Editorial
Semantic density and semantic gravity

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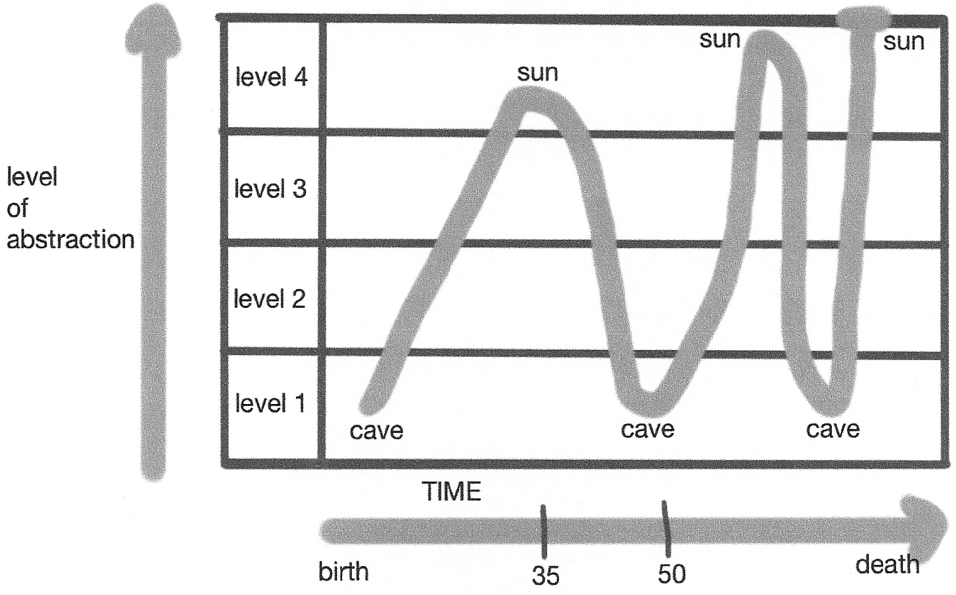
As education academics we are partly in the business of abstraction, but if Socrates had to pin you down in a corridor and interrogate your understanding and practices of 'abstraction', how would you fare? What is abstraction, how does it work, how does it operate in knowledge structures and pedagogy? The best student of Socrates wrote the founding text on how abstraction works in education and captured its essence in the Cave Metaphor. A student, forced to look at only shadows on a cave wall, is released and makes a journey upwards and away from everyday localised experiences into the light of pure abstraction, before descending again into the cave to work towards the release of others. Periods of working in the darkness of the cave must alternate with continual journeys back up into the light to recharge abstract insight and also to push towards the highest levels of pure abstraction found in the form of the Good.



Using the above diagram we can see that Plato was clear on a number of issues. There are four levels of abstraction on the Y axis, and the time period on the X axis is the lifetime of a philosopher king, who only reaches the heights of abstraction at around the age of 35 before descending back into the cave to practice as a politician (35–50), and then ascending up and down more frequently as he develops more experience dealing with the intricate combination of localised experience and abstract principle.

It is the task of each generation of educational thinkers to rearticulate and critique this founding vision, and amongst our current generation, Karl Maton is giving it a good go. In this edition of the *Journal of Education* there is one article that uses his Legitimation Code Theory to analyse Marketing in Higher Education, as well as a book review that critically explores Maton's book '*Knowledge and Knowers'*. Key to the latest developments in LCT are Semantic Waves, and we can use Plato's Cave Metaphor as a backdrop to understand Semantic Waves.

Firstly note the difference between the cave of everyday, located, spontaneous concepts and the light of pure abstraction and principles. Maton uses the term 'Semantic Gravity' to catch how, within the cave, meanings are embedded in their context and are heavy with particularity and detail. With a shift into the light of the sun, meanings become decontextualised and are able to rise above specific, located senses. Meanings become more general and abstract, getting to the essence of the concept beyond its concrete flavours and instantiations. It is almost as if, in rising towards the sun, all that is extraneous to the pure form is burnt away, leaving only the essence to rise, like the spirit away from the body. The task of an education system and the society it exists within is to ensure movement from everyday meanings to abstract and general concepts and then back again. Both the movement upwards and downwards are difficult paths to negotiate. Plato symbolises this by how the pilgrim, when struggling upwards, is blinded by the light of the sun when emerging from the cave; and how, when descending downwards back into the cave, is again blinded by the darkness. It is hard to work from the concrete and local towards the abstract and general; but it is also hard to work from abstract principle to a located case study or instantiation. An educational cycle has to do both – it has to rise upwards to abstraction and then descend to located instance.

