinker and the field*, London: Routledge.

Moore, R. and Maton, K. (2001) 'Founding the sociology of knowledge: Basil Bernstein, intellectual fields and the epistemic device', in A. Morais, I. Neves, B. Davies and H. Daniels (eds) *Towards a Sociology of Pedagogy*, New York: Peter Lang.

Moore, R. and Muller, J. (2002) 'The growth of knowledge and the discursive gap', *British Journal of Sociology of Education* 23(4): 627–38.

Moore, R., Arnot, M., Beck, J. and Daniels, H. (eds) (2006) *Knowledge, Power and Educational Reform: Applying the sociology of Basil Bernstein*, London: Routledge.

Morais, A., Neves, I., Davies, B. and Daniels, H. (eds) (2001) *Towards a Sociology of Pedagogy: The contribution of Basil Bernstein to research*, New York: Peter Lang.

Morais, A., Neves, I. and Pires, D. (2004) 'The what and the how of teaching and learning: Going deeper into sociological analysis and intervention', in J. Muller, B. Davies and A. Morais (eds) *Reading Bernstein, Researching Bernstein*, London: RoutledgeFalmer.

Morrow, W. (2009) *Bounds of Democracy: Epistemological access in higher education*, Cape Town: HSRC.

Moss, G. (2001) 'Bernstein's languages of description: Some generative principles', *International Journal of Social Research Methodology* 4(1): 17–19.

Moss, P. A., Phillips, D. C., Erickson, F. D., Floden, R. E., Lather, P. A. and Schneider, B. L. (2009) 'Learning from our differences: A dialogue across perspectives on quality in education research', *Educational Researcher* 38(7): 501–17.

Muller, J. (2007) 'Hierarchy, knowledge and the school curriculum', in F. Christie and J. R. Martin (eds) *Language, Knowledge and Pedagogy*, London: Continuum.

Muller, J., Davies, B. and Morais, A. (eds) (2004) *Reading Bernstein, Researching Bernstein*, London: Routledge.

Neves, I., Morais, A. and Afonso, M. (2004) 'Teacher training contexts: Study of specific sociological characteristics', in J. Muller, B. Davies and A. Morais (eds) *Reading Bernstein, Researching Bernstein*, London: RoutledgeFalmer.

New Zealand Qualifications Authority (2010) *Level 3 English Question Booklet*, Auckland: New Zealand Qualifications Authority.

NSW Board of Studies (2007) *English (Standard) Paper 2 (Modules), Help for HSC Students*, Sydney: New South Wales Board of Studies.

NSW Board of Studies (2015) *English Syllabus for the Higher School Certificate*, Online. Available at: www.boardofstudies.nsw.edu.au/syllabus_hsc/english-std-adv.html#syllabus.

O'Halloran, K. L. (2005) *Mathematical Discourse: Language, symbolism and visual images*, London: Continuum.

Otero, V. K. and Harlow, D. B. (2009) 'Getting started in qualitative physics education research', *Reviews in PER, 2*. Online. Available at: www.compadre.org/Repository/document/ServeFile.cfm?ID=9122&DocID=1218.

Paltridge, B., Starfield, S., Ravelli, L. and Nicholson, S. (2012) 'Doctoral writing in the visual and performing arts: Two ends of a continuum', *Studies in Higher Education* 37(8): 989–1003.

Perrotta, C. (2013) 'Do school-level factors influence the educational benefits of digital technology? A critical analysis of teachers' perceptions', *British Journal of Educational Technology* 44(2): 314–27.

Popper, K. (1963) *Conjectures and Refutations*, London: Routledge.

Poulet, C. (2010) 'Recognising and revealing knowers: An enhanced analysis of masonic recruitment and apprenticeship', *British Journal of Sociology of Education* 31(6): 777–96.

Powerhouse Museum (2015) About the Powerhouse Museum. Online. Available at: www.powerhousemuseum.com/about/.

Quinn, L. and Vorster, J. (2014) 'Isn't it time to start thinking about "developing" academic developers in a more systematic way?', *International Journal for Academic Development* 19(3): 255–8.

Ramognino, N. (2005) 'Du concept d'institution: La langue et l'école instituent un "monde commun"', in N. Ramognino and P. Verges (eds) *Le Français d'hier et d'aujourd'hui. Politiques de la langue et apprentissages scolaires*, Aix-en-Provence: Publications de l'Université de Provence.

