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Semantic waves and their affordances for teaching scaffolding to pre-service teachers

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Background: Research argues that parents/teachers and learners work collaboratively and this active participation in scaffolded activities builds knowledge and extends understandings. However, researchers who have explored scaffolding as a pedagogic tool do not demonstrate how this tool looks in practice.

Objectives: As a teacher educator, I introduce concepts like scaffolding as part of pre-service teachers' theory of learning. The purpose of this article is to explore how the Legitimation Code Theory (LCT) concepts of semantic gravity and semantic waves, show modelling interactions that reveal the learning pathways leading to independent mastery of the task.

Method: The study was conducted in 2020, which presented a unique opportunity to watch one teacher teach three Grade 3 learners online on a one-to-one basis, providing for comparisons between them. This qualitative study represented a case-study research design and employed data analysis using a semantic gravity translation device. Convenience sampling was used when selecting the participants. A story, 'A visit to the dentist', was used to identify the metaphors in the text.

Results: Using semantic waves, I show how the teacher works with concepts, criteria, text resources and learner understanding. The analysis exposed pathways that could now be purposefully designed.

Conclusion: Further research is necessary to investigate the value of semantic waves as a means of enabling teachers to track these kinds of interaction.

Contribution: The findings provide the means to demonstrating how semantic waves may assist teachers to design and operationalise learning pathways in ways that scaffolding cannot.

Keywords: legitimation code theory (LCT); semantic gravity; semantic waves; learning pathways; scaffolding; metaphor.

Introduction

The Foundation Phase in South Africa includes learners between 5 and 9 years of age in Grades R to 3. Four categories of English, including 'listening, speaking, reading and writing', should be covered in the Foundation Phase (Department of Basic Education 2011:8). The writing section includes 'shared writing and individual writing' (Department of Basic Education 2011). Shared writing is described as the activity in which learners copy work off the board into their books. Grade 1 learners are involved in individual writing when they write sentences related to their weekend news. At Grade 3 level, learners should be writing stories. Creative writing becomes meaningful when learners understand the task (Mukoroli 2011) and can manipulate figurative language to write descriptively. The study of figurative language devices is not only a means to creative writing skills but 'it is imperative that teachers design and implement instruction for figurative language interpretation to increase student comprehension' (Palmer et al. 2006:258). Successful figurative language enactment requires that learners first recognise figurative language devices before they have the power to use them creatively to convey meaning. When the goal is creative writing, the study of figurative language devices may include stories as tools to evoke comprehension of how figurative language is used in text and how teachers may use everyday life to provide real context to describe the meanings portrayed. In this study, I investigated an attempt at a scaffolded model of the metaphor as a figurative language device that is intended to teach learners that metaphors have a literal meaning *and* an implied meaning that are both checked in the particular context. The analysis reported in this paper investigates how the teacher set up conditions of possibility for three learners to produce their own imagery using metaphors.

Scaffolding, in a construction site, is a temporary structure used to support the maintenance and repair of buildings, bridges and other man-made structures (Jones & Thomas 2015). When the building is capable of staying erect, the builder removes the scaffolding. Likewise, Wood, Bruner and Ross (1976), as the originators of this concept in education, showed that if parents/teachers scaffold learning when they introduce a task, they provide adequate support to keep children motivated to complete the task at a reasonable level of difficulty. This process assists the child in completing a task they would not manage on their own or in developing new understanding, empowering them to complete similar tasks alone (Hammond & Gibbens 2005). Hammond and Gibbens (2005) explain that during this process, parents/ teachers and learners work collaboratively and this active participation 'enables them to construct and, potentially, transform understandings'. I found that these descriptions of scaffolding are vaguely articulated without showing the patterns, models and knowledge-building pathways that productively lead to mastery of new content and skills. The concept of scaffolding in literature is associated with learning in a constructivist framework rather than a knowledge-building approach that directly addresses how teachers work with knowledge. As a teacher educator, I introduce concepts like scaffolding as part of pre-service teachers' theory of learning, but this does little to provide them with models of pedagogic practice of what such learning pathways would look at. The gap between theory and practice is a central problem in teacher education (Barends 2022; Gravett & Ramsaroop 2015; Korthagen 2011). The purpose of this article is to explore how the Legitimation Code Theory (LCT) concepts of semantic gravity (SG) and semantic waves attempt to provide concrete ways of showing modelling interactions that reveal the learning pathways that lead to the independent mastery of the task. Making these pathways visible, offers a means to enable pre-service teachers to track the kinds of interactions that result in learner independence.

