



Time travel: The role of temporality in enabling semantic waves in secondary school teaching

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ABSTRACT

Based on the theoretical understandings from Legitimation Code Theory (Maton, 2013) and Systemic Functional Linguistics (Martin, 2013) underpinning the research discussed in this special issue, this paper focuses on classroom pedagogy to illustrate an important strategy for making semantic waves in History teaching, namely *temporal shifting*. We begin with a brief contextualisation of how Legitimation Code Theory (LCT) and Systemic Functional Linguistics have been used together to investigate cumulative knowledge-building before outlining how the LCT concepts of *semantic gravity* and *semantic density* were enacted in linguistic terms for this research in order to understand the linguistic resources marshalled by actors in making semantic waves. The paper then moves on to consider temporality from both linguistic and sociological perspectives and to demonstrate how it is implicated in movements up and down the semantic scale to create semantic waves.

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1. Introduction

When it comes to cumulative knowledge-building, time is of the essence. Time is, of course, implicated in the very notion of cumulative knowledge-building, which involves both looking backwards to previous ideas and looking forwards to future contexts in which current knowledge can be applied and extended. However, this is but one facet of the role of temporality in cumulative pedagogic practice. Maton (2013) highlights the significance for knowledge-building of making 'semantic waves' in the knowledge being expressed in classroom discourse (as well as other practices). These semantic waves involve recurrent movements in the 'semantic gravity' and 'semantic density' of knowledge, or (simply put) the context-dependence and condensation of meaning (see Section 3, below). As we shall discuss, time travel or shifting the temporal and spatial coordinates of discussion, can be a key pedagogic strategy for making semantic waves and thereby enabling recontextualization of knowledge. In particular, strategies aimed at metaphorically locating students in the time of the historical context being discussed can be used in the classroom to enable students to traverse the distance created by texts situated in unfamiliar contexts and which use condensed and archaic language. That is, they enable knowledge to be recontextualised: from historical contexts to current classroom contexts; and from complex constellations of historical meanings into simpler current meanings. Such strategies thereby involve changes in semantic gravity and semantic density, making semantic waves in order to build cumulative knowledge.

This research is part of a larger inter-disciplinary project which investigates the question of how better to enable cumulative teaching in schooling by using approaches from systemic functional linguistics (SFL) and Legitimation Code Theory (LCT) in tandem. The Disciplinarity, Knowledge and Schooling (DISKS) project (Freebody et al., 2008) continues the long and fruitful dialogue between SFL and the tradition of code theory from the sociology of education which began with discussions

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between Halliday and Bernstein in the early 1960s and continues into the present day (Christie & Martin, 2007; Christie & Maton, 2011). The project's focus on cumulative knowledge-building stemmed from concerns, explicitly raised over the past decade by social realist sociology of education (Maton & Moore, 2010), that research and policy in education has neglected the role of knowledge. As Maton (2013) highlights, what he terms 'knowledge-blindness' has been a symptom in educational contexts for several decades. The DISKS project aimed to redress the balance and bring knowledge back into the educational picture by investigating how cumulative knowledge is built in schoolteaching, specifically focusing on secondary school History and Biology.

These investigations into knowledge-building and the role language plays in cumulative schoolteaching have generated new insights into History and Biology in secondary schooling (Martin, Maton, & Matruglio, 2010). A key problem to emerge was the issue of how teachers can facilitate traversing what Maton (2013) calls the 'semantic gap' between the knowledge that resides in high-stakes reading to the knowledge that students need to express in high-stakes writing for assessment (see Figs. 2 and 8 in Maton, 2013). Analyses of teaching texts and students' assessments suggest these both exhibit weaker semantic gravity and stronger semantic density than the knowledge expressed in classroom discourse. Simply put, the knowledge expressed in classroom discourse is typically more context-dependent and less condensed, that is it involves simpler and fewer meanings than the knowledge expressed in the written texts that students must read and write. This raised the question of how classroom practice may move between highly condensed, abstract and generalised knowledge and more concrete, contextualised, situated, commonsense knowledge. The project showed that teachers were adept at moving from the former to the latter through 'unpacking' what they perceived as difficult passages of reading for their students. However, movements back up to less context-dependent and more condensed technicalized meanings occurred much less frequently in the data. In this paper we continue the exploration began by Maton (2013) and Martin (2013) into the nature of these different forms of knowledge, the complex linguistic resources they involve, and, crucially, how to enable movements in both directions along the semantic scale to create semantic waves.

In preceding papers, comparison of the language that teachers use when 'unpacking' texts for students and the language of the original texts themselves has yielded insight in how language is used to enable movement up and down the semantic wave. Technicality, specialised language and grammatical metaphor have all been found to be necessary for mastering semantic waves in school learning and thus enabling achievement and have been reported on elsewhere (Martin, 2013; Martin et al., 2010). In addition to these resources, the strategy of *temporal shifting* is also implicated in movement along the semantic waves and is used in classroom talk. This paper will focus on the language of classroom pedagogy to explore some of the ways that time is manipulated in the oral language of the classroom in order to facilitate cumulative knowledge-building in teaching and learning. This paper focuses on senior school History lessons and explores temporality from both a linguistic and sociological perspective. Following a brief explanation of our understanding of time in schooling to date, this paper will then focus on temporality and how it is used in the classroom to make semantic waves and so enabling cumulative knowledge-building. First we focus on how time is manipulated in history teaching to bring students out of the time of the classroom and into the time of the text. Secondly we explore how this temporal shifting is implicated in constructing the commentary and comment modes of history. Finally we conclude with a brief example of how time travel is also an issue in the study of Biology, and point to avenues for further research into temporality and knowledge-building.

2. Time in history writing

Existing research in the context of secondary schooling has focused on how time is used in the written texts of schooling rather than in the language used in classroom practice. However, this work provides an important starting point for thinking about the use of time in classroom pedagogy. We will therefore comment briefly on the most relevant aspects of this research before considering the language of the classroom.