The time it takes to move through a single cycle gives us an educational semantic 'period'. How many cycles are completed in a given time period gives us the 'frequency'. Where we enter (level 1, 2, 3, 4) gives us our entry point, where we end gives us our exit point. How high (and low) we can go gives us our range, and the individual patterns chased through this plane give us distinct profiles – a wave metaphor rises above us as a way of tracking and analysing the processes of curriculum and pedagogy.

In his empirical research with the LCT community of practice Maton found that two key processes of how abstraction works in curriculum and pedagogy needed clarification – Semantic Gravity and Semantic Density. Both are simple to grasp – Semantic Gravity refers to how embedded in context meaning is. The more meaning relies on its local reference for meaning, the heavier it is; the more decontextualised and universal the meaning, the lighter it is. Take this editorial, for example. At its most general it is an editorial, like many other editorials written in journals across the world. At its most particular and concrete, it is this editorial written for this journal.

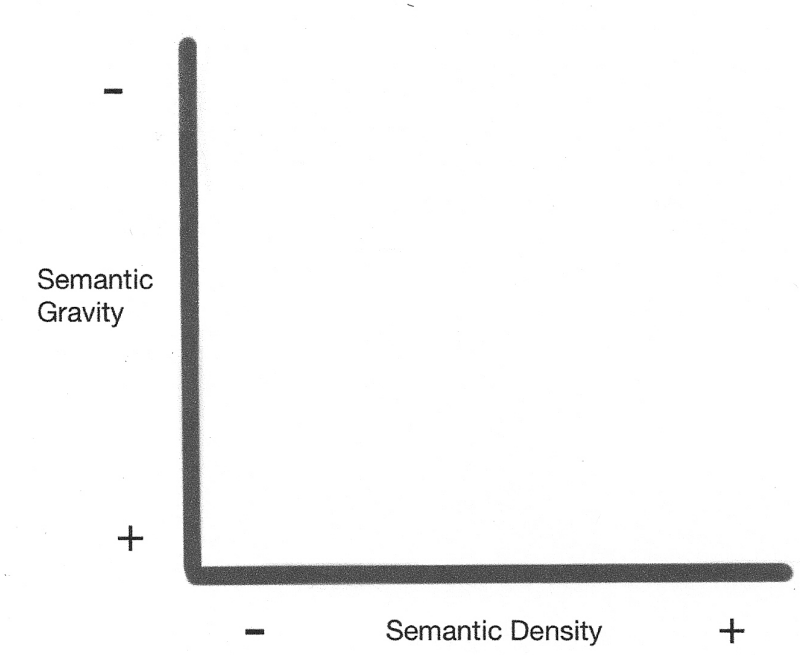
1. Editorial
2. Editorial for *Journal of Education*
3. Editorial for this issue of the *Journal of Education*

In general, the meaning of 'editorial' rises above particular instances and located meanings to describe how editorials work in general; in particular, the meaning of 'editorial' is heavily tied to the current articulation of the page you are reading. Teachers work with the processes named by Semantic Gravity all the time. Every time a general concept is illuminated by a specific case; every time a local instance is generalised into a universal rule, we have Semantic Gravity at work.

