In Search of the Zone of Proximal Development: Introducing a Map used to Navigate a Confusion of Categories and Things

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This paper introduces a cosmological map used in a search for the zone of proximal development (ZPD) that takes a conception of "the ZPD as a symbolic space" (Meira and Lerman 2001) as its point of departure. This cosmology is a methodological response to two questions that are at once epistemological and ethical; "under what terms can I apply theory to the critical description of maths classroom interaction?" and "how can I contribute to a critical vocabulary that is inclusive."[1] This paper introduces a cosmological map that will contribute to; an organizing principle for the "things" we talk about when we talk about the ZPD, and a systematic methodology used to find natural examples of this "thing."

The Zone of Proximal Development

Whatever Vygotskii's original intentions were (van der Veer and Valsiner 1991; Valsiner and van der Veer 1993),[2] the zone of proximal development (ZPD) (Vygotskii 1978, p86) has passed into common use and has been treated as different things at different times. Typically it tends to be seen as a property of the individual psyche, a condition (a cause) for the possibility of the psyche's development and a measure of the potential extent of that development in the near future. This conception survives in pupil-centred teaching philosophies and curriculum design and risks ZPD being treated in isolation as a kind of field effect (like gravity) that predicts an individual's future mental development given their current developmental state. If we treat ZPD this way we risk misusing teaching strategies, scaffolding for example, that cease to be pupil-centred and become solution-centred, seen to warrant kinds of actions that are taken to cause pupil development, as something that someone does to

[1] Inclusive in the sense of being systematic, auditable, and open to criticism in the broadest possible community of maths education researchers and practitioners.

[2] Vygotskii first introduced the notion of ZPD as a rhetorical device rather than an explanatory one (Valsiner and van der Veer 1993, pp44-5). He wanted to conceptualise a causal system of development of the psyche and to promote a research focus that emphasised the coming into existence of higher mental functions rather than the simple recording of their already established existence. The notion of ZPD arose from Vygotskii's material and social-historical principles but it had, and still has, no substantive link to any material circumstances that might indicate its existence. It was devised to bring together the features and functions of his theory and to point them toward some useful pedagogical application (see Vygotskii quoted in van der Veer and Valsiner, 1991, p340).

someone else to achieve a desired effect. By the very nature of the metaphor, scaffolding supports the activities that contribute to construction and does not constitute it. Scaffolding supports the builders, not the building. It is suggested here that it would be more helpful to treat the ZPD as an effect of human interaction, as a quality of the "discursive space" between interactants in a given situation. The task then is to describe the quality of such a space.

A Multidisciplinary Approach to the ZPD as a kind of Discursive Space

The cosmology presented here is a step towards a systematic description of discursive space that follows Meira and Lerman (2001) who suggest that ZPD is a property of kinds of interaction rather than the psyche's functioning. Meira and Lerman identify two kinds of pedagogical interaction that realise the possibility of the ZPD's operation (op. cit., p12), "content-orientated language" and "communication-orientated language." Their classifications[3] immediately suggest Bernstein's principles (Bernstein 1990, for example), that, along with the notions of structure and agency (Giddens 1984), mimesis (Girard 1978), object identity (based on suggestions by, Vallacher and Wegner 1985; Trope and Liberman 2010), and the principles of Systemic Functional Linguistics (SFL) (Cloran 1994; Halliday and Matthiessen 2004; Hasan 2005, for example) have been used to synthesise the cosmology introduced here, and inform the following provisional description of pedagogical discourse[4] (in the context of the maths Period and school maths).

1) Instructional discourse (ID) (after Bernstein) recognises generic Episodes of interaction aimed at some congruence, or coherence, in teacher-pupil and pupil-pupil thematic use with respect to a semantic point of departure (Rhetorical Units and Lessons)[5] and object identities that are accorded the following interrelated dimensions,
    a. prepotent level of construal, and psychological distance[6]
    b. valence, and potency
2) Regulative discourse (RD) (after Bernstein) recognises features of generic Episodes of interaction in which ID is embedded, such as;
    a. interventions made by the teacher that orientate the pupil towards an institutional framing of what it is to do school maths in a maths Period
    b. interventions made by any actor towards;
        i. reducing communicative gaps and ambiguities in object identities
        ii. self-regulation
        iii. calling for and demonstrating attention, and
        iv. building relations between past, current and future events or actions in the context of the institutional organisation of school maths
    c. actions executed by any actor that indicate that actor's realisation and recognition of positioning[7] with respect to their own and others' actions in the given context of situation (a maths Period)

[3] It should be noted that Meira and Lerman (op. cit.) produced their descriptive features based on their interpretation of interaction in a Brazilian crèche, observing pre-school children and their teacher in interaction, and they do not claim that it is exhaustive.