Most, if not all the research already conducted into time in the written texts of schooling has been concentrated in the subject of History, where time is an obvious and central issue. There has been little, if any, previous research into the role of time in, for example, science writing. The construal of time in the genres of History, however, has already been the subject of detailed investigation in the field of SFL (see among others Coffin, 1996, 1997, 2006; Martin, 2002, 2003). In Coffin's research on the configuration of time in the school History curriculum (2006), she identified six categories for the construal of time in school History. These are given below along with examples provided by Coffin to illustrate each category (temporal realisations in italics):

Sequencing	after coming to power in 1959, (Castro...)
Segmenting	the Great Depression
Setting	(25 million suffered malnutrition) in 1928
Duration	(he maintained his position) <i>for 50 years</i>
Phasing	<i>the onset</i> (of the Great Depression)
Organising	firstly...secondly...finally

Coffin found that as students progressed through the curriculum they used fewer resources for sequencing and setting in time and more for segmenting time. This was also accompanied by a movement away from personal construals of time towards a more institutionalised understanding of time:

The movement from the representation of more familiar and directly experienced stretches of time to larger historically labelled stretches suggests that successful learning of the discourse of History is partly a process of shedding personally

oriented construals of time and expanding a more publically oriented 'technology' of time. This means that, as students develop their control of historical discourse, perceptions of time that are internally influenced by the individual's subjective sense of pace and movement through time are superseded by a conventionally agreed upon objective public or social temporality. As part of this process, the distance between past and present intensifies. (Coffin, 2006:228)

Alongside this institutionalised interpretation of time in historical discourse, we need to note that some sources in History are based on particular historical knowers; for example, in a secondary school unit on Pompeii and Herculaneum, a personal recount of events by Pliny the Younger is used. Engaging effectively with the texts written by such writers, which often comprise personal correspondence written in the first person, requires students to traverse the distance between past and present to understand the context, content and relevance of such documents. This requires an ability to, as it were, shift through time. Students first have to be able to negotiate differences between their present realities and that of the time of the text. This involves at least an understanding that the source document was written in a period where social practices and ways of speaking and writing may differ markedly from what they are presently accustomed to. They must also read somebody else's 'personally oriented construal of time' and distance themselves from the subjectivity of that text as it is written to appreciate the historical significance of it in the course of senior studies in school History. In short, it requires them to travel into the time of the text and then back out of it to interpret what the text may mean for the present-day historian.

The classroom data collected in the DISKS project indicates that teachers perceive these shifts as challenging for students. Accordingly, when students have to engage with historical sources from the ancient world, these texts are often mediated by the teacher through an iterative pattern of reading sections from the text followed by an interpretation or explanation of these by the teachers. These stretches of classroom discourse around the primary source text give us an indication of how teachers try to manage the task of helping students cross the distance between past and present in order to understand and then recreate the distance so they can build cumulative knowledge.

3. Understanding semantic waves

The practice of mediating the written text within classroom talk through the process of 'unpacking' can be understood in terms of making semantic waves. As Maton (2013) describes, the notion of semantic waves begins from two concepts from LCT: *semantic gravity* and *semantic density*. Semantic gravity refers to the degree of context dependence of meaning; semantic density refers to the degree of condensation of meaning. They both vary along independent continua of relative strengths and weaknesses. These concepts can be used in a variety of ways, including to trace changes in knowledge through time as *semantic profiles*. As Maton (2013) explains, for simplicity we here focus on describing semantic profiles using a 'semantic scale' where semantic gravity and semantic density are moving inversely. Fig. 1 illustrates a single semantic wave using such a scale. This shows how a semantic wave involves movements between positions higher and lower on the semantic scale, or between weaker and stronger semantic gravity and stronger and weaker semantic density.

The language of textbooks and lesson handouts often displays stronger semantic density, in that a lot of ideas are condensed within terms, while at the same time displaying relatively weaker semantic gravity in that the knowledge is not necessarily dependent upon a particular context but instead deals with more abstract principles or generalised phenomena. This technicalised language is often 'unpacked' by the teacher in their explanation of the handout or textbook. This can be achieved through provision of concrete examples that strengthen semantic gravity and simpler explanations of technical terminology into everyday language that weaken semantic density. This is to move down the semantic scale (the first part of the wave in Fig. 1). A shift up the semantic scale involves abstracting and generalising away from particular contexts and

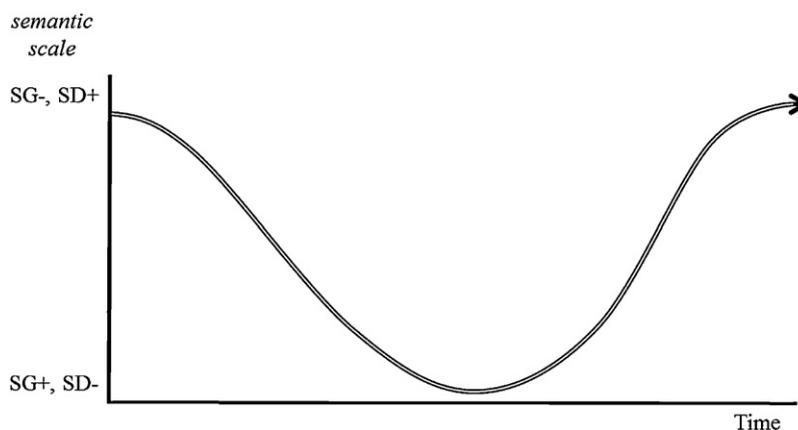


Fig. 1. A semantic wave.

condensing a large range of meaning into terms and concepts. These shifts both up and down the semantic scale can result in the creation of a semantic wave, as illustrated in Fig. 1. As Maton (2013) emphasises, such waves may begin and end anywhere on the semantic scale and are part of larger patterns of waves.

Research into classroom discourse around text has centred around developing an understanding of how these movements up and down the semantic scale are achieved in the language of the classroom. This has involved both the identification of passages of teaching in which we could identify changes in semantic gravity or semantic density or both, and then careful analysis of the language using conceptual tools from both LCT and SFL. Through this process of analysis, the manipulation of time in the classroom emerged as a significant issue for facilitating movements up and down the semantic scale. We will therefore now turn to an analysis of how temporal shifting facilitates such movements before investigating the systems of language that come into play when such changes are made.

