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Legitimation Code Theory

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1. Historical background

Legitimation Code Theory or LCT is a relatively recent theoretical framework for analysing knowledge practices. As its name suggests, it focusses on the underlying structuring principles upon which claims to legitimacy may be made in social fields of practice. The term "legitimation" in the theory's title "foregrounds both sociological issues of cooperation and struggles over status, and ontological and epistemological questions of the potentially legitimate nature of practices" (Maton 2016a: 10). That is to say that Legitimation Code Theory is about understanding the bases of achievement in social practices, whether these be visible and explicit, or whether they are unspoken or "go without saying". While it is a sociological theory of *knowledge,* and sees *knowledge not language* as its object of study, LCT nevertheless has insights to offer an audience interested in pragmatics. While finding its roots in sociology of Education, LCT has further developed through interaction with applied linguistics, most notably Systemic Functional Linguistics, and is the first sociological theory to develop tools for text analysis (e.g., MacNaught, Matruglio & Doran in press). LCT can be used to investigate what language (among other things) reveals about knowledge practices, making it a useful tool for application alongside pragmatic and other applied linguistic analyses (see Section 5).

LCT responds to the perceived over-emphasis on power in constructivist and post-structuralist sociological approaches at the expense of being able to understand knowledge fully as an object of study. LCT seeks to overcome the difficulties produced from viewing knowledge from the false dichotomy of either positive absolutism or constructionist relativism. It encourages a both/and approach, seeing knowledge as both something that is real, an object in its own right, and also something that is socially constructed. In other words, "knowledge involves more than social power; it also involves epistemic power" (Maton & Moore 2010: 5). It is argued that this approach is more effective in enabling the study of knowledge as an object, and overcomes the knowledge-blindness that has resulted from constructivist overemphases on the knower and on knowing.

LCT's initial development in the 1990s began with the integration and extension of influential theories of Basil Bernstein and Pierre Bourdieu by the theory's main

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architect, Karl Maton. The theory, however, should be understood as being in a sense still under creation or as a "work-in-progress" as Maton emphasises that knowledge-building is always ongoing. The theory continues to develop through research collaborations with a diverse body of scholars (see Section 5). As LCT is applied in empirical research to investigate real-world problems the theory is continuously refined, extended and more thoroughly described. Maton describes LCT as "a practical theory rather than a paradigm, a conceptual toolkit and analytic methodology rather than an "-ism" and sociological rather than philosophical" and describes its development as "evolution through research into a growing range of topics, where data "speak back" to the theory, demanding clarifications, refinements and new developments" (2014: 15). As LCT is growing rapidly worldwide, as a theory which enables the study of both knowledge and knowers in diverse fields of practice, LCT's toolkit can be expected to continue to develop beyond the description provided here as a single snapshot of its development at a particular point time. An introduction to the emergence of LCT and the dimensions of Semantics and Specialisation can be found in Maton (2014), upon which this entry draws heavily. In most cases more detailed information on the aspects of LCT and its development, along with examples which ground the theory in data can be found there. Up to date information on the newer developments in LCT, including lists of the latest publications and theoretical developments can be found on the LCT website (www.legitimationcodetheory.com).

As a theory more concerned with generating explanatory power than its intellectual pedigree, LCT draws on a range of intellectual influences with Maton listing sociology, anthropology, cultural criticism, linguistics, philosophy and political theory. Nevertheless, Bourdieu's field theory and Bernstein's code theory are identified by Maton as central foundations which are integrated and extended on by LCT. Maton is clear to point out that LCT does not supplant or erase these theories but rather shares a Bernsteinian concern towards cumulative knowledge building through extending on and integrating existing concepts in order to achieve greater explanatory power with increasing theoretical economy. A brief outline of the most important concepts from each for LCT is provided below.

It is also important to note before continuing that LCT uses a large degree of technical language to refer to its concepts and tools. Some of these terms originate from its intellectual foundations in Bernstein and Bourdieu (languages of legitimation, codes, devices) and others have developed as the theory grew (semantic gravity, semantic density). While some of these terms appear to mirror those in linguistic fields, it is important to emphasise that these are sociological technical terms, and are used to mean different things than they would in linguistics, just as the word "discourse" or "genre" can refer to different things even among closely related sub-fields in applied linguistics. Every effort is made to define these concepts sociologically as clearly as possible below.

1.1 Bourdieu

Maton identifies field theory's emphasis on realist and relational thinking as core principles which are extended and developed in LCT. In particular, Bourdieu's field theory offers concepts such as *field, capital* and *habitus* which encourage the investigation of underlying structures to understand practices, a core concern of LCT. That is, field theory and LCT share a central concern in seeking to understand how social fields of practice structure knowledge. However, while field theory calls for an investigation of the underlying organising principles of practices, dispositions and fields, Maton emphasises that it does not provide fully developed operationalised tools to do so. He also calls attention to field theory's inability to account for the knowledge itself. He describes field theory as an "unfinished conceptual revolution" (2014: 20) which provides more a new sociological *gaze* through which to view knowledge practices rather than fully developed tools for analysis. The sociological gaze is another critical component from field theory which is integrated and subsumed in LCT.

Maton characterises field theory as being useful for analysing "relations to" the practice of social power but not to analyse "relations within". That is, the thinking tools of field theory can describe structures of power but they are unable to account for what generates fields of practice or to capture the organising principles underlying practices. In order to develop field theory, Maton suggests "theorizing the means whereby the evolving system of possibilities constituting a field is generated, maintained, transformed and charged" (2014: 47). To this end, Maton builds upon the work of Basil Bernstein.

1.2 Bernstein

While Bourdieu's field theory provides ways of thinking and underlying concepts which may have less surface visibility in LCT, Bernstein's code theory provides a visible impetus for many of the concepts in LCT.