[4] It is taken here, as noted in Meira and Lerman (op. cit.), that learning is not development, that learning leads development, and that learning is a product pedagogical discourse (see also Vygotskii, 1978, p90).

[5] Capitalised terms (like Lesson) are units of analysis and can be found on the map shown in Figure 1.

[6] See Trope and Liberman (op. cit.).

The elaboration of features included in this project's description of ID[8] is intended to be an expression, in terms of this cosmology's analytical tools, of Meira and Lerman's own view that interaction provides the opportunity for the "fragile conditions" for the possibility of ZPD's operation emerging when participant's in interaction "catch each others activity" (op. cit., p35). This cosmology contributes to research that aims to translate "catch each others activity" into descriptions of semantic objects (Lesson and Rhetorical Unit) that realise kinds of Episodes that plausibly indicate the possibility of ZPD's operation.

A Semogenic Cosmology – How to Read this Map

Figure 1 shows a cosmological map – a semogenic[9] (Halliday 2003, p248) cosmology – used to navigate the literature in search of an objective description of the ZPD. It is an attempt to organise the categories and things that populate our discourses so that objects that are otherwise incommensurate, like the Clause and the Episode, can be put into functional relationships. Figure 2 maps this cosmology's key theorists onto the analytical strata of Figure 1.

The stratification of analysis. The justification for stratifying the analysis of human interaction is argued elsewhere (Hjelmslev 1961; Shwayder 1965; Halliday 1977, and others). This cosmology features the analytical strata; ecology, phonology, lexicogrammar, text semantics, social order, and economy (the individual psyche's valued content). Each stratum calls for its own set of analytical tools and its own units of analysis (such as Tone unit, Clause, Rhetorical Unit, Episode and so on).

Units of analysis, scale, and delicacy. This cosmological map's analytical strata classify phenomena according to units of analysis, or object classes. For example, a unit of analysis in the lexicogrammatical stratum is the Clause. The descriptive systems that underlie object classes (such as the Clause's Mood, Key, Transitivity, and Theme systems) are not shown on the map. Object classes are organised according to their relative scale. Smaller scaled objects are located lower down on the map. Delicacy refers to the "depth" of analysis undertaken for a given unit of analysis (a third dimension, not shown, of the map).

Constitution. Within each stratum, object classes stand in a relationship of composition, or constitution. For example, in the semantic stratum, Messages constitute Rhetorical Units (RUs), that is, RUs are composed of sequences of Messages with particular structures and functions.

Redundancy. A special relationship obtains between objects in adjacent strata that is referred to in this cosmology as "redundancy,"[10] or "recognition and realisation." Objects "realise" other objects of around the same scale to their left, and "recognise" others to their right. Recognition : realisation :: ideal : material :: climate : weather.

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[7] Positioning (power and control) features in Bernstein's account of reproduction and variation in social order.
[8] That is, features 1a through to 1d that build on Meira and Lerman's description (op. cit.).
[9] Semogenesis – a system of meaning making (after Halliday).
[10] Redundancy is defined here as "super-abundance," an "overflowing" of meaning-potential.

The visible and the invisible, the symbolic and the material. The broken line A-A marks the boundary on this cosmological map between material production (the object of natural science) and symbolic production (human science). The broken line B-B marks the boundary between objects that are "visible" (sensible) and those that are here taken to be "hidden" (the individual psyche's content and functioning).

A bound and infinite cosmos. That this semogenic cosmos is bound and yet potentially infinite is indicated by the broad arrows, to the left and right of the map, that mark where the map folds back upon itself to close on the broken lines C-C & C'-C'. This puts the psyche's economy in a redundant relationship with its material ecology – the "embodied psyche" – and accounts for both the constraints and the possibility of indeterminate material and symbolic production and variation.