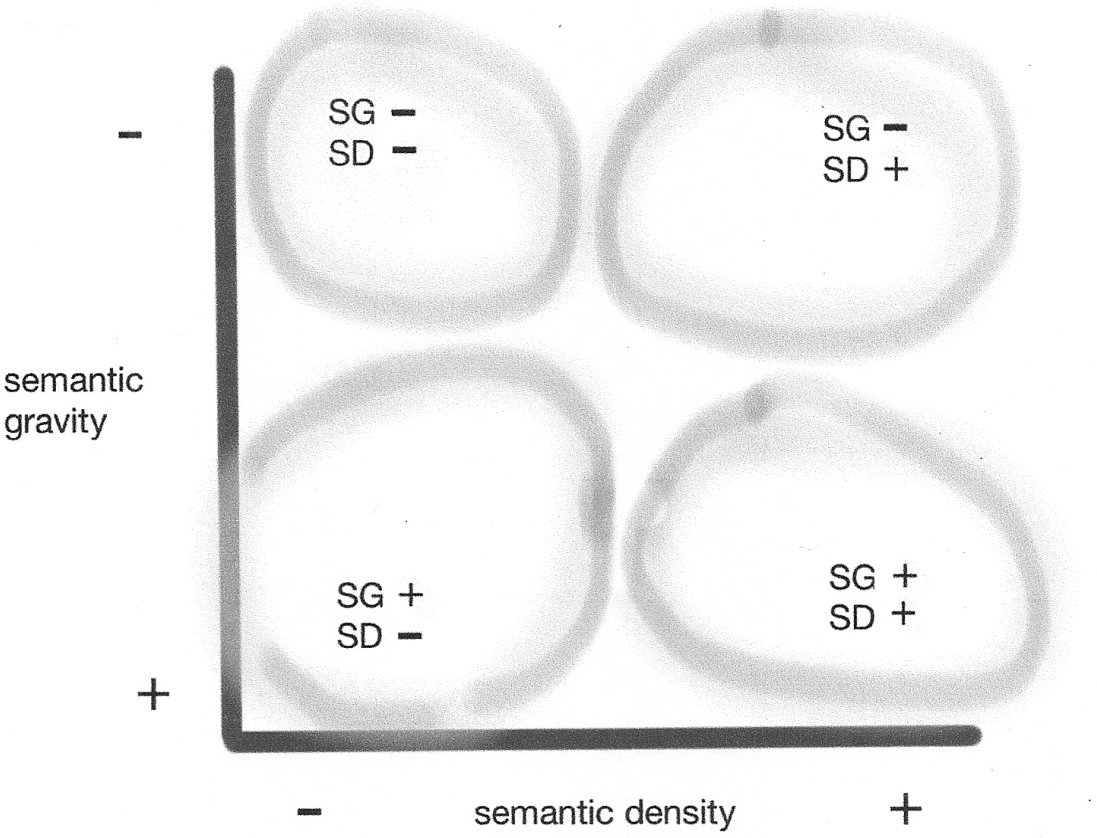
But something very strange happens with abstraction losing particularity as it rises to generality – its formalisation allows for new relations to build that are not based on located concreteness but on logical connection and specific features. This allows for a very different type of connection that is not based on located meaning in context, but of formal distinctions and specifications. There are major differences in the complexity and depth of different networks. Some networks are denser than others, some concepts contain more distinctions and relations within themselves than others – some concepts condense more within themselves than others. Maton calls this variation in condensation Semantic Density. Again, this process is ubiquitous in

pedagogy. Teachers are continuously building up Semantic Density when working conceptually with their students. Complex concepts need to be unpacked into their specific elements and relations and once the concept has been properly understood, it needs to be used with other concepts to grasp a larger or higher process. When a teacher 'unpacks' a concept then there is a lessening of Semantic Density; when she 'packs' the concept up and uses it as a whole to understand even more complex or broader issues, then there is a strengthening of Semantic Density.

Maton then combines Semantic Gravity and Semantic Density together and explores how they play with each other. Often these two processes work together. When a teacher unpacks a concept into its specific components (SD-), she often also gives a concrete or local example (SG+). But these two processes independently vary. It is quite possible for a teacher to unpack the concept into its specific elements (SD-) and not give concrete examples, just as it is possible for a teacher to give a located example to illustrate a general concept (SG +) without unpacking the specifics of the concept. I make sense of how these two processes work with each other by simply placing each process on a separate axis. An increase in abstraction results in a lowering of SG, descending to more concrete and located examples results in an increase in SG.



Four basic zones are generated with infinite grading between them:



Such a representation allows you to track how the pedagogic process plays out in terms of Semantic Gravity and Semantic Density over time. It also forces you to think about the two processes separately and together at the same time. This is important in terms of knowledge cumulation, because simple abstraction strips away particulars as it moves towards the general – it becomes lighter and lighter – and that is not what counts, because knowledge becomes more dense and complex as it grows. You have to catch a process that becomes more 'intricate' as it becomes more abstract. That is why the combination of Semantic Gravity and Semantic Density work so well together.