Maton draws on Bernstein's pedagogic device and the arena of struggle it creates in order to develop the epistemic – pedagogic device (EPD) in LCT. The EPD involves an extension and re-theorising of Bernstein's pedagogic device. Following Bernstein's model, the EPD consists of fields of production where "new" knowledge is created, fields of recontextualization where knowledges from production fields are selected and transformed into pedagogies, and fields of reproduction which encompass sites of teaching and learning. However the EPD in LCT focusses equally on all three fields with respect to how power shapes practices, and highlights the importance of distinguishing the logics of activities that can be hidden by some educational approaches. Bernstein's focus in the pedagogic device reflected a movement from understanding pedagogic discourse and its organising principles towards analysing the knowledge structures that were transformed by this pedagogic discourse. Maton asserts that his pedagogic orientation resulted in a

"portrayal of knowledge production from the viewpoint of its role in pedagogic discourse rather that its own terms" (2014: 49), resulting in an occlusion of the epistemological and ontological bases of knowledge claims within fields of production. However, fields of production should not always be viewed from the perspective of pedagogy and the "rules" or in Maton's terms *logics,* regulating the practice of production fields must be theorised. Maton proposes a different way of thinking about the device which encapsulates epistemological and ontological issues across all three fields.

Bernstein's concepts of classification and framing are also integral to the concepts in LCT. In particular, classification and framing are implicated in the ways that the relative strengths and weaknesses of modalities in the LCT dimensions are understood. The understanding that stronger and weaker classification and framing of modalities operate along clines or continua is a major advancement which has enabled the plotting of the two modalities in each LCT dimension on a cartesian plane to yield a topological space resulting in four principal codes for each dimension (see Section 3 below). Importantly, all legitimation codes are not ideal types but can be understood as topological spaces because of the infinite variation in strengths of classification and framing of each modality along a continuum. That is to say that not all *knowledge codes* (for example) will necessarily look the same, because their two contributing modalities, *epistemic relations* and *social relations* can vary infinitely along their clines (see Section 3). This also means that changes in relative strengths and weaknesses of modalities can result not only in a *code shift*, that is a shift *between* codes, but also in shifts *within* codes.

Maton also draws on Bernstein's concept of knowledge structures. Bernstein's knowledge structures provide the opportunity to describe types of knowledge but do not fully account for the organising principles which underlie fields with different knowledge structures. Maton extends on this concept in two important ways. He proposes that knowledge structures must be able to be analysed across the whole arena created by the EPD and not just the field of production, as in the inherited model. He also asserts that knowledge structures should be more thoroughly understood as knowledge-knower structures, able to account for how practices shape both knowledge and knowers. While Bernstein conceptualised how knowledge can progress through accumulation of different, segmented, strongly bounded languages in horizontal knowledge structures, and by integration and subsumption of knowledge into higher order axioms to account for a wider range of phenomena in hierarchical knowledge structures, Maton demonstrates that knower structures, which can also be understood as hierarchical or horizontal, must also be interrogated in order to fully understand the underlying principles of social fields. By conceptualising both knowledge structures and knower structures, LCT highlights that hierarchy does not merely exist in knowledge structures but also knower structures, and avoids deficit views of social fields of practice with horizontal knowledge structures (for example) through demonstrating that their hierarchy may be present in the knower structures instead. See Section 3.1 below for an introduction to Specialization

and Section 3.2 for an introduction to Semantics, both of which are used in LCT to analyse both knowledge and knower structures.

The importance of the relationship of the theory to the empirical world is a concern which underlies both Bernstein's code theory and LCT. Both are developed in order to engage with substantive problems of social justice. The primary means in both theories of enabling the data to speak to the theory and vice-versa is through the development of external languages of description, or as Maton calls them, *translation devices*, which enable a kind of translation between empirical descriptions and theoretical concepts. Importantly, a translation device must be developed for each different object of study, as the same theoretical concept may be operationalised differently in different fields of practice. Translation devices also offer greater transparency in research in that they enable analyses to be replicated by other researchers.

2. The Legitimation Device

Drawing on both Bernstein and Bourdieu, Maton views knowledge as a *structured and structuring structure*. That is, when actors in particular fields engage in practices, they do so according to particular beliefs or "rules of the game" through which they demonstrate their legitimacy in their fields of practice. In this way, practices can be understood as *languages of legitimation* which indicate the basis for achievement in a field of practice. Expressed in another way, languages of legitimation embody the particular organising principles and beliefs about achievement which underly practices in certain fields. It is through these languages of legitimation (practices and beliefs) that we perceive the underlying principles of social fields of practice. These underlying organising principles are *legitimation codes*. That is to say that legitimation codes conceptualise the organising principles of practices, dispositions and contexts. Legitimation codes are the means by which actors struggle over the Legitimation Device. Maton (2016b: 240) defines the Legitimation Device as "a hypothesised generative mechanism underlying social fields of practice over which actors cooperate and struggle for control in order to establish relations […] of dominance, visibility, centrality, etc". While as yet not fully developed, as the theory is continuing to evolve through its application in diverse fields of practice, particular aspects of the Legitimation Device have been theorised and are outlined below, beginning in this section with the epistemic-pedagogic device, and the dimensions of LCT in Section 3.

In his epistemic-pedagogic device (EPD), Maton develops the inherited model of Bernstein's pedagogic device in several important directions. While he retains the three fields of production, recontextualization and reproduction, he makes clear that recontextualization may occur between fields in *both* directions. While Bernstein's model focussed on the pedagogizing of knowledge and how knowledge may be *curricularized*

from the field of production to the field of recontextualization and *pedagogized* from the field of recontextualization to the field of reproduction, the EPD also accounts for how educational knowledge enacted in pedagogy may be *recurricularized* into the field of recontextualization and how knowledge from reproduction fields may be *intellectualized* as part of knowledge serving as raw material for creating new knowledge in fields of production. The entire EPD is the object of struggles for power by social actors who seek to control it, naturalising their own practices and ensuring that the characteristics of their own practices remain the dominant measures of achievement.