The main research question addressed in this research study is: How does the LCT concept of semantic waves offer affordances for teaching scaffolding to pre-service teachers?

The sub-question is: How does the LCT concept of semantic waves offer pathways to track the kinds of interaction that result in learner independence?

Research design

I am presently collaborating with teachers[1] on a creative writing course for English Home Language (EHL) learners. The course spans over 20 days and lessons are 20 min daily. The purpose of the creative writing course is to enable Foundation Phase and intermediate phase learners to master figurative language to use in their writing of poetry, descriptions and stories. I am interested in the support that the teacher provides to enable learners to use figurative language devices independently in their writing. Using the

case study research design, I studied how one teacher presented a lesson to teach metaphors to three learners, individually on Zoom.[2] The teacher/learner interactions were based on an online Zoom lesson context (Merriam 1998) and this research method permitted analysis of these individual lessons with an exploration of the interactive processes involved in these lessons (Verma & Mallick 2005).

I used convenience sampling to locate participants for this study from the target population who meet certain criteria, such as: having access to Zoom and internet for 20 min daily, being in Grade 3 and being willing to participate. The sample consisted of four EHL Grade 3 learners within the age range of 8–9 years, living in Gauteng. The teachers selected to teach the overall course were volunteers who have an online Zoom platform setup and knowledge of creative writing skills. As they were volunteers, the individual teacher who was available to participate in the study only had under 1 year of teaching experience. The teacher in this study is Ms Carim, and the learners were Sue, Jayshree, Naseema and Batseba.[3] These names are pseudonyms.

In this paper, I report on the lesson which addressed metaphors. This lesson was the introductory lesson to metaphors and the learners were required to identify metaphors in the story titled 'A visit to the dentist'. Two methods of data collection were utilised: Zoom lesson recordings and an interview with the teacher. A progression of 20 lessons were Zoom-recorded for each of the four Grade 3 learners. One interview was conducted with the teacher after recording all the lessons. All lessons were recorded, transcribed, coded and analysed using a translation device of the LCT concept of the SG form. In doing so, certain semantic waves emerged.

Theoretical framework

The theoretical framework that informed this study is the socio-cultural theories of learning. Socio-cultural theories focus on learning as a socially based process, rather than an individual one. Thus individual work can be accommodated but only in the context of collaborative work (Vygotsky 1978). 'Learning involves a communicative process whereby knowledge is shared and understandings are constructed in culturally formed settings', (Vygotsky 1978 in Hammond & Gibbens 2005:12). The zone of proximal development (ZPD) is a popular construct in sociocultural theory used to explain this process.

The most frequently quoted explanation of ZPD is the following:

> It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving

1. Only one teacher was available to participate in the study.

2. Zoom is an app that allows you to set up collaborative virtual video and audio conferencing, etc.

3. In this study, I did not include the analysis of Batseba's lesson as her mother also interacted in the lesson. A parent's presence would influence the findings.

under adult guidance or in collaboration with more capable peers. (Vygotsky 1978:86)

These developmental processes can be differentiated in reference to actual and potential developmental levels. Vygotsky (1978 in Jina 2008) explains that when a child succeeds in tasks independently, we are assessing actual development, but if a child solves a problem under adult guidance or in collaboration with his/her peers, the child gains more (potential development). Vygotsky emphasised that the same skill that a child learns through assistance will be mastered independently at a later stage and thus actual development will be eventually achieved and a new stage of potential development will be reached (Vygotsky 1978 in Jina 2008). I argue that learning took place when the learner was working within her ZPD in the co-production of knowledge with the teacher through her role of mediating support, to assist the learner to learn independently. The ZPD in this instance is co-constructed (Hammond & Gibbens 2005) through the engagement that takes place in the teacher/learner interaction as they work through a task.