You can intuitively try it out. Here is a grade four Natural Science textbook working with 'Energy'. See if you can track the line through six sentences:

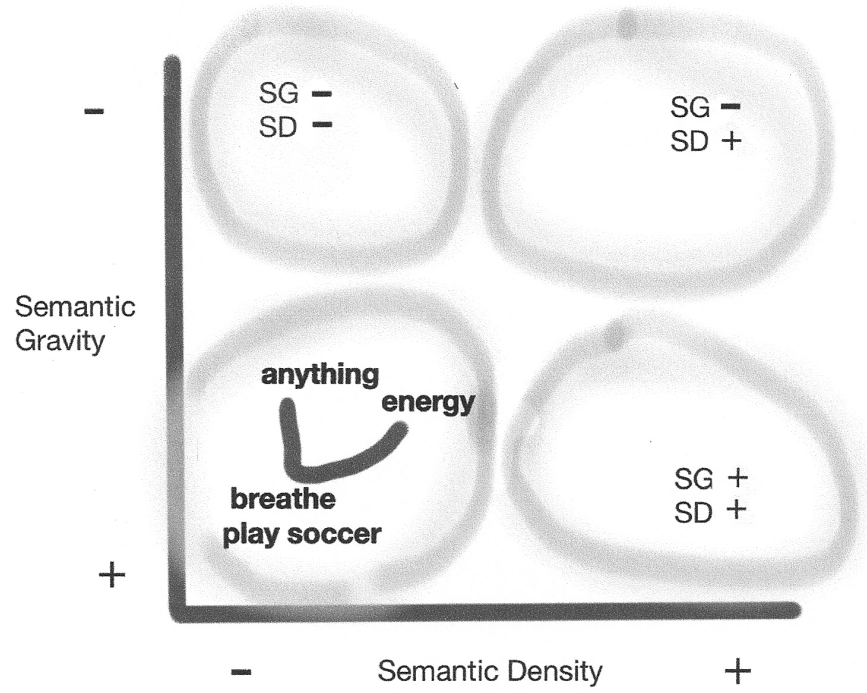
1. In order to do anything – breathe, get out of bed, do your homework or play soccer – you need energy.
2. All machines that help us, such as taxis, televisions, the stove and light bulbs need energy in order to work.
3. In science we say that energy is needed to do work.
4. Work is a word used in Science to describe effort or energy used.
5. For example, if you push a box along a table, you are doing work.
6. The box is also doing work.

What jumps out for me, before I show my line, is that the extract works with everyday and specialised senses of energy and work.

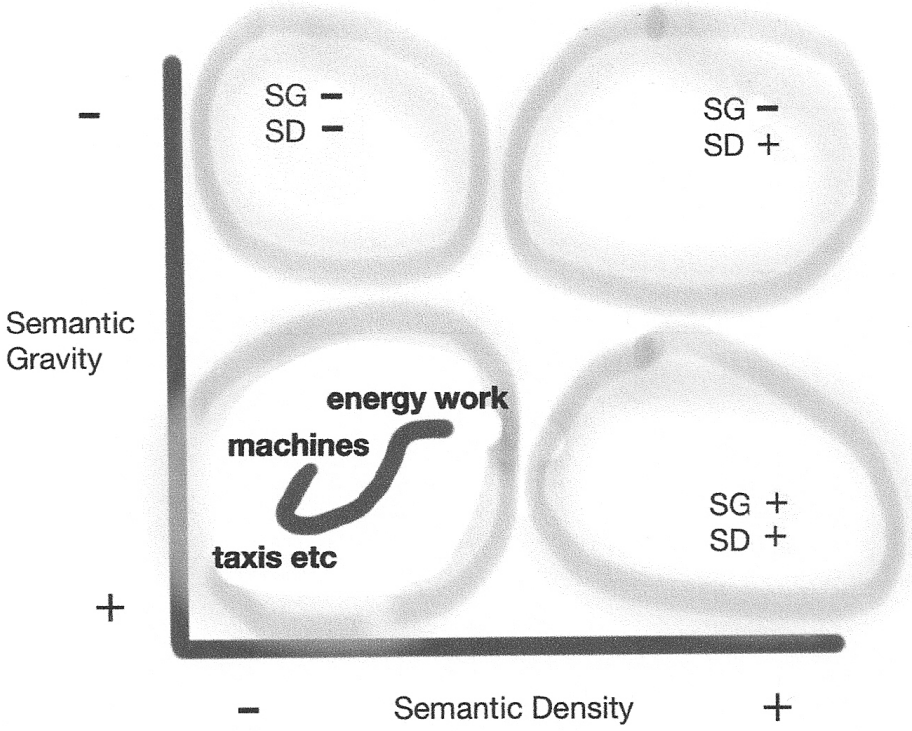
- An everyday sense of energy is the stuff we need to do things (sentence 1).
- An everyday sense of work is that machines need energy (like electricity or petrol) to function (sentence 2). If something is working, then it is doing its job.
- A specialised sense of energy is that what is needed to do work (sentence 3).
- A specialised sense of work is energy used (sentence 4).