The means of struggle over the EPD are the legitimation codes which are outlined below in Sections 3.1–3.3. Those whose coding orientations match with codes dominating a social field will experience privilege, while those whose coding orientations clash will experience difficulty. In addition, a distinction can be made between the *focus* of knowledge practices which can differ from their *basis*. That is the underlying organizing principles in a field of practice, or the *basis* of their legitimation can vary from what the field of practice *focuses* on as part of its legitimate activity. Both the basis and the focus of practices can be analysed with LCT. Importantly, the code dominating a social field and thus setting the "rules of the game" may be less visible or transparent to those without a matching coding orientation. Analysis using LCT can, however, make these codes visible and therefore make contestation, negotiation and learning more possible.

3. The dimensions of LCT

Legitimation codes have three active dimensions, Autonomy, Specialization and Semantics. All three dimensions are currently being widely used in empirical research. Each dimension explores one part of the *Legitimation Device* which shapes the field of possibilities within social fields of practice. These dimensions are briefly outlined in the sections below.

3.1 Specialization

The dimension of Specialization reflects the fact that practices are oriented towards something and by someone, thus involving relationships to both objects and subjects. For knowledge claims, we can analyse *epistemic relations* (ER) between knowledge and objects of study and s*ocial relations* (SR) between knowledge and its author or subject. Importantly, epistemic relations to knowledge and social relations to knowers may each vary in relative degrees of strength or weakness along a continuum. Visualising these two continua as the axes on a cartesian plane creates a topological space within which four principal specialisation codes can be described (see Figure 1).

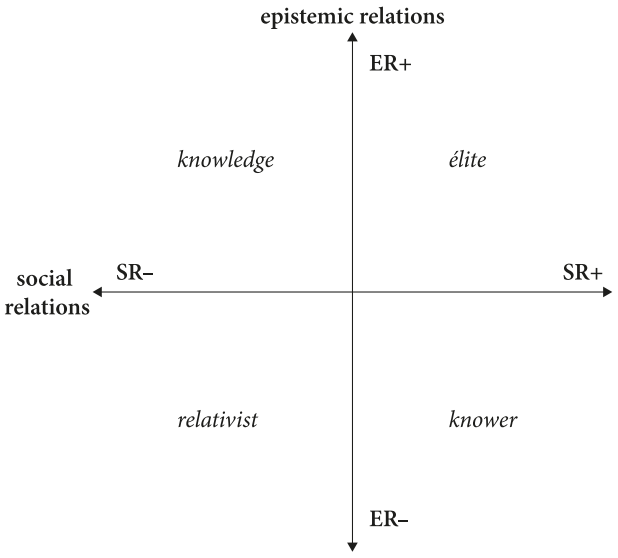

Figure 1. The specialization plane (Maton 2014: 30)

In *knowledge codes*, there are relatively strong epistemic relations (ER+), emphasising specialised knowledge about particular objects of study, however social relations to actors are relatively weak (SR–). In such codes, it does not matter so much who you are but whether you possess the specialised knowledge of the field and a focus on the field's accepted objects of study. In such codes, the possession of legitimate knowledge is potentially open to anyone who cares to learn it. By contrast, in *knower codes*, social relations are relatively strong (SR+) highlighting the importance of the actors and their attributes as the basis for achievement while epistemic relations to specialised knowledge and objects are less important (ER–). In knower codes, the identify of the knower, their dispositions, attitudes and proclivities are far more important and *ideal knower* types can be identified. Legitimacy is based more on who you are than the acquisition of specialised knowledge (for example a white middle class male, an LGBTQI person, a black activist, etc.). *Elite codes* characterise social fields in which both specialised knowledge (ER+) and particular personal attributes, or being the right kind of knower (SR+) matter and in *relativist codes* legitimacy does not depend on either specialist knowledge or learner attributes (ER–, SR–).

Educational research in Australia investigating differentiated educational success suggests that understanding which specialisation codes are privileged in different school subjects can illuminate how learners are positioned differently by them. For example, Mathematics and Sciences have been described as possessing knowledge codes (Maton & Howard 2016) where success depends on learning the correct ways of knowing, or adopting the right kinds of practices towards the right objects of study. In knowledge

code fields like Mathematics and Science, a person's social class or personal dispositions is not what is counted as the basis for legitimacy. What counts is a particular orientation to knowledge. In a sense, in such subjects, it doesn't matter as much who you are, what matters is that you can learn the correct methods of approaching the objects of study. School subject English, on the other hand, has been characterised as privileging a knower code (Christie 2016; Maton & Howard 2016), where a student needs to be the "right kind of learner" with certain valued dispositions in order to succeed. Students who do not already possess the valued gaze may fail to understand the "rules of the game" in knower code subjects where explicit approaches to knowledge are less visible. This explains why some learners find the study of school subject English in Australia so difficult and ephemeral; they may be looking for specific and tangible practices towards specified objects of study and do not have access to the tacit rules of the game underlying subject English as it is currently taught in Australian schools. Bringing to light specific relations to knowledge and knowers makes it possible to describe more unwritten or invisible expectations and struggles. If the particular code underlying a subject is made clear, then the "rules of the game" can also be made explicit, enabling access to a wider group of learners who may not have otherwise understood the tacit codes underlying success. While an understanding of what is required is not the only determiner of school success, it is nevertheless an important factor, especially in contexts where gatekeeping examinations determine future educational opportunities for students. There have been many other studies investigating the codes underlying particular school subjects (and indeed other fields of practice) in an effort to make high stakes school knowledge more visible and therefore learn-able for students. Some of these are referenced in Section 5.