Analytic framework

This paper draws on the concept of SG from LCT to analyse how the context-dependence of knowledge shifts over time in a lesson (Maton 2013, 2014). SG describes the degree to which meaning is tied to a real-world context (stronger SG) or abstracted to a form that transcends contexts (Maton 2014). In this study, stronger SG manifests as metaphorical comparisons drawn from personal experience or identified from text-based sources. For example, 'my mummy is a pretty rose' is closely connected to a learner's personal perceptions of her mother. Less context-dependent forms of knowledge could be types of figures of speech frequently used in creative writing practices. For example, 'metaphorical comparisons attribute a characteristic of one object to another' provides criteria for a concept that transcends the example of a metaphor in which a particular learner compares her mother's appearance to a flower.
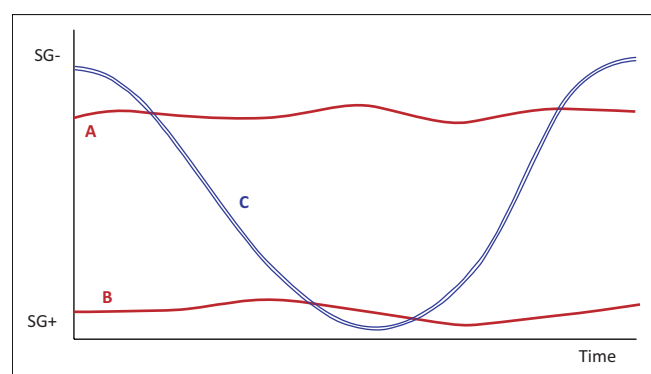
Source: Maton, K., 2013, 'Making semantic waves: A key to cumulative knowledge building', *Linguistics and Education* 24(1), 8–22. https://doi.org/10.1016/j.linged.2012.11.005

SG, semantic gravity.

FIGURE 1: Illustrative example of semantic profiles.

Over the course of a lesson, teachers shift knowledge between abstracted and more contextually dependent forms. These shifts are usefully depicted on a semantic profile, according to the strength of SG. The pathways that SG takes over time can be represented graphically on a semantic profile. The strengthening and weakening of SG (on the y-axis) is plotted against time (on the x-axis). The semantic profile is plotted as a single line, illustrating shifts between complex concepts (weaker semantic gravity, SG–) and manifestations of personal experience and/or real-world examples (stronger semantic gravity, SG+) (Maton 2014).

Learning activities that focus on abstracted concepts, for instance how figures of speech may be used to evoke imagery in poetry would be characterised by SG–. These parts of the lesson could be depicted as a high flatline on a semantic profile (see line A in Figure 1). Knowledge generated from the learner's experience, examples or case studies retains a SG+. In such cases, the semantic profile can be depicted by a low semantic flatline (see line B in Figure 1).

During the course of lessons, teachers mediate knowledge by making recurrent movements between more experiential and more abstract forms of knowledge (Maton 2013). These create semantic waves (see line C in Figure 1) that show a back-and-forth oscillation between experience/examples and complex concepts. A semantic wave is a profile that shows both weakening and strengthening of the SG of knowledge over a period of time. These can be represented by the upward shifts (from SG+ to SG–) and downward shifts (from SG– to SG+) of a semantic wave. For example, a lesson would begin with weaker SG if the teacher starts by giving a definition of a metaphor (e.g. 'Metaphor is a figurative language device that makes an implicit, implied, or hidden comparison between two things that are unrelated, but which share some common characteristics' [Zamboanga del Norte National High School n.d.]). SG would become stronger if an illustrative example is added to the explanation (e.g. 'We were tiny fish swimming in a sea of people' compares the feeling of being in a crowd to being in a school of fish in the ocean). The knowledge would strengthen its SG further if learners generate a metaphor by drawing from their own personal context. The SG would be weakened if learners then engaged in an activity that requires them to identify metaphors in a story and extract the objects and grounds of the comparison, thereby creating a 'combinatorial item' (Johnson & Pascual-Leone 1989:12). Semantic waves reveal powerful and replicable ways to represent the knowledge-building pathways teachers construct as they interact with learners.

Semantic waves have been used extensively to trace the knowledge-building work teachers do in the lessons they teach. For example, Jackson (2016) used semantic waves to map the knowledge formations of two KwaZulu-Natal Grade 10 English literature lessons, one EHL and one Additional Language (EAL) to illuminate distinctions between lessons with similar classification and framing profiles, thus uncovering reasons for the imbalances in literacy levels

TABLE 1: Translation device that defines four strengths of semantic gravity used to code context-dependence of knowledge in a Grade 3 lesson on poetic devices.

Relative strength of semantic gravity	Indicators	Examples
Much weaker semantic gravity (SG−−)	The focus is on the abstract features of figures of speech.	'A metaphor is also a figurative language or a figure of speech.'
Weaker semantic gravity (SG−)	The focus is on categories, attributes and comparisons of the metaphor.	'Is that a metaphor?' 'Are we comparing afraid to anything?'
Stronger semantic gravity (SG+)	Focus is on examples of metaphors extracted from a story.	'The dentist's chair was a submarine and it dropped lower and lower.'
Much stronger semantic gravity (SG++)	Focus is on examples of comparisons/metaphors constructed from the learner's life experiences.	'So, you know, like when you swim in the salty ocean or not?'