The two concepts of energy and work are defined in terms of each other, not localised examples. Local examples are stripped away in sentences 3 and 4. Then we get a new example of work in sentence 5 that combines energy and work inside of 'work'. Finally, the coup de grace, with sentence 6, an example that surprised and subverts everyday understanding – when you push a box along a table, the box is 'working', not just you. Can we track this on the matrix above?

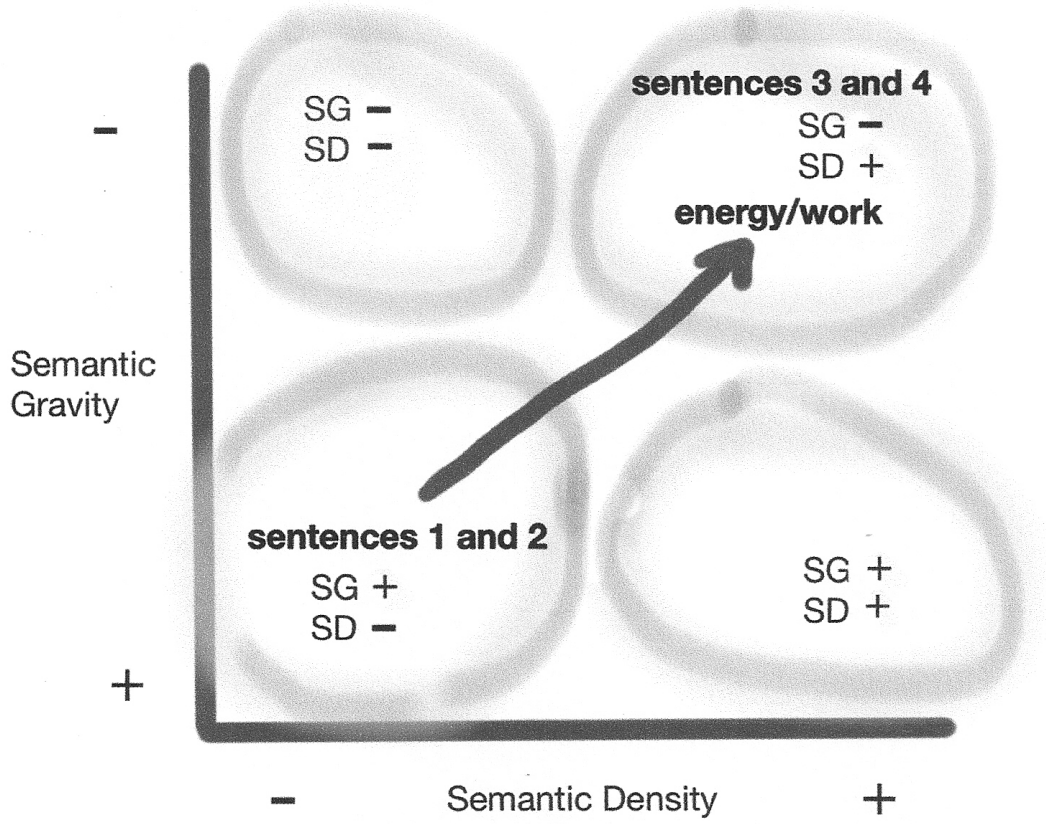
An immediate issue is what level of focus are we working with – inside the sentence or between sentences? The first sentence has a low level concept 'anything' that is unpacked with examples (breathe, get out of bed, do your homework or play soccer) and then tied together again with a more specific concept 'energy' that is related to what you need in order to do anything.