4. Time in history teaching

The following text is an excerpt from a letter written by Pliny the Younger to Tacitus describing the eruption of Mount Vesuvius in AD79. It was written in about AD104 and is letter 16 in volume six of his collected letters. It was used in a History lesson recorded for the DISKS project and brief references to the letter can be found in multiple lessons in this unit of work. The letter is referred to in the core unit on Pompeii and Herculaneum for the final year of Ancient History studies in New South Wales secondary schooling due to its importance in understanding the eruption of Vesuvius. Not only does it provide a first-hand account of the events, but it also forms the basis for naming the particular *type* of volcanic eruption represented by Vesuvius, which is now known as a 'plinian eruption'. The first few paragraphs of the letter are provided below as an orientation to the style and language of the letter:

You ask me to write to you about my uncle's death, so that you can hand down a truthful report to those who will come after us. I am grateful; for I am aware that he will have an immortal glory, if his death is made known to others by you. He died in the calamity of those most exceedingly beautiful of lands memorable for the people and cities destroyed and thus will always be remembered. He himself wrote many lasting works but the immortality of your writings will add more still to his immortality.

I consider equally blessed either those men to whom the gods have granted the ability to do something worth writing about, or those who have the ability to write something worth reading. The most blessed, however, are those who can do both. Just such a person was my uncle as both his books and yours will show. You impose on me the task that I would demand for myself and I undertake it very willingly.

He was at Misenum in active command of the fleet. The ninth day before the Kalends of September my mother pointed out to him a cloud of unusual size and appearance. He had been out in the sun, then had taken a cold bath, had lunched lying down, and then was studying. He demanded his shoes and climbed to a place from which he was able to have the best view of the marvelous thing. . .

As noted above, texts such as these are often read in iterative cycles where the teacher or student reads a section of the text and the teacher then interrupts the reading to 'unpack' it for students by explaining in commonsense terms what the class has just read together. This seems to be motivated by a desire to make sure that students have understood what has been read and to bring to attention points of importance that students need to remember for the future. In the excerpt which follows, taken from a transcription of the lesson on this text, CAPS are used for what is read aloud from the text and normal font is used for the teacher's commentary on it.

ALTHOUGH NOT YET IN IMMEDIATE DANGER WAS AWARE THAT IT WOULD COME NEARER AS IT SPREAD. HE HAD PUT HIS LUGGAGE IN THE-BOATS DETERMINED TO FLEE IF THE OPPOSING WIND ABATED. THE WIND AT THAT TIME WAS VERY MUCH IN MY UNCLE'S FAVOUR AND HE REACHED LAND. HE EMBRACED THE ALARMED MAN CONSOLED HIM AND ENCOURAGED HIM. IN ORDER TO CALM HIS FRIEND'S FEAR BY HIS OWN LACK OF CONCERN HE ORDERED A BATH. HAVING BATHED HE LAY DOWN AND ATE CHEERFUL, OR AND THIS IS JUST AS GREAT, AT LEAST PRETENDING TO BE FULL OF CHEER

...There's all pumice on the top and they're trying to row through the stones and they're rowing, and he, and he's thinking 'oh my god what are we gonna do' and the helmsmen saying 'oh we've gotta go back, go back, go back,' and um, poor old Pliny's saving, what does he say? Fortune favours brave men. Even though he mightn't believe it he says it, and so they keep rowing on, and there's Pomponianus standing on the shore, with his luggage, and a bit of a panic and they get him into the boat, or they get to shore and Pliny the um, Elder, is trying to appear calm and everything's alright, I'll just go and have a bath!

Differences between the language of the text as it is written and the language that the teacher uses in paraphrasing it are revealing. In the spoken paraphrase of the text, the teacher has modernised the language from an archaic form of prose to a more contemporary spoken form. This 'translation' of the language can be seen by the two pairs of text and commentary below. The parts of the text that have been reconstrued in more modern spoken language are rendered in **bold** for each pair.

IT WAS APPARENT TO SO LEARNED A MAN THAT **THIS WARRANTED CLOSER INSPECTION**. HE ORDERED A FAST SAILING VESSEL TO BE PREPARED AND TOLD ME THAT **I COULD COME IF I WANTED**. I REPLIED THAT **I PREFERRED TO STUDY**

Pliny the Elder says 'ooohhh! **Better see what's here!** Do you **wanna come with me?**' And I love Pliny the Younger. He says '**oh no I have to study!**'

NOW, AS THE SHIPS DREW NEAR, **ASHES WERE FALLING HOTTER AND THICKER**. NOW PUMICE AND BLACKENED STONES, CHARRED AND CRACKED BY FIRE. NOW THEY WERE IN SHALLOW WATER AND THE **SHORE WAS OBSTRUCTED BY DEBRIS** FALLEN DOWN FROM THE MOUNTAIN.

They're rowing and rowing and as they get closer **it starts to rain pumice and hot ashes** and the **sea is starting to get full of garbage** and you can just imagine the oarsmen are trying to go through and there's pumice it floats, there's all pumice on the top and they're trying to row

This movement between written text and spoken explanation in the discourse of the classroom represents, in part, a time shift from a language from the past to a language in contemporary use. Modernising the language by paraphrasing the text is one way that the teacher tries to 'unpack' the source for the students and therefore to bridge the distance between the students present realities and the past world as represented by the source. Essentially this shift in language is about making knowledge in the text accessible by presenting the information in more recognisable language so that the students can understand the text and its context. This *temporal shifting* between past and present language is maintained throughout the reading and explanation of the whole text in the particular lesson recorded.

This movement in time from past to present language is a strategy which has the effect of weakening the semantic density and strengthening the semantic gravity of the text, resulting in a downward movement on the semantic scale (see 'Modernise the language' in Fig. 2). The archaic terms are understood by the teacher as incorporating meanings inaccessible to students and she therefore renders them in more spoken-like contemporary language. In the process of this 'translation' into contemporary language, the teacher weakens their semantic density by reconstruing processes or descriptions from their nominal to their more congruent forms (Martin, 2013).

This warranted closer inspection → better see what's here
As remedy for their fear → he's trying to keep everybody calm

Additionally, in her translation of the archaic language of the text, the teacher focuses on only some of the meanings of the original (weakening semantic density). In the following example, it is the translation of 'debris' into 'garbage' which draws the teacher's focus along with the manner in which this creates an obstruction, rather than the location of the shore (Fig. 3).