SG, semantic gravity.

within the South African school system. Curzon et al. (2020) apply semantic waves to Computer Science Education by illustrating how the oscillating waves help show ways that an unplugged activity might be effective or not, and how adaptations to the activities may offer a more productive learning experience. Walton and Ruszynyak (2020) draw on semantic waves to frame both conceptual and contextual knowledge as foregrounded for pre-service teachers to have for inclusive teaching.

In this study, I used a translation device (detailed in Table 1) to define four strengths of SG as it manifests in my study. The translation device shows the indicators used to code the empirical data and shows illustrative examples. The four levels indicated should be understood as strengths of SG on a continuum rather than absolute fixed points (Jackson 2016).

This translation device enables me to code interactions between the teacher and learners which are then plotted on a semantic profile. Coding all four lessons in terms of the relative strength and weakness of SG allowed for a detailed illustration of the pathways on a semantic wave. The shape of the semantic waves reveals how the teacher supports learners in making semantic shifts to identify and analyse metaphors, first together and then to make those shifts independently. When teachers take particular shaped semantic shifts with learners and learners then can replicate those moves, they demonstrate their learning independently.

In the section that follows, I analyse the learning pathways that the teacher traversed with three learners. The interaction in one lesson went beyond modelling the knowledge-building pathways to the learner traversing this pathway for herself.

Data analysis

A metaphor is a figurative statement taking the form of 'an X is a Y'. Bowdle and Gentler (2005) define a simile as a figurative statement using a comparative term such as 'like' or 'as', taking the form 'an X is like a Y'. The categorisation comparison of the metaphor is emphasised in the verb 'was'[4], in that the learner draws an inference that the metaphor relies on a similar rule to that of the simile (in this case, that the use

4. *Was* and *were* are past tense forms of the verb *to be*.

of 'was' indicates a metaphor in the same way that 'as' and 'like' indicate a simile). A metaphor as a 'combinatorial item' (Johnson & Pascual-Leone 1989:12) can be related in a '− was a −' sentence frame. Metaphors and similes promote different comprehension strategies. Specifically, a metaphor explains an idea or makes a comparison in a way that is not literally true. In Bowdle and Gentler's terms: metaphors should invite classifying the topic as a member of a category named by the vehicle, whereas similes should invite comparing the topic to the vehicle. Hence, I might describe the topic of the metaphor (i.e. tooth) to the category denoted by the vehicle (i.e. volcano): 'the tooth was a deep red volcano'. This metaphorical category represents features that share some significant elements with '(a subset of) items that fall under the concept lexically encoded by the vehicle' (Dulcinati et al. 2014:72). For example, the metaphorical category *volcano* may include things that are red, fiery and destructive (e.g. some rotten teeth but also some erupting volcanos). The understanding must be established that the connections between the topic and vehicle must be recognised. If I take this metaphor to mean 'the tooth was bloody and painful', then I have chosen as ground some sort of colour and sensation. 'A given metaphor may offer multiple potential grounds, and a given ground multiple potential interpretations' (Johnson & Pascual-Leone 1989:49). Understanding a metaphor as an analogy 'is a way of noticing relational commonalities independently of the objects to which those relations apply' (Gentner 1987:2). Subsequently, one cannot access the metaphor without first recognising similarities across entities (Pouscoulous 2014).

The focus of the 20-min lessons is the oscillating SG in terms of metaphors as a figurative language device. The teacher's overall goal in this lesson was to elicit the learners' identification of metaphors within stories. As I coded the SG, I related the teacher's questions to previous or successive questions and the learner's responses. Two of the three lessons comprise four phases (summarised below) with the bulk of the time spent on phase three.

1. Task Orientation:
   a. The teacher identifies the lesson as a focus on metaphors.
   b. The teacher defines a metaphor.
2. Academic Administration[5]: The teacher directs the learner to the story and tells the learner to underline the sentences with metaphors.
3. Task Orientation:
   a. The teacher/learner reads the story sentence by sentence.
   b. The learner identifies the metaphor in each instance.
   c. The learner underlines the sentence with the metaphor.
   d. The teacher moves on to the next sentence.
4. Conclusion: The teacher makes concluding statements about the lesson.