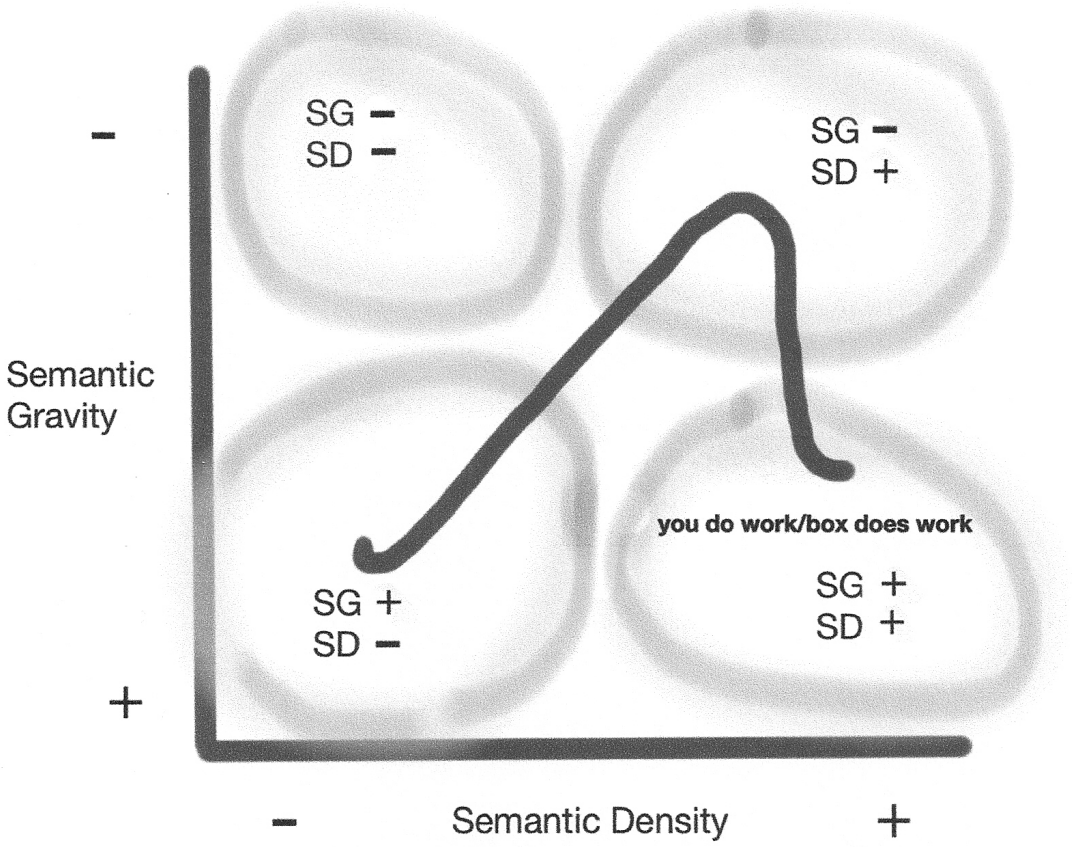
The second sentence performs a similar movement from low level concept (machines) to specific examples (taxis…light bulbs) to energy again, only it adds an everyday understanding of 'work'. I think, at this point, that 'work is slightly more semantically dense than energy, because it wraps up inside of itself energy and machines. 'Machines' is also more concrete than 'anything', hence slightly higher in SG.