While Specialization codes are helpful in revealing and understanding the languages of legitimation they characterise, it is important to emphasise that the codes are not ideal types and that their realisations may differ empirically according to context. That is to say that depending on the field of practice being studied (be it pedagogy, curriculum, dance performance, academic disciplines, religious practice, etc) they will be enacted differently and will require a translation device for use in empirical research. Specialisation codes are also not homogenous. They may scatter across the quadrants in which they fall as both epistemic relations and social relations represent continua of relative strengths and weaknesses. They can also change over time, so that a particular school subject (for example) described as privileging one particular code may change with curriculum or social reform in its basis for legitimate practice (Carroll 2021).

In summary, the analysis of a social field of practice using Specialization enables an understanding of where its hierarchy lies: with the structuring of knowledge, the structuring of knowers, both or neither. This type of work has value in that it can bring to light the nature of struggles for legitimacy, and therefore success, in particular fields, making the "rules of the game" clearer. For example, a person operating under a knower code in a knowledge code field will experience a *code clash* and will not have access to the accepted

and powerful practices for advancement in that field. For example, they may be operating from a knowledge code orientation, valuing specific procedures and objects of study, in a knower code field, where it is a person's gaze, cultivated over long years of immersion in a field, that counts. One example of how Specialization codes may perpetuate hierarchies of legitimate knowers, resulting in differential access to powerful educational knowledge, can be found in Carroll's (2017) study of senior secondary Music in New South Wales schools in Australia. She found that traditional Western Art Music, as taught in the senior secondary curriculum, represented an elite code, where success depended both on skill in playing music developed over time and on technical skills and formal education in music (for example, the ability to read musical notation and an understanding of music theory). However there were many students who wished to study music who had a history of *playing* music, perhaps learned informally, without a formal education in music theory. In an effort to make the senior secondary study of music available to more students, a second music course was developed to stand alongside the more "traditional" elite code subject. This new subject reflects a knower code, apparently valuing the informal learning that come from a history of *playing* rather than *studying* music. The subject is still examined in end-of-school high-stakes testing, however, and the kinds of knowledge important for success in this subject remain unclear. This has led to a status differential in these two subjects. Study of the second, knower code music subject does not prepare students for the further study of music at tertiary level and usually results in lower marks in the end-of-school examinations. The study has therefore highlighted a need to re-evaluate the music curriculum in NSW schools as a subject initially introduced to allow more access to music education is instead having the opposite effect. This is one example of how making the Specialization codes in fields of practice visible can push towards greater democratisation of access to discourses of power in society.

As argued above, social justice goals of access for all to powerful forms of knowledge involves making the basis for legitimate knowledge practices visible. In knowledge codes, the method of development in the field is quite visible in that the knowledge structures are hierarchical and "truth claims can be judged against available evidence using shared criteria" (Maton 2014: 94). However in understanding cumulative knowledge building in knower code fields, an understanding of *gazes* is necessary. Gazes represent different strengths of social relations. The strongest social relations emphasise the "natural talent" of a *born gaze* where a legitimate knower must posses some kind of genetic or biological genius in some area, for example an ear for music or perfect pitch. Less strong social relations relate to the *social gaze* of an actor who is part of a specific social category, such as gender, sexuality, class, etc. Those with a *cultivated gaze* derive legitimacy from inculcated dispositions which generally have developed over time through immersion or prolonged exposure, for example the literary critic who has immersed themselves in the literary canon for years. The weakest relative strength of social relations result in a *trained gaze*, where legitimacy can be gained through specialist training in procedures

or principles integral to the field. Relative strengths of SR shape the restrictions on membership of particular social fields: knowledge codes with *trained gazes* enable membership to anyone who can access the training in specialist procedures or principles, while knower code fields with very strong social relations are sometimes only accessible to those who are born into the privileged knower group and therefore possess the born gaze. Cumulative development in knower code fields can thus be traced generally to their underlying gazes. Fields which shape their knowers through training or cultivation are enable to embrace more knowers, as knowing is both teachable and learnable. However social and born gazes restrict access and so may offer less opportunity for cumulative knowledge building.

It is important to recognise that there can be variations *within* both knowledge and knower codes. Understanding these differences requires teasing apart the components or sub-relations within epistemic and social relations. Epistemic relations can be understood as comprising both *ontic relations* (OR) to objects of knowledge (or what they relate to) and *discursive relations* (DR) to other knowledges (or how they relate). Each of these relations may vary independently of each other along a cline, so that if modelled on the axes of a cartesian plane they generate the four principal insights of the epistemic plane (see Figure 2). For practices characterised by *situational insights,* objects of study matter more than how they are studied ("allegiance to a problem not an approach") while practices emphasising *doctrinal insights* place greater emphasis on methods of study than objects of study ("allegiance to an approach not a problem"). Where *purist insights* are emphasised, both what and how one studies matters, while were *knower/no insights* predominate nether what nor how one studies matters.

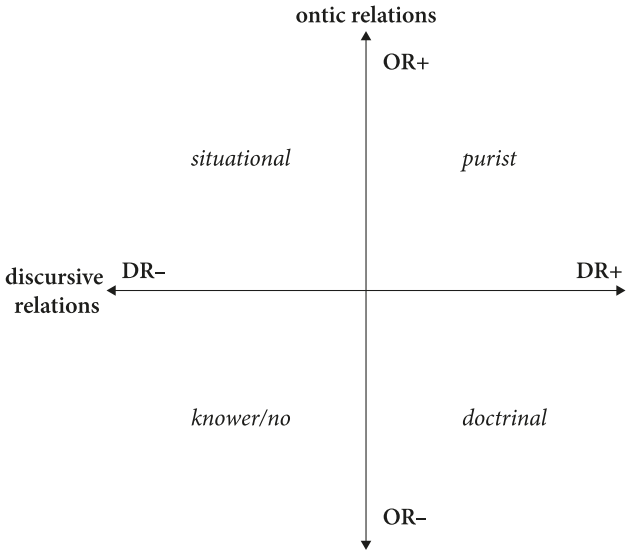

Figure 2. The epistemic plane (Maton 2014: 177)

Understanding these different insights can help explain why relation clashes can exist between different knowledge code fields and help explain why some knowledge code fields might be more easily able to build cumulative knowledge than others. Doctrinal insights, for example, can bring a wide range of phenomena under a common distinct and strongly-bounded approach and the clarity around legitimate methods of study is a benefit for training new initiates into a field, however the strong adherence to particular methods or procedures can lead to disengagement from the real world and eventually limit explanatory power. Situational insights, on the other hand, can make possible multiple approaches to real world problems, however if discursive relations become too weak actors may find it difficult to reach consensus among competing ideas. Maton asserts that all insights have different strengths and that "no single insight guarantees cumulative and powerful knowledge-building" in all situations all the time and that further research is required to investigate "which insights are most valuable for what and when" (2014: 184).