Shore was obstructed by debris → sea is starting to get full of garbage and you can just imagine the oarsmen are trying to go through. . .

In this example the teacher strengthens the semantic gravity of 'shore was obstructed' by giving the students a concrete picture of what was happening at the time (imagining the oarsmen trying to row). She also weakens the semantic density of the expression 'obstructed by debris' by using everyday language. In the final example below, the teacher unpacks by explaining *how* he will have an immortal glory, which remains implicit in the original text. This strengthens semantic

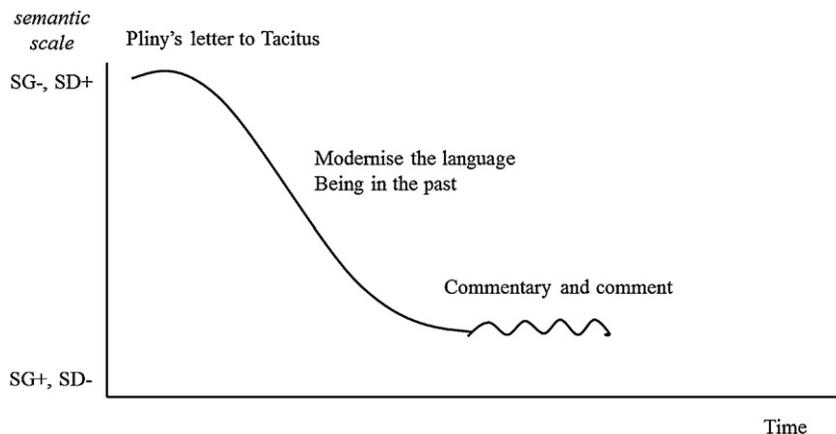


Fig. 2. Waving and bobbling.

gravity, as the teacher is grounding the idea that Pliny the Elder will have an immortal glory in the concrete actions of individuals which will produce this immortal glory.

He will have an immortal glory → people read about him for ever and ever

A relatively abstract concept which is initially unrelated to concrete action has therefore been glossed by reference to what will produce this state of immortality. These unpackings from archaic to contemporary language, and many similar unpackings throughout the lesson, shift the knowledge being expressed down the semantic scale, from condensed and archaic language to more contemporary speech (see *Modernise the language* in Fig. 2). They focus on what is often only part of the meaning of the original and ground it in some less condensed particulars for students to focus on. Maton (2013) explains this phenomenon whereby ‘unpacking’ a term weakens its semantic density by explaining that in its original context, meanings such as those being translated by the teacher form part of ‘constellations’ pertinent to their original context. In their original context the terms condense meaningful links and references to a swathe of other related terms to which students in the present context of their classrooms do not yet have access. Not only are words like ‘glory’ relatively scarce in the discourse of the present-day teenager, they meant something different in the time of Pliny the Younger, they condensed a different and complex range of meanings and relations. In their ‘translation’ from archaic to everyday, and the teacher’s focus on often what is only part of the meaning of the original, the semantic density of the terms is thus weakened as the meanings contained in the original term are transformed from the complexities of their original context to a simpler, more singular meaning expressed in present-day language.

Alongside strengthening semantic gravity and weakening semantic density of the archaic language and making the meanings contained in the language accessible by ‘translating’ into contemporary language, the teacher further increases the semantic gravity of the knowledge contained in the written text by moving the students metaphorically through time in their consideration of Pliny’s letter (*Being in the past* in Fig. 2). The shift from language of the past to language of the present is also echoed by a shift in the discourse of the classroom from past to present *tense*. Although the original source document is written as a recount in the past tense, the teacher’s explanation and commentary on the text is construed in the present tense, as illustrated in the following example.

HE WAS AT MISENUM IN ACTIVE COMMAND OF THE FLEET. THE NINTH DAY BEFORE THE KALENDS OF SEPTEMBER MY MOTHER POINTED OUT TO HIM A CLOUD OF UNUSUAL SIZE AND APPEARANCE. HE HAD BEEN OUT IN THE SUN, THEN HAD TAKEN A COLD BATH, HAD LUNCHED LYING DOWN, AND THEN WAS STUDYING. HE DEMANDED HIS SHOES AND CLIMBED TO A PLACE FROM WHICH HE WAS ABLE TO HAVE THE BEST VIEW OF THE MARVELOUS THING.

they’re across up this end, and they’re looking across to, um Pompeii, so there’s quite a distance, and it’s mum who first sees this strange cloud coming out of the volcano, and you know they’d all just been having a normal day lying in the sun ‘I’m hot now! No swimming pool I’ll just go and have a, a cold bath, um study,’ don’t you like it, you know, all of a sudden Pliny the Elder says ‘ohhh! Better see what’s here! Do you wanna come with me?’

The effect of the change in tense is to reconstrue the events recounted in Pliny’s letter as a kind of dramatically unfolding imaginative re-enactment in the present. This kind of temporal shifting of knowledge also aims to metaphorically shift students through time by positioning them within the time of the action being investigated. That is, as the text is re-told in the present tense, the students can become vicarious participators in the action as they are invited to move outside their current context of a twenty-first century classroom. From the perspective of the classroom, the knowledge being expressed by Pliny has relatively weak semantic gravity: its meanings are weakly dependent on the classroom context. However, with the imaginative re-enactment of the letter, the students are given the option of shifting their focus out of the context of the classroom and into the historical time of the eruption of Vesuvius in order to help them bridge the gap between past and present. This strengthens the semantic gravity of the knowledge which was originally expressed in written form in the text, as the students are offered an opportunity to enter the context of the happenings themselves. They are invited by the teacher to imagine the events as if they could see them unfold, and also to imagine what they would do in similar circumstances. They are, in a sense, asked to put themselves in Pliny’s shoes.

and you can just imagine the oarsmen are trying to go through and there’s pumice. . . and Pliny the um Elder is trying to appear calm and everything’s alright, I’ll just go and have a bath! You know which is what you’d do wouldn’t you? Disaster happening! Things going on! Oh! Better have a bath! Better have a bath. . . Um, meanwhile. . .