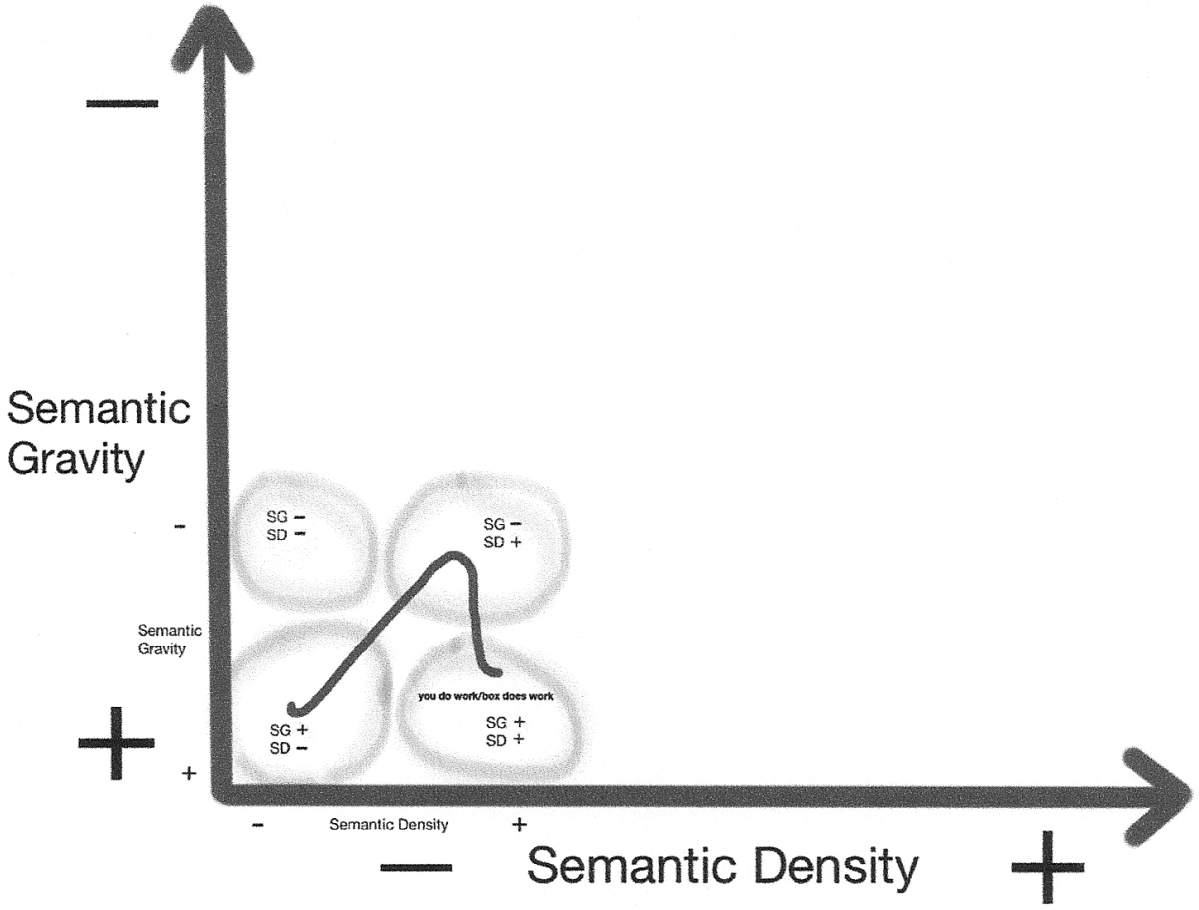
But notice that both sentences are really operating in the SG +/SD- region. With sentence three and four there is a shift into increased abstraction (SG-) and tighter definition (SD+). The terms energy and work are defined in terms of each other at an abstract level that increases the SD of both through each other.



Sentences 5 and 6 then give an example of how these more specialised concepts of energy and work combine that refuses to go back to everyday understandings, *but does still concretise*. So what happens here is that Semantic Density remains strong (maybe even increases), but Semantic Gravity becomes stronger with the concrete example.



What we have, is a semantic wave that combines both SG and SD continuously together. Note that this is a grade 4 textbook discussion of energy that is working at the very beginnings of scientific understanding. As we move through the years, both abstraction and density will increase dramatically as higher and higher levels are reached with more and more meaning compacted within the terms. The size and systematicity of the network will grow.



We have the beginnings of a way to symbolically track cumulative learning. You might disagree with how I analysed the textbook – maybe 'anything' is lower in SG and lower in SD than I indicated; maybe you doing work pushing a box has the same SD as the box doing work – but these intricate decisions make a community of practice flourish as it deals with actual engaged analysis that gives and demands reasons.

There is much more than Semantic Waves to LCT, as you will find in two of the articles in this edition of JoE. Arbee, Hugo, and Thomson show how LCT works as an analytical tool in Higher Education through a case study of Marketing at UKZN. Fiona Jackson provides an extended essay review of Maton's book, *Knowledge and Knowers*, that substantively engages with the structure and issues of the book. *Knowledge and Knowers* is an impressive book. It provides a synthesis of much of Maton's recent work as well as demonstrating how LCT is continuously on the move, engaging with developments and problematics, both theoretical and empirical, in a

constructive and synthetic way. LCT is growing in strength in South Africa, with established communities of practice at UCT and Rhodes, and we need to engage substantively with what it offers.