Just as epistemic relations have two sub-relations, social relations are understood as comprising relations to knowers in terms of who they are or *subjective relations* (SubR) and relations to how knowers know or *interactional relations* (IR). These relations can vary along continua of strength and when represented along the axes of a cartesian plane, they generate the four *gazes* (see Figure 3).

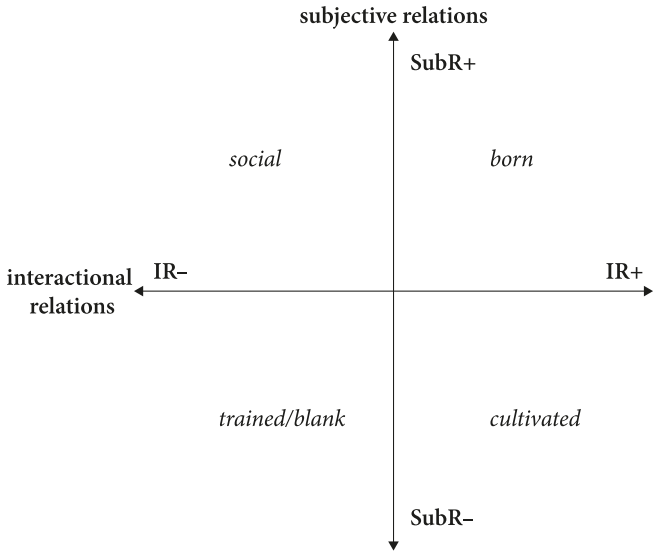

Figure 3. The social plane (Maton 2014: 186)

3.2 Semantics

Semantics is one dimension of LCT that can be used to illuminate segmentalism and its opposite, cumulative knowledge building. It consists of two sociological concepts: semantic gravity and semantic density. *Semantic gravity*, which may be stronger or weaker along a continuum, is the degree of context dependency between practices and their social and symbolic contexts. When semantic gravity (SG) is stronger, then meanings are more tied to their contexts and when it is weaker they are less so. Representational conventions place semantic gravity at the bottom of the cline ("tied to the earth") while lower semantic gravity is represented at the top of the cline ("in orbit", see Figure 4).

Analyses in educational contexts have shown that cumulative learning requires learners to be able to master shifts in semantic gravity. That is, they must be able to relate abstract, decontextualised principles (for example "-isms" like democracy or communism in History, or taxonomies of physical systems in Biology) to specific contexts or examples they are studying (for example the Vietnam war in History, or how individual physical systems affect our lives as humans in Biology). Several examples of teachers assisting students to manage these shifts can be found in the Disciplinarity Knowledge and Schooling (DISKS) project (Martin & Maton 2013), which recorded over 100 hours of classroom teaching in years 8 and 11 Science and History. In this project, researchers found that teachers used various strategies for making decontextualised content more accessible to students. One History teacher did this by locating students in the unfolding action of a source they were reading by re-narrating it in the present tense as if the students were vicarious participants in the ancient historical event, thereby making the past events seem less strange and less distant (Matruglio, Maton & Martin 2013). A Biology teacher managed shifting semantic gravity by explaining what cilia in the respiratory system are ("little hairs") and their function ("move in a wavelike function to move pathogens from the lungs") before relating this knowledge to the real world context of smoking, explaining that "when you smoke cigarettes, the tar actually causes your cilia to…to drop, and so your cilia don't work properly after that because they're too heavy so they can't beat the pathogens out of your body" (Maton 2013: 15). Both these examples involve the teachers taking knowledge that is relatively decontextualised in that it is removed from students' embodied experience of the world and trying to contextualise it for students by linking it to their lived experience. This kind of shifting in semantic gravity manages decontextualisation and recontextualisation of knowledge and enables knowledge transfer between contexts and therefore also cumulative knowledge building. Importantly, studies in education settings, such as the DISKS project mentioned above, have also shown that shifting semantic gravity appears to work in tandem with the other modality in Semantics, semantic density (SD), to produce semantic waves.

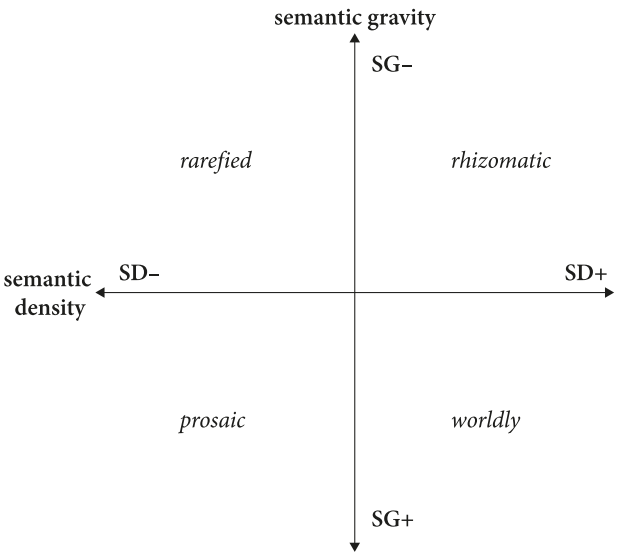

Figure 4. The semantic plane (Maton 2014: 131)