Additionally, as they are positioned by the teacher within the unfolding event, they may partially imagine Pliny’s gaze and through this perhaps achieve some sort of historical ‘empathy’ with him as a historical figure experiencing the eruption of Vesuvius. Thus temporal shifting represents a strategy for enabling students to understand Pliny as a knower of History. The use of the present tense to relay events as if they are presently happening aims to locate students metaphorically in the boat along with Pliny in order to participate vicariously in the action. Events of the past are presented in a human context and the dispositions, actions and emotions of historical actors are presented in the present tense so that students can engage with a historical knower in order to learn about the past. They can, if they choose, imagine themselves in his shoes and do not have to *be* Pliny the Younger to know. The teacher has strengthened semantic gravity, ameliorating the distance between the classroom context and that of the events.

However, the students' vicarious participation in the events being related is on occasion disrupted as the teacher relates the events of the drama and then comments on them. As shown in the text excerpt above, the teacher sometimes shifts from the present tense dramatic re-creation of events into a kind of commentary which disrupts Pliny's gaze and positions the students as observers looking in. The dramatic retelling of the past events in the present tense identifies students with *Pliny* as a knower in history, however the teacher's commentary on those events positions the students with the *teacher* as a knower of History. The teacher's commentary also creates implicit evaluation through comments such as 'even though he mightn't believe it he says it!' and 'which is what you'd do wouldn't you?' for example and provides the basis for development of a historian's gaze. This shifting from vicarious participation through Pliny to commentary on Pliny implicates a small but significant movement back up the semantic scale, as illustrated in Fig. 2. Students are invited to shift from the concrete experiences of a particular historical knower, grounded in the context, to weaken semantic gravity slightly by stepping back to comment and generalise about these experiences. Thus, if modernising the language can be represented as bringing the students partway down the semantic scale, the cycling between participation and commentary can be seen as a kind of 'bobbing' up and down the scale, as students are located within the action then step back to consider it from an outsider's perspective.

Thus far the teacher has transformed the knowledge from the written text through a double move: shifting the language from the past into the present and shifting (or at least attempting to shift) students mentally from the present into the past ('Modernise the language' and 'Being with Pliny' in Fig. 2). These both work to strengthen semantic gravity and weaken semantic density, moving the knowledge down the semantic scale towards a first-person, commonsense understanding of the events in the text. However, in order to demonstrate mastery of the pedagogic discourse of History, which is more than personal narrative and involves an array of specialised terms, students must display knowledge in assessments that involves weaker semantic gravity (by, for example, discussing events with more 'objective' detachment) and stronger semantic density (through, for example, marshalling technicalised terms). Students must reason about the relevance and importance of the source for the study of History. This necessitates moving back up the semantic scale.

It is useful at this point to consider what it is that students need to take from sources like this in order to be able to conceive of how a shift back up the scale might be managed. This particular source is an eyewitness account of the eruption of Vesuvius which is used for its importance in describing the type of volcanic eruption represented by the one that destroyed Pompeii. This source text, which describes the eruption of Vesuvius in AD79 has become the basis for naming a whole category of eruptions and is therefore an important historical source. The teacher explains its relevance to the students in the following way.

we keep referring to Pliny's letter, okay? Pliny's letter explaining... the eruption. And describing the eruption, and we've been talking about it and you've had extracts. But I thought you might like to see the letter... in total... Right! We're looking at the eruption of Vesuvius! It's a letter of Pliny the Younger to Tacitus, containing a description of the eruption of AD seventy-nine. So, we've talked about the eruption we keep referring to a plinian eruption, we keep referring to the letter that was written...

... interestingly, this is where we get the pine tree. Now did you notice in one of the, um information stencils you got yesterday it, it it said umbrella? Did anybody pick it up? That it said umbrella, but I would rather you use the pine, because let's use the ancient source, okay go back to the ancient source. If it's good enough for Pliny, it's good enough for us to describe the cloud as a pine tree, okay? Even though they said an umbrella... You know so we won't crucify them for saying umbrella but I think a pine tree is more accurate.

This source, then, is important for more than just its description of events surrounding the eruption of Vesuvius and the resulting destruction of Pompeii. Its relevance also involves the use today in naming a type of volcanic eruption. Students therefore need to weaken semantic gravity significantly in order to transition from this particular incident in AD79 to generalise across a category of volcanic eruptions, and to move away from Pliny the Younger himself as a knower in History to the significance of source documents in the field of History. In this particular context, they are being asked to go from a starting point of Pliny's letter to Tacitus, through a process of imagining they were Pliny in the unfolding action, to a comprehension of the relevance of the letter as an historical source document.

This movement, if it were achieved, would represent a semantic wave. However, with notable exceptions, the majority of lessons recorded in the DISKS project involved repeated movements downwards through recurrent 'unpacking' of written sources (Maton, 2013; Martin, 2013).

5. Semantic waves and the modes of history

To address how better to enable movements up the semantic scale we need a better understanding of the systems of language which come into play in weakening and strengthening semantic gravity and/or semantic density. First, it should be emphasised that there is no simple one-to-one relation between these organising principles of knowledge and language resources. One cannot equate 'semantic gravity' or 'semantic density' with single linguistic equivalents. Stronger or weaker semantic gravity and semantic density are realised differently according to the object of study; the language resources associated with their strengths similarly vary according to the object of study. For example, strengthening semantic density in Biology may involve a different complex of language resources to strengthening semantic density in History (see Martin,

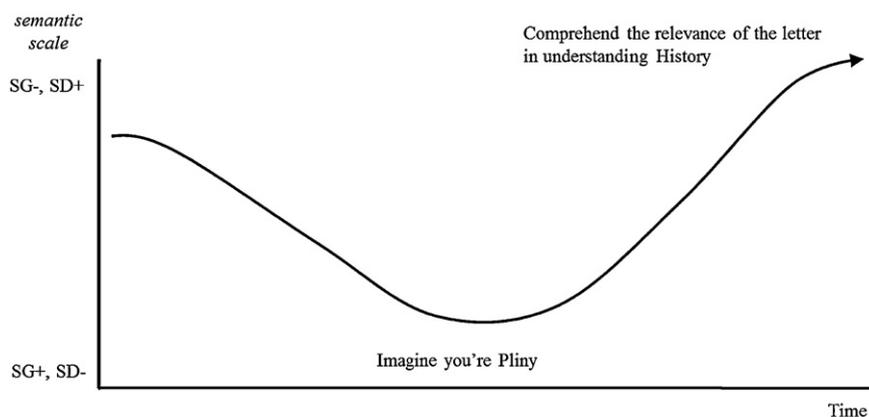


Fig. 3. From Pliny's letter to historiography.