An analysis of SG makes known a more precise description of the interaction between teacher and learner. The teacher focuses exclusively on the story, 'A visit to the dentist', as an

5. A term taken from Jackson (2016).
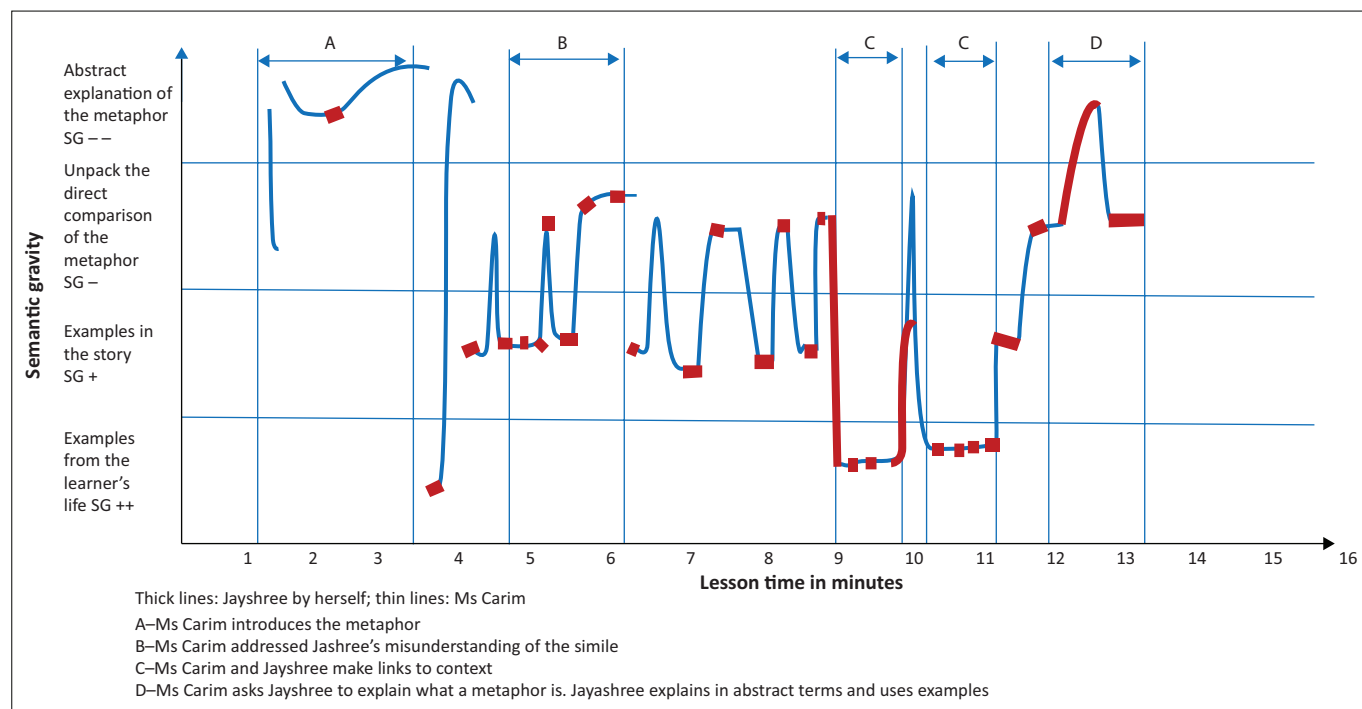
SG, semantic gravity.

FIGURE 2: Semantic profile for Jayshree's lesson.

independent artefact and requires that the learners identify the metaphors using exact textual quotes. The tightly structured process moves learners from the definition of a metaphor into the identification of metaphors captured in a story. However, in the pedagogic space, the bases for approaching and relating to the text can vary, shifting along both the stronger and weaker SG continua.

Engaging in response to the identification of metaphors in a given text requires that learners demonstrate that they understand the implied comparison of the metaphor. In this particular text, 'A visit to the dentist', the weakening of the SG is supported by the teacher's questions to focus learners on identifying the metaphor. Bringing in information from beyond the story, strengthened the SG, allowing learners to better understand the broader associations of the metaphor. In the lesson engagement that analysed this text, interaction around the identification of the metaphors from the story frequently integrated knowledge from the learner's personal context to represent the implied comparison of the metaphor. Therefore, I did not find it entirely surprising that two of the three lessons contained sections of stronger SG in which the teacher engaged the learners' experiences of visiting the dentist and of going to a mall. The analysis below refers to occurrences of stronger SG in pathways that went beyond the comparative nature of the metaphors in the text. In this analysis, the thick lines represent the learner's turns, and the thin lines represent the teacher's turns – together the line segments connect to represent semantic waves. Jayshree's lesson (see Figure 2 following) is the only lesson from the three lessons in the data set in which the semantic wave shows two pathways (see C) of strong SG. These two pathways involve interactions

concerned with Jayshree's experience of going to the dentist and going to the mall.