Semantic density (SD), which may be stronger or weaker along a continuum, is the degree of condensation of meaning within socio-cultural practices. When semantic density is relatively strong (SD+) more meanings are condensed within practices and when it is relatively weak (SD–), fewer meanings are condensed. Relative strengths of semantic density are related to the semantic structure in which they are located. That is to say that the word "nose" for example, exhibits different strengths of semantic density if it is located in the everyday field of domestic living or in the more technical field of wine tasting. In everyday fields the nose is something that might run from a cold, itch from an allergy or get burned in the sun and might be various sizes or shapes. In this field the SD is relatively weak as there are not a large amount of meanings packaged up in the term. However in the field of wine-tasting the word "nose" incorporates meanings to do with the smell of the wine, divided into primary, secondary and tertiary aromas, each of which has a corresponding range of olfactory notes and which vary according to grape variety, wine making practices and the aging of the wine. In this case the SD is relatively strong, with a high amount of meaning packed into the word "nose". The process of increasing semantic density to package meanings up is called *condensation* while weakening the semantic density to unpack meanings is called *rarefaction.*

As with Specialisation, the two modalities of Semantics may be plotted against each other on a cartesian plane to conceptualise the semantic structures of social fields. The semantic codes thus generated can be viewed both typologically and topologically because relative degrees of strengths and weaknesses of semantic gravity and semantic density can vary infinitely along continua. The concepts enable the investigation of both

the *semantic range* of practices, that is how much distance there is between the most condensed and least condensed meanings and/or the most contextualised and least contextualised meanings and can be used to construct a *semantic profile* of practices.

The semantic codes generated by the interaction of semantic gravity and semantic density represent different configurations of complexity or condensation and context dependency which may be valued in a field of practice. Fields in which legitimacy rests on relative complexity and contextual independency are *rhizomatic* while *prosaic* codes refer to situations where contextual dependency and more simplified practices or knowledge are valued. When legitimacy is based on relative context independence along with relatively simple knowledge or practices a field of practice can be said to reflect a *rarefied* code, while *worldly* codes relate to fields of practice which value context dependent but complex knowledge and practices (see Figure 4).

Semantics has been found to be highly significant for cumulative knowledge building. Importantly, *semantic waves*, which involve movements in SG and SD together over time have been shown to be critical in establishing knowledge connections between the concrete particulars of specific situations and the more highly condensed and abstract concepts and theories those situations relate to (Macnaught et al. 2013). Movement down a semantic wave involves decreasing semantic density by unpacking technical meanings into more common-sense meanings and increasing semantic gravity by tying meanings to particular contexts, while moving back up the wave involves increasing semantic density by repacking meanings and decreasing semantic gravity by moving away from particular contexts towards generalisation and abstraction (see Figure 5).

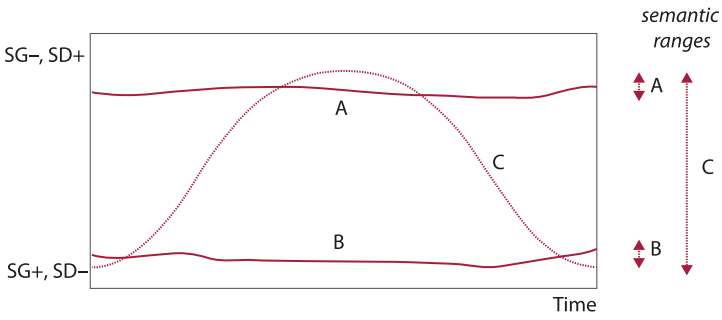

Figure 5. Three semantic profiles (Maton 2013: 13)

When semantic waving does not occur, cumulative knowledge building is hindered. For example, it is possible to have a *high semantic flatline*, where knowledge is abstract, condensed, generalised and theoretical but difficult to tie to any empirical referents. In cases such as these, theory cannot be operationalised. A *low semantic flatline* results in knowledge that is highly contextualised but lacks connection to theoretical principles which would allow knowledge to develop over an increasing range of concepts. In ped-

agogical contexts, serial downshifts have also been found to limit cumulative knowledge building. Serial downshifts result when teachers unpack and contextualise knowledge perceived as difficult for students to access, usually found in high-stakes reading, but fail to show students how knowledge can be repackaged up into condensed, abstract forms valued in high-stakes writing. This can happen for example in joint reading practices, where the class together reads a handout and the teacher stops the reader periodically to explain the contents of the reading in more common-sense language, often providing examples that students can relate to in their every day lives. When pedagogical practices do not couple this with explicit teaching on how to repackage this knowledge in a form valued by high-stakes testing, students may be trapped in the contextualised every-day realm of the common-sense, able to express certain forms of knowledge "in their own words" but unable to travel back up the semantic wave to the decontextualised, abstract and condensed principles valued as important "terms and concepts" in their school subjects (Macnaught et al. 2013).

As with every dimension in LCT, analysis of Semantics can be sharpened with the use of a translation device, which makes the principles of translating between data and the concepts clear. Semantics can be applied widely to a large variety of objects of study in empirical research, and each object of study will need its own translation device.

3.3 Autonomy

Autonomy is a dimension of LCT that can be used to investigate integrative knowledge-building or how diverse knowledge practices are brought together. "Autonomy begins from the simple premise that any set of practices comprises constituents that are related together in particular ways [...] Autonomy codes explore the boundaries that practices establish around their constituents and the boundaries they establish around how those constituents are related together." (Maton & Howard 2018: 6). The modality of *positional autonomy* (PA) concerns the boundaries between constituents placed within a context or category and those positioned in other contexts and categories and may be stronger or weaker along a continuum of strengths. *Relational autonomy* (RA) concerns principles of relation among constituents of a context or category and relations among constituents of other contexts or categories, for examples, purposes, aims and ways of working and where these come from. Relational autonomy may also be stronger or weaker along a continuum of strengths. While these concepts must necessarily remain abstract as they can be used in analysis of diverse objects of study, Maton and Howard (2018) exemplify them by grounding them in the study of classroom pedagogy where positional autonomy can be understood as the *content* of the lesson and relational autonomy can be understood as the purpose to which this content is put. Where the content is derived from the subject's syllabus, the PA would be considered to be relatively high and where the purpose of the lesson is to teach the content, the RA would be relatively high (see Figure 6).