2013; Martin et al., 2010). This cuts both ways: there is no sociological concept equivalent to, for example, the linguistic concept of grammatical metaphor. The search for one-to-one equivalents (typically as a precursor to dispensing with the original concepts) is futile, and typically a nervous attempt to avoid the perturbations of inter-disciplinarity that then fails to gain the greater explanatory power generated by bringing two complementary approaches to bear. Nonetheless, the attempt to explore the language resources involved in, for example, semantic waves is worthwhile, as it provides new insights into how complexes of language resources are marshalled to achieve changes in the forms of knowledge being communicated.

Although we do not yet have an exhaustive understanding of the language systems at stake, we can partly understand movements in semantic gravity as implicating mode shifts from language as action to language as reflection. These are typically achieved in the History classroom through manipulation of deixis and grammatical metaphor (Martin & Matruglio, *in press*). The use of specific participants and particular processes (e.g. *Tacitus, Pliny, Rome; the volcano erupts*) could be said to represent stronger semantic gravity, while the use of generic participants and recurrent processes could be said to represent relatively weaker semantic gravity (e.g. *diplomats, theatres; people walked around selling*). Similarly, nominalised process (e.g. *the excavations of Pompeii*) and verbalised time and/or cause (e.g. *a career that culminates in his governorship; the treatment of skeletal remains has evoked impassioned debate. . .*) could be said to represent weaker semantic gravity than the congruent expression of these. Semantic density, on the other hand can be at least partly understood as implicating technicality, either through distillation of ideational meaning into subject-specific terminology (e.g. 'cilia', 'the immune response'), or through iconisation (Martin, 2009) to produce axiologically loaded 'flexi-tech' as in the -isms of History (e.g. colonialism, nationalism, imperialism) (Martin et al., 2010).

These language resources however do not give a full account for what occurs in the process of creating semantic waves. As described above, classroom data collected in the course of the project also revealed interesting manipulations of time in the pedagogy of History classrooms as sections of source documents were read through and then explained or commented on by the teacher before moving on to reading the next part of the text. It is therefore important to consider the different uses of language which are necessitated by these time shifts in order better to understand how shifts along the semantic scale are achieved in the language of the classroom.

As exemplified above, the iterative process of reading and explaining the source text involved a kind of dramatic re-interpretation of the original text as a kind of unfolding drama for the students. As the teacher moved through alternate phases of reading and explaining the text, she switched between the past tense in which the document was written and a present tense explanation of the events in commonsense terms. This temporal shifting is illustrated here with an example repeated from above.

HE WAS AT MISENUM IN ACTIVE COMMAND OF THE FLEET. THE NINTH DAY BEFORE THE KALENDS OF SEPTEMBER MY MOTHER POINTED OUT TO HIM A CLOUD OF UNUSUAL SIZE AND APPEARANCE. HE HAD BEEN OUT IN THE SUN, THEN HAD TAKEN A COLD BATH, HAD LUNCHEDED LYING DOWN, AND THEN WAS STUDYING. HE DEMANDED HIS SHOES AND CLIMBED TO A PLACE FROM WHICH HE WAS ABLE TO HAVE THE BEST VIEW OF THE MARVELOUS THING.

they're across up this end, and they're looking across to, um Pompeii, so there's quite a distance, and it's mum who first sees this strange cloud coming out of the volcano, and you know they'd all just been having a normal day lying in the sun 'I'm hot now! No swimming pool I'll just go and have a, a cold bath, um study, don't you like it, you know, all of a sudden Pliny the Elder says 'ohhh! Better see what's here! Do you wanna come with me?' You'll have to talk about tense and process type, cos mental processes here and they take simple present tense, and present in present for something beginning to be sensed

Not only does the teacher make the shift from the past tense of the original source to the present tense of her 'unpacking', but she also uses two different types of present tense in her explanation of the source text. These changes in tense seem to broadly mark out differences in the construction of the events of the original text as an unfolding drama, in which the

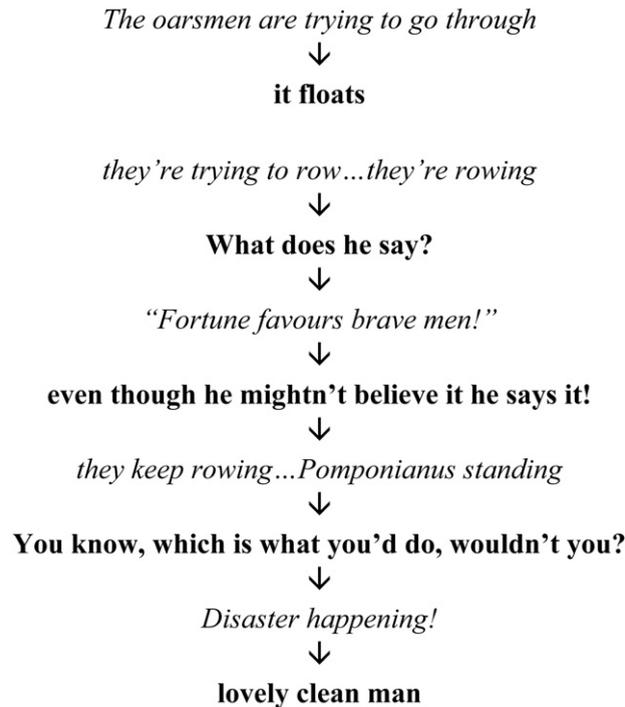


Fig. 4. Participation and commentary in history pedagogy.

students are invited to participate vicariously, which is presented as present-in-present (Halliday & Matthiessen, 2004), and comment on the events or personages presented in the simple present tense. These seem to represent two different modes of History: (i) commentary, which invites students to participate vicariously in the unfolding action; and (ii) comment, which invites students to make evaluations and assessments of the events and actors being described. These two modes of History are indicated on the excerpt below with commentary in *italics* and comment in **bold**.