Before traversing these two pathways, Ms Carim corrected Jayshree's confusion between the simile and metaphor.

Ms Carim	Very good! 'Mom helped me rinse my mouth with warm salt water, and when I gargled, I choked. Salt water drained down my throat, and I was a swimmer in the salty ocean'. (pauses briefly)
Jayshree	I was like a swimmer in the salty ocean.
Ms Carim	'I was a swimmer' not 'I was like', if I was 'like' then what would it be?
Jayshree	A simile.
Ms Carim	Yes. So, what does the sentence say? 'I was a swimmer in the salty ocean'. So that's a metaphor, right?

General waving across the lesson includes the teacher reading from the text and learner identifying the metaphor as pertinent goals for the lesson. Further engagement between Ms Carim and Jayshree connects to a wave which weakens SG in order to conclude the topic on metaphors. At this point, Ms Carim asked Jayshree to explain what a metaphor is and she used her understanding of similes in her explanation – 'a metaphor is something that describes something that and doesn't include an "as" or a "like"#'; and when prompted for an example, she responded, 'Hmm for example, "her heart is like gold", then the simile is "her heart is like gold". And the metaphor is "a heart is gold".' The end result is that Jayshree can identify a metaphor in text but does not necessarily see the broader associations or implied comparisons of the metaphor.
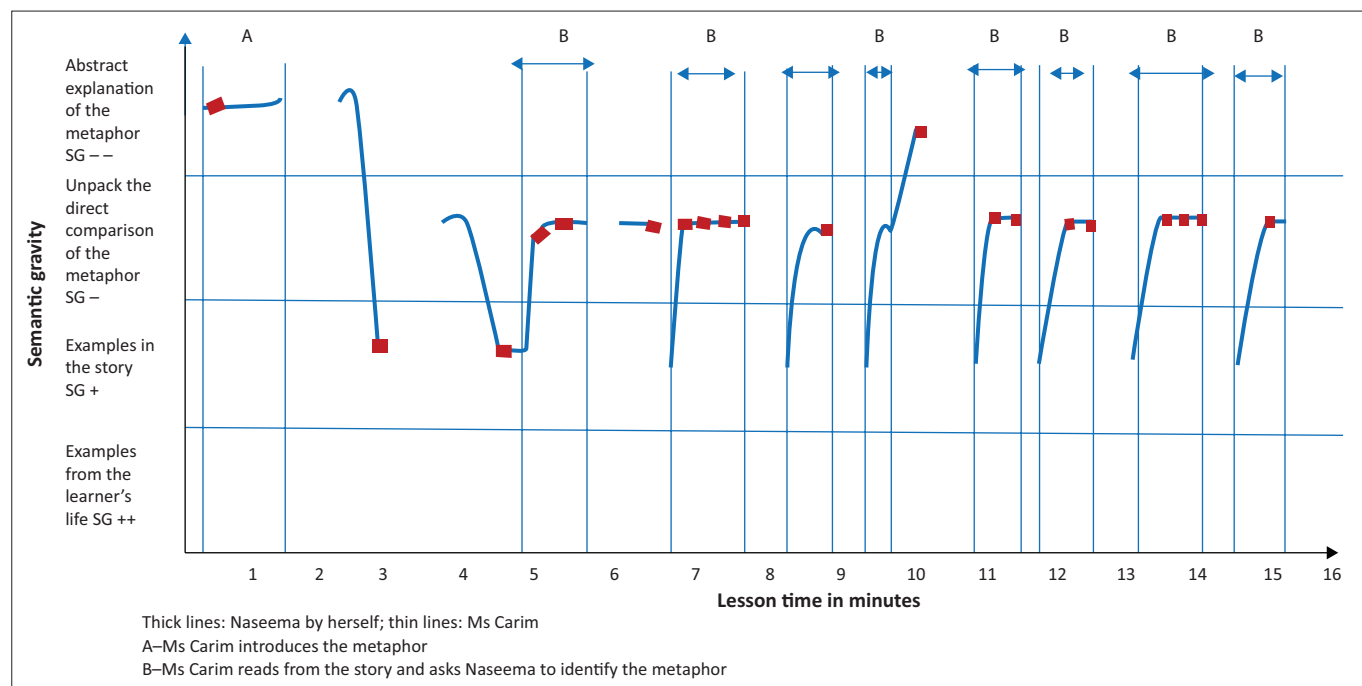
SG, semantic gravity.

FIGURE 3: Semantic profile for Naseema's lesson.