Operationalising the ZPD

In this cosmology (Fig. 1) ZPD is a "thing" used in a multidisciplinary account of the possibility of psychic development through pedagogical discourse (PD),[11] ID/RD,[12] the orientations to meanings (object identities) constituted by positioning and code (structure and agency) that recognise objects of social order, objects like Unit of Work, maths Period, and Episode that feature plot, place, players, purpose, progression, theme, exposition, extension, dénouement, and so on[13] (in the fashion of Burke (1954), for example). These objects of social order realise Bernstein's code modalities (orientations to meanings constituted by classification and framing) and are themselves realised by semantic objects (RUs and Lessons). These semantic objects are in their turn realised (though not exclusively[14]) by lexicogrammatical objects (like the Clause) and this cosmology's phonological and phonetic objects, down to the elementary psychic functions that realise material action.[15]

Here, genre (generic forms of interaction) is not a description of lexical, grammatical, or semantic forms; it is a description of a context of situation. The maths Period is a generic form. Episodes are generic forms of a smaller scale that constitute the Period. The maths Period is a constituent part of generic forms of a higher scale such as a Unit of Work, a curriculum, and so on. It is important to note that the "thing" referred to here as the "institutional organisation of school maths," a kind of social order, is not real, it is not some bound and determined object with an a priori existence. It exists, or not, in its recognised artefacts and in each of us who participates in the specialised practices that we have come, variously and variably, to recognise as "doing school maths." It is this researcher's task to describe kinds of Episodes that plausibly realise the possibility of ZPD's operation and then to find them (or not) in instances of natural maths classroom interaction so that they may be shared as material examples of what the ZPD "is."

[11] In this cosmology ZPD is a "thing" used in academic and professional discourses about pedagogical discourse.
[12] Bernstein's formulation PD=ID/RD is his account of pedagogical discourse (framing) – a discourse of competence embedded in a discourse of social order (op. cit., p183, for example).
[13] "All the world's a stage," Jaques, 'As you like it,' a2s7
[14] Other "lexicologies" and "grammars" are needed to analyse forms of expression other than language.
[15] Which, in the case of language, is the physiological articulation and audition of sound.