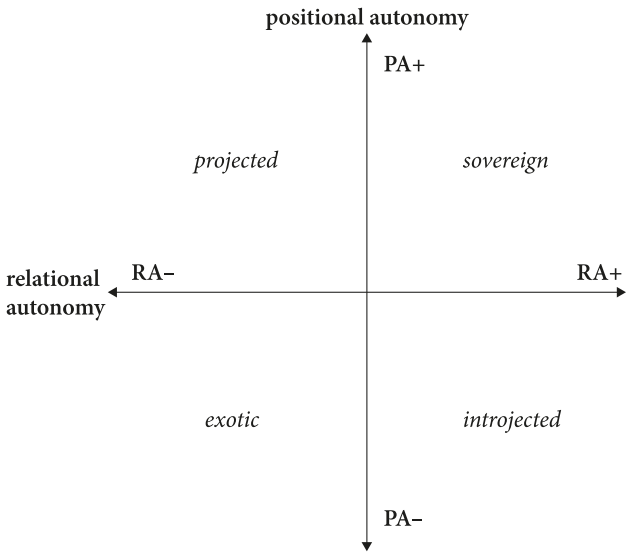

Figure 6. The autonomy plane (Maton & Howard 2018: 6)

The modalities of Autonomy can be charted on the axes of a cartesian plane to yield four autonomy codes on an autonomy plane. As with the other legitimation codes in LCT, the autonomy codes are both typologies and topologies and in analysis it can be useful to look at boundaries or changes *between* codes but also movement *within* codes.

Sovereign codes describe situations where what is valued comes from within the context or category and where the purposes of those constituents are internal (internal constituents for internal purposes) while *exotic codes* refer to situations where both what is valued and ways of working come from outside the context or category (external constituents for external purposes). For introjected codes, what is valued comes from outside the context or category but ways of working with those constituents comes from within (external constituents for internal purposes) while for projected codes what is valued comes from within but ways of working are from elsewhere (internal constituents put to external purposes).

Autonomy pathways chart how practices may shift around the autonomy plane over time and how diverse knowledge practices can be integrated. Practices may stay within a particular code or they may move around the autonomy plane unidirectionally in a *one-way trip*, bi-directionally in a *return trip* or around the plane in a *tour*. In other words, the suggestion is not that particular codes are "better" than others, but that tracing pathways gives insight into how particular fields of practice may or may not enable integrative knowledge building. Maton and Howard (2018) suggest, for example that one-way trips in the context of classroom pedagogy result in segmentation of knowledge practices. An example they give is the discussion in a school History class of where Ancient

Rome was on a map compared to modern day Italy. To help students locate modern Italy, the teacher mentions that Italy has the shape of a boot and discussion quickly shifts to chatting about boots, including whether the "boot" of Italy is high heeled or not. In this case material from outside the subject is brought in and results in discussion unrelated to the purpose of the lesson. The autonomy tour is a one-way trip out of the sovereign code (History material for History purposes, talking about the location of Ancient Rome) into the exotic code (non-History material for non-History purposes, talking about boots). Return trips and tours on the autonomy plane, however, are important to build integrated knowledge. Return trips and tours which begin and end in a sovereign code in particular, represent ways in which knowledge from outside a particular teaching context may be brought in and repurposed for the purposes of achieving valued practices within the context. Maton and Howard (2018) give the example of a second History teacher who links discussion of politics in Ancient Sparta to modern Australian politics. Importantly, this teacher moves *back and forth* between discussing Ancient Greece and discussing analogues in Australian politics, always shifting discussion back to Ancient History after she brings in knowledge from outside the curriculum. In other words, she moves from a sovereign code to an exotic code and back again.

While their paper explores several autonomy pathways and tours in school History and Science lessons, Maton and Howard (2018) caution that the pathways they describe are not the only ones or even always necessarily the best ones that can be used for learning. Different types of tours may have benefit in other contexts and research using Autonomy should always be guided by the question "what pathway serves what purposes, for whom, and in which contexts?" (Maton & Howard 2018: 31).

4. Combining LCT dimensions

Much of the work published using LCT to date has focused on using one dimension at a time with a particular data set. This is unsurprising when considering that many of the initial publications have been introducing newly explored dimensions of LCT and explore one particular issue related to the problem-situation under study. However multiple dimensions of LCT can contribute to the possibility or not of integrative knowledge-building in a particular social field, and it is likely that applying several dimensions of LCT to the same data will yield greater explanatory power in many cases. For example, in school pedagogy, Semantics, Specialization and Autonomy have all been shown to influence cumulative, integrative knowledge building: Semantics through semantic waving enabling connections to be made through shunting between abstract generalised knowledge to concrete particulars, Specialization through either the cultivation of knowers or the integration of insights, and Autonomy through ways of working with knowledge from either inside or outside the field or both. This is not to say that all

dimensions of LCT should be applied all the time. Maton is well-known in LCT circles for calling attention to the fact that the research question should drive the choice of theoretical tools and that only enough theory should be used as is needed to answer a particular problem.

Semantics and Specialization are the dimensions of LCT which were among the first to be described in publication and which have since been used in a wide range of empirical research studies (although studies using Autonomy are on the increase). The next section outlines how these dimensions may be used together to theorise the *cosmologies* underlying fields of practice.