Redish, E. F. (2004) 'A theoretical framework for physics education research: Modeling student thinking', in E. F. Redish and M. Vicentini (eds) *Proceedings of the International School of Physics, "Enrico Fermi" Course CLVI*, Amsterdam: IOS Press.

Redish, E. F. and Bing, T. J. (2009) 'Analyzing problem solving using math in physics: Epistemological framing via warrants', *Physical Review Special Topics – Physics Education Research* 5.

Rhodes, C. (2000) 'Ghostwriting research: Positioning the researcher in the interview text', *Qualitative Inquiry* 6(4): 511–25.

Robson, K. and Sanders, C. (2009) *Quantifying Theory: Pierre Bourdieu*, London: Springer.

Rose, D. and Martin, J. R. (2012) *Learning to Write, Reading to Learn: Genre, knowledge and pedagogy in the Sydney School*, London: Equinox.

Rothery, J. (1990) 'Story writing in primary school: Assessing narrative type genres', unpublished PhD thesis, University of Sydney, Australia.

Rothery, J. and Stenglin, M. (1997) 'Entertaining and instructing: Exploring experience through story, in F. Christie and J. R. Martin (eds) *Genres and Institutions*, London: Continuum.

Ryan, A. (2008) 'Indigenous knowledge in the science curriculum: Avoiding neocolonialism', *Cultural Studies of Science Education* 3: 663–702.

Sabella, M. and Redish, E. F. (2007) 'Knowledge activation and organization in physics problem-solving', *American Journal of Physics* 75(11): 1017–29.

Salomon, G. (1991) 'Transcending the qualitative–quantitative debate: The analytic and systemic approaches to educational research', *Educational Researcher* 20(6): 10–18.

Shaffer, S. and McDermott, L. C. (2005) 'A research-based approach to improving student understanding of the vector nature of kinematical concepts', *American Journal of Physics* 73: 921–31.

Schlunke, K. (2005) 'Gagging the past', *Journal of Media and Cultural Studies* 19(3): 413–19.

Schwab, J. (1962) 'The teaching of science as enquiry', in J. Schwab and P. Brandwein (eds) *The Teaching of Science*, Cambridge MA: Harvard University Press.

Selwyn, N. (2006) 'High-tech soc-of-ed? Signs of a "smart" sociology of education technology', *British Journal of Sociology of Education* 27(3): 417–26.

Selwyn, N. (2010) 'Looking beyond learning: Notes towards the critical study of educational technology', *Journal of Computer Assisted Learning* 26: 65–73.

Shalem, Y. and Slonimsky, L. (2010) 'Seeing epistemic order: Construction and transmission of evaluative criteria', *British Journal of Sociology of Education* 31(6): 755–78.

Sharma, M., Millar, R., Smith, A. and Sefton, I. M. (2004) 'Students' understandings of gravity in an orbiting space-ship', *Research in Science Education* 34(3): 267–89.

Shay, S. (2013) 'Conceptualizing curriculum differentiation in higher education: A sociology of knowledge point of view', *British Journal of Sociology of Education* 34(4): 563–82.

Simpson, J. S. (2010) '"I'm more afraid of you than I am of the terrorists": Agency, dissent, and the challenges of democratic hope', *Review of Education, Pedagogy and Cultural Studies* 32(2): 177–205.

Singh, P., Sadovnik, A. and Semel, S. (eds) (2010) *Toolkits, Translation Devices, Conceptual Tyrannies: Essays on Basil Bernstein's sociology of knowledge*, New York: Peter Lang.

Smith, D. (2005) *Institutional Ethnography: A sociology for people*, Oxford: AltaMira Press.

South African Department of Basic Education (2010) *National Senior Certificate English Home Language Paper 2*, Cape Town: Department of Basic Education.

Spector, J. M. (2013) 'Emerging educational technologies and research directions', *Journal of Educational Technology & Society* 16(2): 21–30.

Starfield, S., Paltridge, B. and Ravelli, L. J. (2012) '"Why do we have to write?": Practice-based theses in the visual and performing arts and the place of writing', in V. J. Bhatia and C. Berkenkotter (eds) *Insights into Academic Genres*, Bern: Peter Lang.

Stehr, N. (1994) *Knowledge Societies*, London: Sage.