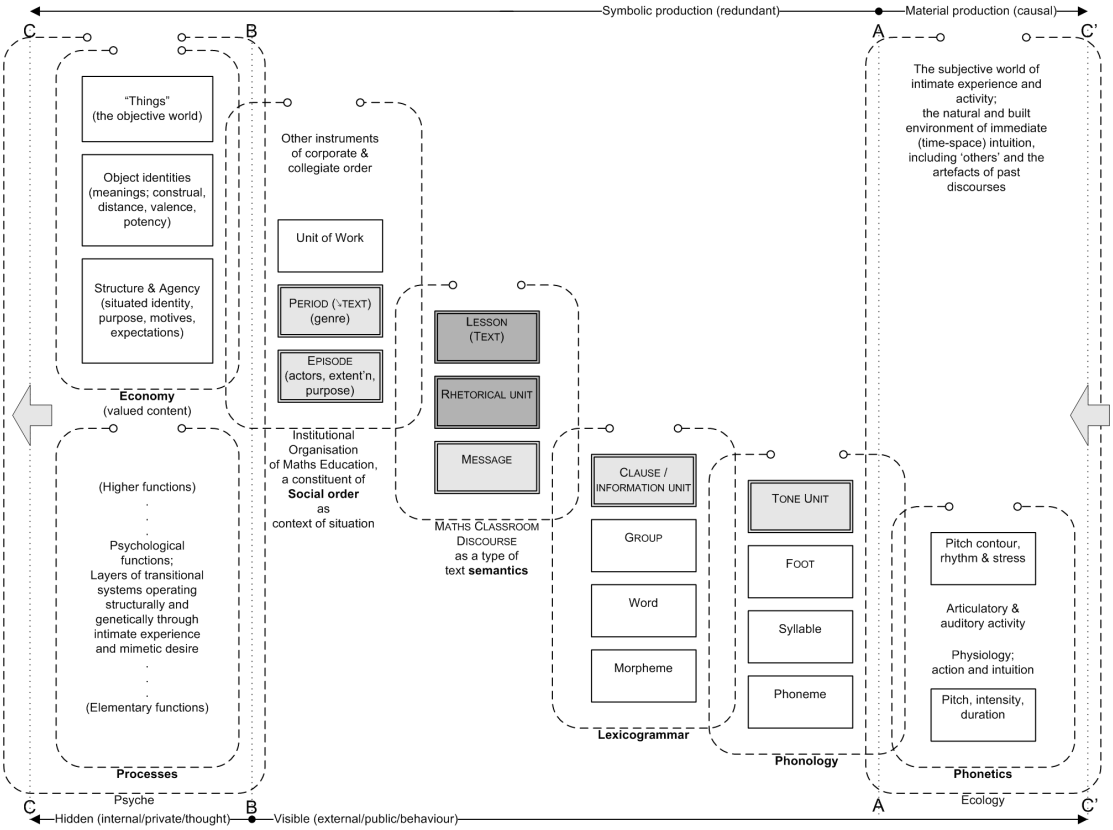

Figure 1: A semogenic cosmology

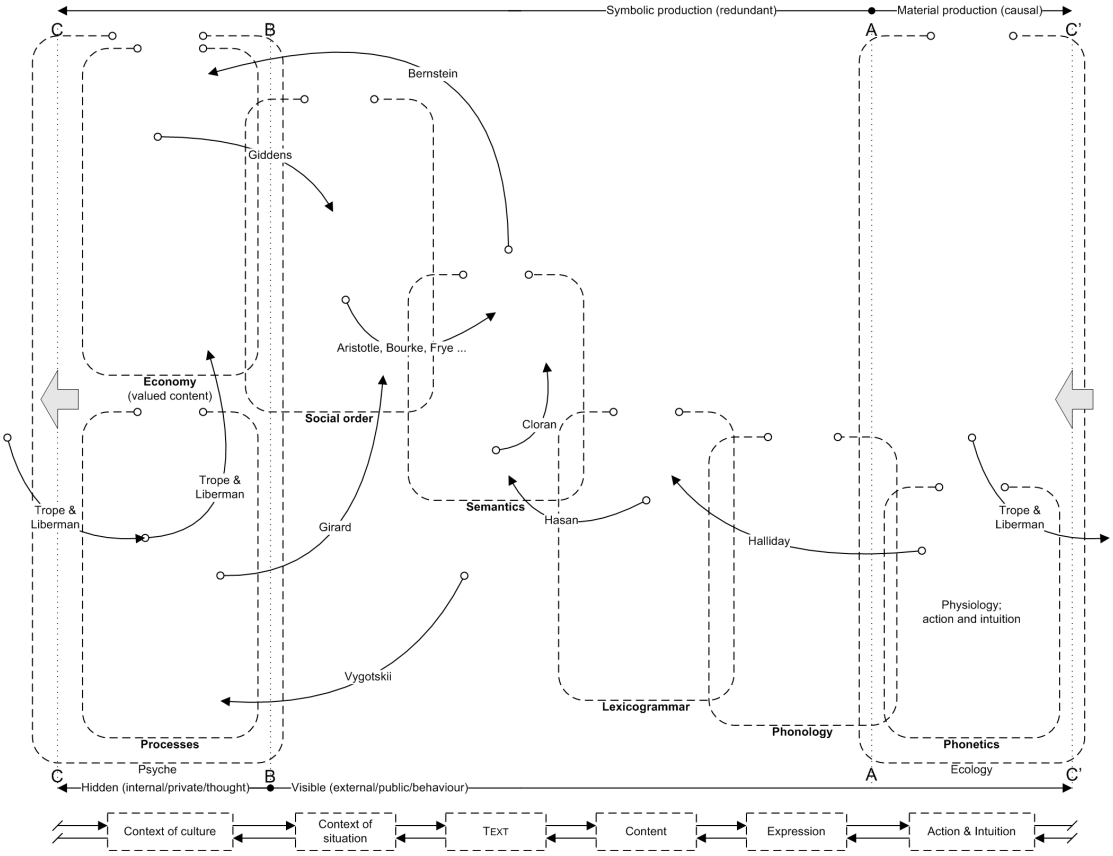

Figure 2: Key theorists mapped onto this cosmology

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