and you can just imagine the oarsmen are trying to go through and there's pumice, **it floats**, there's all pumice on the top and they're trying to row through the stones and they're rowing, and he, and he's thinking 'oh my god! What are we gonna do' and the helmsmen saying 'oh! We've gotta go back! Go back! Go back!' And um, poor old Pliny's saying, **what does he say?** 'Fortune favours brave men.' **Even though he mightn't believe it he says it!** And so they keep rowing on and there's Pomponianus standing on the shore with his luggage and a bit of a panic and they get him into the boat or they get to shore and Pliny the um Elder is trying to appear calm and everything's alright, I'll just go and have a bath! **You know which is what you'd do wouldn't you?** Disaster happening! Things going on! Oh! Better have a bath! Better have a bath. **So, lovely clean man. Um, meanwhile. . .**

In this excerpt, there is what appears to be a sequence of mode shifts, from commentary to comment and back again, largely managed by the shift from the simple present to the present-in-present. Within the commentary mode itself, however, there are also phases of punctiliar completed events which are tracked through the use of the simple present for material and behavioural processes ('they get him into the boat') within the broader context of the drama unfolding in the present-in-present. This seems to occur in places where the teacher wants to speed up the activity sequence (simple present tense is used in a similar way in sports commentary, to keep up with fast-paced sequences of play). In broad terms then we can characterise commentary mode as involving present-in-present tense across process types for presently occurring and incomplete actions and the simple present tense for completed actions; note however that because the concept of an activity being finished or not does not make sense for relational processes these keep the simple present tense – e.g. *there's all pumice on the top*).¹

The mode shifts between commentary inviting vicarious participation which is expressed in present-in-present and comment expressed in the simple present is represented diagrammatically in Fig. 4.

These two modes of History have other distinct features aside from the differences in tense. Commentary mode also features ellipsis, e.g. *Disaster happening! Things going on!* and quoting '*Fortune favours brave men!*' The quoting itself features mood variation, '*go back!*', modulation '*We've gotta go back!*' and expletives '*oh my god!*'. Commentary is mainly

¹ An apparent exception to this characterisation is the simple present tense *keep in they keep rowing on* where a verbal group complex involving phased action is used instead of present in present tense to indicate extended activity.

in the third person and may include interludes of comment as the teacher steps back to interrupt the action: *so, lovely clean man*. Comment mode on the other hand is construed in the simple present tense and also contains a great deal of mood variation, including rhetorical questions *which is what you'd do wouldn't you?* This mode is mainly delivered in the second person (*you can just imagine*) and also contains humour *lovely clean man* and modalization *even though he mightn't believe it*. Comment mode also includes the use of the simple present tense for material processes to indicate a habitual process. An example of this occurs in the extract above when the teacher is talking about pumice and she comments *it floats*. This use of the simple present is unlike its use for punctiliar completed events in commentary mode as it indicates a step, albeit briefly, out of the commentary mode to generalise about a particular aspect of the unfolding action.

Commentary mode is a kind of moment-by-moment narration of events which constructs an event as 'live action' and invites the students to participate vicariously along with the historical actors. In this sense they can partially adopt Pliny's gaze and the distance between the past and the present is narrowed. Comment mode complements commentary by beginning the process of distancing the action as students attention is directed to observe certain features of the events ('what does he say?') and implicit evaluation of the actors ('you know, which is what you would do, wouldn't you?') and events is offered. Although it is still located in a particular time, the comment mode operates as a kind of 'freeze frame' in which students' attention is directed to certain features before returning once again to the unfolding events in the episode.

These two modes of History can be compared to the more reflective modes of recount and generalisation. The mode of recount is best illustrated by the source text, which is written-like, while the comment and commentary modes are spoken-like. The recount mode is construed in past tense in contrast to the present tense of the commentary and comment modes.

AS HE WAS LEAVING THE-HOUSE, HE RECEIVED A NOTE FROM RECTINA, WIFE OF TASCUS, WHO WAS TERRIFIED BY THE DANGER HANGING OVER HER AND WHOSE VILLA LAY UNDER THE MOUNTAIN SO THAT THERE WAS NO ESCAPE, EXCEPT BY BOAT. SHE BEGGED HIM TO SNATCH HER AWAY FROM SUCH DANGER. HE CHANGED HIS PLAN AND THAT WHICH HE HAD BEGUN IN A SPIRIT OF STUDY, HE ENDED IN A MIGHTY MANNER. HE LAUNCHED VESSELS WITH FOUR BANKS OF OARS AND WENT ON BOARD HIMSELF IN ORDER TO BRING AID NOT ONLY TO RECTINA BUT TO MANY OTHER PEOPLE, FOR THE BEAUTIFUL COASTLINE WAS CROWDED WITH RESIDENTS. HE HURRIED TO THAT PLACE FROM WHICH OTHERS WERE FLEEING, AND WITH A FIRM GUIDANCE HE STEERED A STRAIGHT COURSE INTO THE DANGER. HE WAS FREE FROM FEAR AND HE NOTED DOWN AND DESCRIBED ALL THE MOVEMENTS OF THE PHENOMENON AND ITS DIFFERENT SHAPES EXACTLY AS HIS EYES HAD TAKEN THEM IN.

Generalisation mode is used for timeless and recurrent events and is often used in definitions or explanation of technicality in the subject. Although there are no examples of the generalisation mode in the transcript of this lesson with its focus on a text recounting specific events, examples of this mode can be found in transcripts of other lessons. In the following case, the generalising mode is used to explain the term 'aesthetic trade'.

- Teacher ... So there would be massive amounts of trade going on, and umm, you know people visiting their diplomats you know or their, their, ambassadors. ... like their envoys and things like that all going back and forth across the countries. Sooo, ideas. When you get a, ah trade in ideas you wouldn't have heard this word before, we call it aesthetic trade. Have you heard of it? Yeah.
- Student You told us before.
- Teacher Ooh! Told you before. Great, excellent! You remember aesthetic trade! Trade in ideas. So of course, when you've got contact with the country you're gonna get the trade in ideas coming as well. So that's what that one is.