The analysis of Naseema's lesson (see Figure 3) reduces the identification of the metaphor to an application of rules only. The categorisation comparison of the metaphor is emphasised in the verb 'was', in that the learner draws an inference that the metaphor relies on a similar rule to that of the simile (in this case, that the use of 'was' indicates a metaphor in the same way that 'as' and 'like' indicate a simile). The breaks in the semantic profile indicate when Ms Carim's focus changes to a new phrase from the story. The waves begin with a stronger SG when the teacher reads from the text. The SG is weakened with an upward movement which represents the pathway taken to request Naseema to identify the metaphor. As a result, there are many points where upward

escalators are present. Upward escalators represent shifts from relatively stronger SG towards relatively weaker SG (Jackson 2016; Maton 2013) (Box 1):

In the above extract, Ms Carim asked Naseema to identify the metaphor. The expected reaction failed to come, as Naseema was unsure. Ms Carim repeated the phrase from the story and Naseema began reading the phrase. The teacher repeated the phrase and then funnelled (Brodie Jina Modau 2009) her questions towards an expected answer – 'Was he using a metaphor to compare himself to a swimmer?' Naseema affirmed the presence of a metaphor. In Turn 31, Ms Carim (44 years, female teacher) asked, 'So what … what is the metaphor? The 'what part' of the sentence, just use one word then I'll know. Are you failing to see?' Naseema responded, 'Umm, "I was"…' and Ms Carim commended her for the answer. This answer gives the appearance that Naseema understood the metaphor, but from her engagement, we can see that this was not the case. When asked about her engagement with Naseema, Ms Carim explained that 'Naseema had difficulty reading and comprehending texts, so it was hard for her to grasp literary devices.' She further explained that:

> 'I don't think she [*Naseema*] understood what a metaphor was. I think she looked for "were" or "was" in the sentence and identified it this way. But the actual concept of using a metaphor to compare two things and describing it wasn't something she was grasping at all.'

When asked why she did not ask Naseema to describe the comparison, Ms Carim said:

> 'I think it's because she seemed to get very uncomfortable when I did do this, and I thought leading her on would be a better approach so she wouldn't feel uncomfortable as she really wanted to get things right.'

BOX 1: Ms Carim's focus changes to a new phrase from the story.