If Fiona Jackson provides a detailed review of *Knowledge and Knowers*, then Paula Ensor does a similar job on Stephanie Allais' fascinating book – *Selling out Education: National Qualifications Frameworks and the Neglect of Knowledge* (2014). If Maton provides us with a way to grasp the micro fibres of cumulative learning, then Allais shows the macro forces ranged against cumulative learning across the world and particularly in South Africa. The logic of the market and the belief that education can solve all the problems of the world pins education between two unenviable forces – one strips the substantive content of education down to marketable elements; the other fattens education up as the great provider. Education is not the great saviour of our modern world; it is not the salve to all that is wrong. Education can do good, but it is an imperfect force with limited means operating in a restricted environment. Allais uses her detailed research on the South African National Qualifications framework to illustrate how market forces and hyped expectations inflicted educational damage, not only in South Africa, but across the world. Ensor finds Allais' account insightful, but engages in a respectful critique of Alias' critique, pointing to areas where Allais needed to clarify her focus, where she overstepped bounds, misidentified forces, and where more work is needed. It is the kind of serious review a book of this calibre deserves.

Ensor ends with a call to focus in on the distinctive dynamics of vocational education, crucial as it is to the functioning of modern societies. It's not only vocational education that needs a distinctive focus, it's all the different types of knowledge structures and practices. We have not yet developed a taxonomy of knowledges that has the same detail as Linnaeus provided for plants, but at least it is on our horizon. Hirst came close with his Forms of Knowledge (see *Knowledge and the Curriculum* (1974), but his idealist project lost traction, although it is now being picked up by the social realists who work a lineage from Durkheim, through Bernstein to Young, Moore, Muller, and Maton. This project has become increasingly sophisticated, especially with the realisation that Cassirer provided us with a more precise and generative classification of knowledge than Durkheim or Bernstein (see Young and Muller's much under-rated *Truth and Truthfulness in the Sociology of Educational Knowledge,* 2007). Cassirer was the genuine article, a philosopher who took the project of understanding all current forms of knowledge of his generation and age seriously, even if that meant dealing with Einstein's relativity and Darwin's evolution in relation to Kant's metaphysics. I cannot name an equivalent

modern philosopher who has attempted the same project with the same rigour and eye for historical detail – Latour and Zizek pale in comparison, Foucault's *Order of Things* hardly bears mention – so the use of Cassirer to understand specific knowledge forms is to be welcomed, and Alka Sehgal-Cuthbert provides us with just such a piece in her analysis of Art Education.

In 2009 we published Bolton's research on Art Education that pushed for a distinctive understanding of the processes and dynamics of evaluating Art at school level. We finally have a companion piece in Cuthbert's sustained meditation on the distinctiveness of Art Education.

If we can summarise all that has gone before under a general theme of access to powerful knowledge structures, then this falls under an even wider theme, which is access to education in general. There are many luminaries in this field, but for me it is the work of Keith Lewin that I turn mostly to for insight. He has set up The Consortium for Research on Educational Access, Transitions and Equity (CREATE) that focuses on the reasons why children fail to access and complete basic education. Key to this endeavour is 'an expanded vision of access that includes meaningful learning, sustained access and access provided equitably'. (http://www.create-rpc.org). It is a key intervention in the most massive of all struggles – meaningfully educating the poor children of our world. Jean Baxen, Yvonne Nsubuga, Lori Diane Hill, and Anne Craig provide us with an account of CREATE's meaningful access framework, how it can be applied to conditions in the Eastern Cape, and what additional dimensions can be added to gain a more insightful account of meaningful access.

With such an intense set of papers, it is fitting to have one paper that deals with the role humour plays in education. Mary Chabeli, Jackie Malesela, and Monica Rasepae spent some time with learner nurses exploring what experiences of humour they had in nursing education. Humour plays a key role in pedagogy but can be abused – either by being offensive or by being aggressive and denigrating. The teacher is in a position of power and can tease without being teased back, ridicule and mock without being mocked back. That said, there are all sorts of humour that have positive effects. Banas, Dunbar, Rodriguez and Liu (2011) have provided us with an excellent general review of humour in education, and much of what they say is pointed to in the experiences of learner nurses. You will not however, find a joke in Chabeli *et al*'s paper, which is a little sad, given that even Kant and Freud told jokes when analysing humour, so perhaps it is fitting to end off with a joke about us as academics (forgive the masculine):

> Upon waking, a woman said to her academic husband, "I just dreamt that you and me were playing with a string of pearls on our bed. What do you think it means?"
>
> The academic smiled and kissed his wife. "You'll know tonight," he softly whispered.
>
> That evening, he came home with a small package. She jumped up, embraced him, took him to the bedroom, settled on the bed, and delicately unwrapped the package.
>
> It contained Freud's *'The Interpretation of Dreams'*.

I might add, it's a darn good book.

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