4.1 Cosmologies

The dimensions of Specialization and Semantics can be brought together to investigate how *cosmologies* or belief systems which underlie social fields shape what is possible and legitimate in a field. "A cosmology is the logic of the belief system or vision of the world embodied by activities within a social field" and theorises what "makes one set of ideas and practices sexy and another not so hot" (Maton 2014: 152). All systems of ideas and practices have a cosmology of some kind or another. While a wide range of cosmologies are possible, based on varying strengths of relations in specialization and semantic codes, two main types of cosmologies have received the most attention in empirical research to date: *epistemological cosmologies* where the attractiveness and acceptability of ideas, beliefs and practices is based on their explanatory power and *axiological cosmologies* where "sex appeal" is based on the valorisation of knowers.

Importantly, cosmologies bring together *relations within* knowledge practices through processes of *clustering* and *constellating* and *relations to* knowledge practices through *condensing* and *charging* to theorise how fields of practice legitimize particular world views. Maton (2014) demonstrates this process for an axiological cosmology underlying educational research. He shows how in educational research, groups of ideas and concepts cluster around the central signifiers of "student-centred learning" and "teacher-centred learning". Student-centred learning frequently appears together with other concepts such as "social", "constructive", "authentic", "collaborative", etc. while teacher centred learning appears together with "mental", "receptive", "symbolic" and "individual". These clusters of meanings, which are frequently associated together, become bound together in *constellations* so that meanings within a constellation become strongly associated with all the other meanings within that same constellation. For the example of student centred learning, this comes to mean that learning described as "authentic" immediately invokes all the other associated signifiers in the constellation: constructive, collaborative, social and student-centred. Constellations are often found in opposition to others as poles on a cline, so that to be "student-centred" is understood in opposition to "teacher-centred".

Constellations can be further analysed as to the predominant types of meanings which are condensed within them. *Epistemological condensation* refers to the process whereby the meanings condensed within a constellation emphasise epistemic relations to concepts or empirical referents, resulting is *structures of meaning*, while *axiological condensation* refers to when the meanings condensed in a constellation emphasise social relations such as affective, ethical, political moral or aesthetic stances, resulting in *structures of feelings*. Maton argues that for the constellation of student-centred learning, "comparative explanatory power appears not to be a decisive factor" and that "[p]ositive valuations of SCL are insulated from the paucity of evidence for and considerable evidence against claims made for the approach" (2014: 161). Instead he demonstrates how the semantic density within the constellations of "teacher-centred learning" and "student-centred learning" is axiological. In other words, he suggests that the constellating of evaluative adjectives into the binary opposition of teacher-centred and student-centred learning enables the demonisation of one and the valorisation of the other to be naturalised, independently of the research evidence. Research work is progressing on the various mechanisms by which both epistemological and axiological condensation may happen (Martin, Maton & Matruglio 2010).

5. Applications of LCT

Many of the examples in this entry and in publications introducing LCT dimensions have focussed on educational contexts, especially pedagogy (see also Martin, Maton & Doran 2020; Maton, Hood & Shay 2016). LCT has been used to investigate a wide array of school and tertiary subjects including Modern History (Martin, Maton & Matruglio 2010; Matruglio 2014), Ancient History (Macnaught, Matruglio & Doran in press; Martin & Matruglio 2013; Matruglio 2014), Community and Family Studies (Matruglio 2014, 2015, 2017), Society and Culture (Matruglio 2014), Business Studies (Weekes 2014), Music (Carroll 2017; Weekes 2014), Physics (Doran 2016; Georgiou 2014), Biology (Macnaught et al. 2013) Mathematics (Doran 2016) and English (Christie 2016).

Alongside this strong representation in educational research, it is important to note that LCT is not limited to educational research and can be used to investigate any data set at all. LCT has been used to study fields as diverse as museums (De Carvalho 2010), freemasonry (Poulet 2010), legal practices (Martin 2009; Martin, Zappavigna & Dwyer 2012), ballet (Lambrinos 2020), jazz (J.L. Martin 2013; Richardson 2020), and school choice (Aris 2020) among others. It can be applied to any field of study at all. It is particularly relevant for researchers wishing to understand social justice issues of unequal distribution of power and educational and social inequalities and how these are perpetuated through social institutions over time.

Perhaps due to a shared its concern for social justice, LCT is also useful in interdisciplinary research, especially together with education and applied linguistics. LCT has particularly been used together with Systemic Functional Linguistics (SFL) in a range of research studies. Martin, Maton and Doran (2020) collect some of this research as applied to academic discourse in one volume. Importantly, interdisciplinary research combining SFL and LCT has led to a number of theoretical advancements in both theories as each theory raises problems and questions for the other as they are used together to investigate the same research problem. Maton, Martin & Matruglio (2016) provide a brief introduction to this interdisciplinary work, and Martin and Matruglio (2013) and Martin (2017) provide some detail on the developments in SFL theory which have resulted from the provocations arising.

Perhaps also due to interdisciplinary dialogue resulting from years of interaction between social realism, beginning with the exchanges between Bernstein and Halliday in the 1960s and continuing between Maton and Martin and their students from the 1990s onwards, LCT has developed systems of annotating text during textual analysis, which makes it unique amongst sociological theories. Not only are translation devices for understanding semantic gravity and semantic density in English text under development (see Maton & Doran 2017a, 2017b for an example of semantic density; see Macnaught, Matruglio & Doran in press for an example of semantic gravity) but systems of notation for use on transcripts have been developed and can be found on the "working with LCT" section of the LCT website.

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Abbreviations, notes and symbols

DR discursive relations
EPD epistemic-pedagogic device
ER epistemic relations
ER+ relatively strong epistemic relations
ER– relatively weak epistemic relations
ER↓ weakening epistemic relations
ER↑ strengthening epistemic relations
IR interactional relations
LCT Legitimation Code Theory
OR ontic relations
PA positional autonomy
RA relational autonomy
SD semantic density
SG semantic gravity
SR social relations
SubR subjective relations