These four modes of History can be plotted along a continuum representing degrees along a cline between language in action and language as reflection, as illustrated in Fig. 5. One of the important effects of changing into the present tense when interacting around source documents is changing into commentary or comment modes and therefore shifting towards action rather than reflection. In other words, when the teacher feels that a text needs 'unpacking' s/he grounds it more in the everyday by metaphorically 'inserting' the students into the action and talking about past events as though they were occurring in the present. In LCT terms, the teacher strengthens the semantic gravity of particular knowers by narrating events in such a way as the students vicariously participate in the action along with the historical figures. Events thus become grounded and contextualised while at the same time the language is modernised by the teacher, thus weakening semantic density in knowledge made available to the students. This represents a shift down the semantic scale.

The main features of the four modes of History are summarised below in Table 1 along with illustrative examples in *italics*.

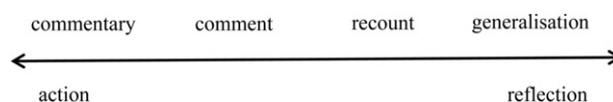


Fig. 5. The four modes of composing history.

Table 1
The modes of history.

Commentary	Comment	Recount	Generalisation
Present-in-present <i>the oarsmen are trying to go through</i>	Simple present <i>And you can just imagine</i>	Past tense <i>He changed his plan and that which he had begun in a spirit of study he ended in a mighty manner</i>	Simple present tense <i>When you get trade in ideas</i>
Quoting sayings of characters <i>Fortune favours brave men!</i>	Mood variation <i>Which is what you'd do, wouldn't you?</i>		Generic participants <i>People, diplomats, ambassadors</i>
Quoting with mood variation <i>Go back!</i>	Humour <i>Lovely clean man!</i>		Generic processes <i>visiting</i>
Quoting with modulation <i>We've gotta go back!</i>	Modalization <i>Even though he mightn't believe it</i>		
Quoting with expletives <i>Oh my god!</i>	Generic statements <i>It floats</i>		
Exclaiming finite ellipsis <i>Disaster happening! Things going on!</i>	Evaluation <i>Lovely clean man.</i>		

6. Time in the future

We have demonstrated here how temporality is implicated in semantic waves. It can be used to weaken semantic density through modernisation of language and strengthen semantic density by linking events such as the eruption to concepts such as that of a *plinian* eruption. It can also be used to strengthen semantic gravity through the use of the participatory mode to enable identification with certain historical actors and weaken semantic gravity of particular knowers in History (i.e. you do not have to be Pliny to know about the eruption of AD79). In this sense we have added to the rich description of the use of language in History by contributing research that begins to look at the language of pedagogy.

There remains considerable work to be done in the investigation of language use in the classroom and particularly with respect to the manipulation of time in pedagogy. One question concerns the underlying beliefs about the students' learning which underpins the use of this kind of temporal shifting in the classroom. Does the teacher's use of this strategy indicate that she considers the students' control of historical perceptions of time to be underdeveloped such that it needs scaffolding in this way? Another question concerns the 'empathy tasks' and role plays that seem to appear in History teaching, even in the senior years. Are these empathy tasks and role plays an artefact of inquiry-based approaches to the teaching of History or is something else at stake in activities such as a senior History class role playing the Geneva conference as part of their studies on the Vietnam War, for example? Evidence seems to point towards these types of activities as ways to manage semantic waving however it is not yet clear how or why. Further investigation into how time is managed in the pedagogy of History should help to begin to tease out the basis for these kinds of classroom activities and discussion.

More research is also needed in investigating to what extent and in what ways temporal shifting is used in pedagogy in other discipline areas. Data collected for this project also revealed the use of temporal shifting in the senior Biology classroom, involving the location of students in a present tense retelling of an experimental procedure from the previous lesson. The teacher leads the students through a symbolic mental re-enactment of the procedure in order to enable connections to be made to the theoretical principles underlying the practical lesson. That is to say, the symbolic mental re-enactment enables the opportunity for a connection to be made between the higher gravity concrete lived experience of a practical lesson and the weaker gravity theoretical concepts underlying certain procedures in Biology. This is exemplified briefly in the excerpt from a Biology lesson transcript below.

- T: So we've now, sterilised ohh! Ahn how do we sterilise the loop. How do we move it through the Bunsen burner
 S: Yeah we um, move the loop halfway
 T: Beautiful! So through it halfway back again good, until when?
 S: Until the, the loop is red
 T: Red hot, beautiful. Okay Alison, we're now up to cooling it. How do you do that
 S: You hold it ((inaudible – too far from mic))
 T: For about how long. Thirty seconds to one minute. Okay. Cathy why do we have to cool it.
 S: Because the flame on the Bunsen burner also hits the air around-it the actual Bunsen burner so there's less microbes in that area?
 T: Beautiful so where you're cooling it, the convection currents have moved the microbes away. Why don't I Melissa put it straight into my sample.
 S: (Um because ((inaudible – too far from mic)))
 T: Exactly it will boil them! And then if you actually touch an agar plate I didn't say that last time but you'll melt the agar okay? So that's why we cool it. Alright so, we are now up to, plate umm, doing our, what do we call it
 S: Streaking
 T: Streaking, so (Kavuk) how do we streak

In this example, the teacher uses a similar strategy to temporal shifting. In this case, however, the shift is not from a past tense account to a present tense dramatic reconstrual of that account, but from a past enactment of a process to a present tense mental re-enactment of that process. This gives the teacher the opportunity to then comment on the theoretical

reasoning behind certain activities in the practical lesson thus weakening semantic gravity from specific acts located in time and space to more general scientific principles underlying these acts. It also gives her the opportunity to strengthen semantic density as she can connect and package up meanings into the technicality of science, such as *convection currents*. More research is therefore warranted into links between temporal shifting and the semantic scale in History, Science and beyond if we are fully to understand the language of the classroom and how it can enable or constrain cumulative learning. A further step is also to investigate, together with teachers, how better to enable movements up the semantic scale to enable semantic waves. If temporal shifting as described above can move students *downward* and leave them at the bottom of the wave, how do we enable them to move confidently towards the top? How do we get them from the action of the story into historiography? We have raised more questions than we can answer. However, thinking in terms of semantic waves offers, we believe, a fruitful and productive way of addressing these questions, in time.

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