Steyn, D. (2012) 'Conceptualising design knowledge and its recontextualization in the studiowork component of a design foundation curriculum', unpublished MPhil thesis, University of Cape Town.

Straehler-Pohl, H. and Gellert, U. (2013) 'Towards a Bernsteinian language of description for mathematics classroom discourse', *British Journal of Sociology of Education* 34(3): 313–32.

Szenes, E., Tilakaratna, N. and Maton, K. (2015) 'The knowledge practices of critical thinking', in M. Davies and R. Barnett (eds) *The Palgrave Handbook of Critical Thinking in Higher Education*, London: Palgrave Macmillan.

Taguieff, P.-A. (2005) *La foire aux illuminés. Esotérisme, théorie du complot, extrémisme*, Paris: Fayard.

Taylor, P. and Bain, P. (2003) '"Subterranean worksick blues": Humour as subversion in two call centres', *Organization Studies* 24: 1487–509.

Thomson, E. A. (2014) *Battling with Words: A study of language, diversity and social inclusion in the Australian Department of Defence*, Canberra: Australian Government.

Todorov, T. (1984) *Mikhail Bakhtin: The dialogical principle*, Minnesota: The University of Minnesota Press.

Treagust, D. F. (1988) 'Development and use of diagnostic-tests to evaluate students' misconceptions in science', *International Journal of Science Education* 10(2): 159–69.

Tsai, C. C. and Wen, M. L. (2005) 'Research and trends in science education from 1998 to 2002: A content analysis of publication in selected journals', *International Journal of Science Education* 27(1): 3–14.

Van Krieken, R., Habibis, B., Smith, P., Hutchins, B., Martin, G. and Maton, K. (2014) *Sociology: Themes and perspectives*, fifth edition, Sydney: Pearson.

Van Leeuwen, T. (1999) *Speech, Music, Sound*, Basingstoke: Macmillan.

VanSlyke-Briggs, K. (2009) 'Consider ethnofiction', *Ethnography and Education* 4(3): 335–45.

Vidal Lizama, M. (2014) 'Theorising popular education as a knowledge practice: The case of Chile', unpublished PhD thesis, University of Technology, Sydney, Australia. Online. Available at: www.legitimationcodetheory.com.

Vosniadou, S. (2002) 'On the nature of naive physics', in M. Mason (ed.) *Reconsidering Conceptual Change*, Dordrecht: Kluwer Academic.

Vosniadou, S. (2008) *International Handbook of Research on Conceptual Change*, New York: Routledge.

Vosniadou, S. and Ortony, A. (1989) *Similarity and Analogical Reasoning*, Cambridge: Cambridge University Press.

Weekes, T. (2014) 'From dot points to disciplinarity: The theory and practice of disciplinary literacies in secondary schooling', unpublished PhD thesis, University of New England, Australia. Online. Available at: www.legitimationcodetheory.com.

Wheelahan, L. (2010) *Why Knowledge Matters in Curriculum: A social realist argument*, London: Routledge.

Wittgenstein, L. (1980) *Culture and Value*, Chicago: University of Chicago Press.

Wolf, M. (1992) *A Thrice Told Tale: Feminism, postmodernism and ethnographic responsibility*, Stanford, CA: Stanford University Press.

Wolf, S. F., Dougherty, D. P. and Kortemeyer, G. (2012) 'Rigging the deck: Selecting good problems for expert-novice card-sorting experiments', *Physical Review Special Topics-Physics Education Research* 8(2). Online. Available at: http://prst-per.aps.org/abstract/PRSTPER/v8/i2/e020116.

Wolfe, J. (2006) 'A musician's English: The challenge awaiting international students in tertiary music programs in Australia', *TESOL in Context* 16(1): 18–25.

Wolfe, J. (2007) '"You'll have to start early if you want to be on time for the F sharp!" Language and the study of music: Implications for international students studying in tertiary music programs in Australia', paper presented at ISANA International Conference, Adelaide, Australia.

Wolff, K. and Luckett, K. (2013) 'Integrating multidisciplinary engineering knowledge', *Teaching in Higher Education* 18(1): 78–92.

Wu, H. K. (2009) 'Modelling a complex system: Using novice-expert analysis for developing an effective technology-enhanced learning environment', *International Journal of Science Education* 32(2): 195–219.

Young, M. F. D. (2008) *Bringing Knowledge Back In: From social constructivism to social realism*, London: Routledge.