21	Teacher	Right, let's carry on. 'Mom helped me rinse my mouth'. Are you looking at the page?
22	Naseema	Yes.
23	Teacher	Okay. 'Mom helped me rinse my mouth with warm salt water, and when I gargled, I choked. Salt water drained down my throat, and I was a swimmer in the salty ocean'. So, in which one of those two sentences is the metaphor? Which part of that sentence is the metaphor, do you think?
24	Naseema	Umm.
25	Ms Carim	Okay, I'll read to you again: 'Salt water drained down my throat, and I was a swimmer in the salty ocean.'
26	Naseema	Umm … the part … mommy helped me rinse my mouth.
27	Ms Carim	Yeah?
28	Naseema	… with warm salt water
29	Ms Carim	'[A]nd when I gargled, I choked'. But then it carries on. 'Salt water drained down my throat, and I was a swimmer in the salty ocean'. So, was he really a swimmer in the salty ocean? Was he using a metaphor to compare himself to a swimmer?
30	Naseema	He was using a metaphor
31	Ms Carim	So what … what is the metaphor? The 'what part' of the sentence, just use one word, then I'll know. Are you failing to see?
32	Naseema	Umm, I was…
33	Ms Carim	Very good. 'I was a swimmer in the salty ocean'. Can you underline that part?
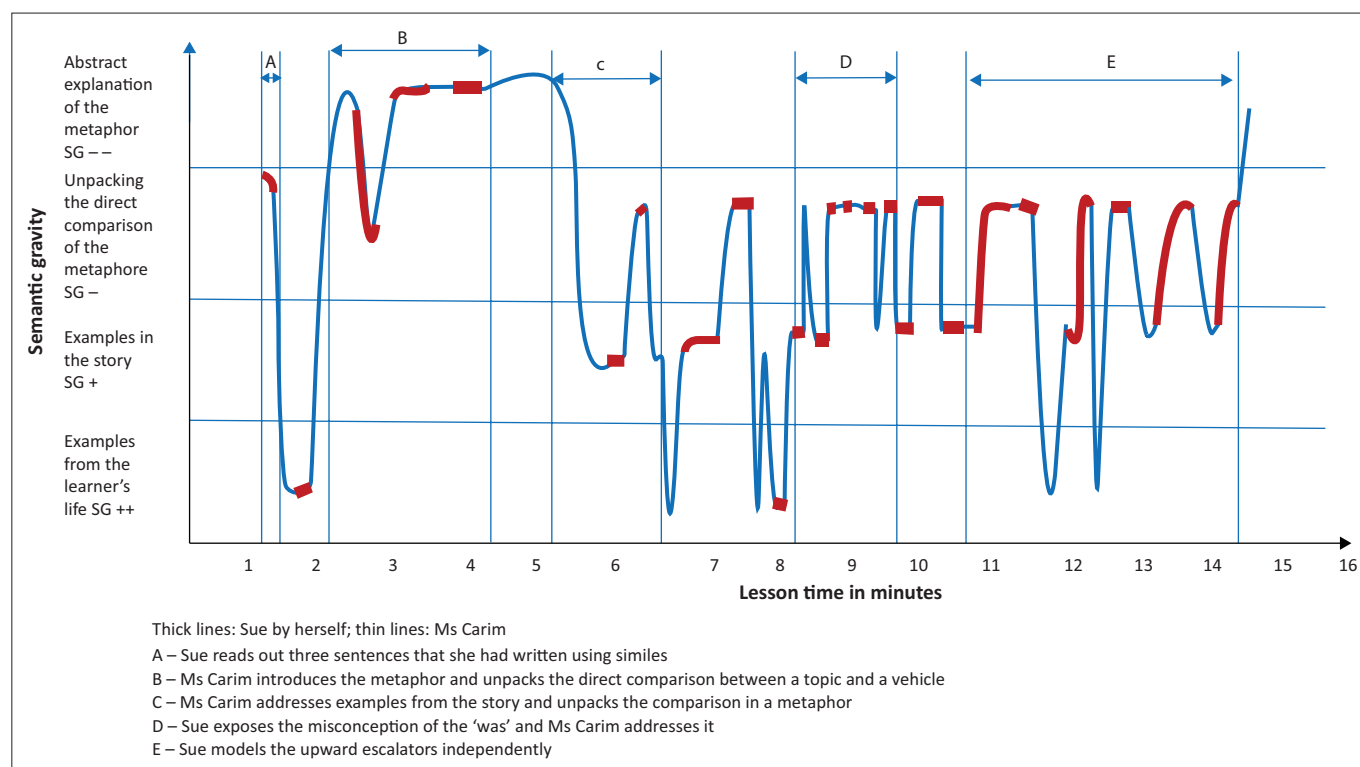
SG, semantic gravity.

FIGURE 4: Semantic profile for Sue's lesson.

Sue's lesson (see Figure 4 following) offers stark differences in comparison to the other two lessons. The lesson offers building distinct knowledge pathways that Ms Carim takes with Sue so that ultimately Sue could traverse them on her own. The wave begins at a weaker SG when Ms Carim introduces the metaphor. In this lesson, Sue identifies the metaphor in each phrase and then Ms Carim further elicits Sue's understanding of the comparison. Ms Carim poses probing questions that require Sue to explain the comparison that the metaphor represents, as in, for example, 'Is that a metaphor?' and 'Could you perhaps explain what he means there, though?' Mostly she directs Sue's attention syntactically, focusing on the categories of a metaphor, such as an application of the rule that metaphors should invite classifying the topic as a member of a category named by the vehicle (Bowdle & Gentler 2005). For example, she asks, 'But are we comparing "I was afraid" to anything?' Upward escalators are present typically when Ms Carim builds knowledge into more abstracted forms. These upward escalators usually occur where Ms Carim wants Sue to explain the comparison that the metaphor represents. Here, I elaborate on the two occurrences to illustrate how Ms Carim modelled semantic waves to enable Sue to demonstrate this learning independently.

Sue's misunderstanding: The case of the 'was'

For much of the lesson (see Appendix 1 for the transcript of this lesson), it may seem as though Ms Carim's work is focused on ensuring that Sue keeps up with her in the identification of metaphors in the story, leading to a relatively weaker emphasis on SG in this process. That is, she reads descriptions from the story that require Sue to identify the metaphor. The pathway D demonstrates how a misunderstanding is revealed when Sue provides an incorrect response. Here, Sue identified the verb 'was' as the indicator of the metaphor. She said: 'Um. Was ... the dentist's chair was a submarine?' Ms Carim accepts this response; however, immediately thereafter slightly weakens SG by focusing Sue's attention on whether 'I was afraid. I was a captive monkey to be analysed' is a metaphoric description. Ms Carim here strategically works at a weakening level of SG. She intercepts Sue's misconception of the 'was' by reformulating instructions, thereby weakening the SG. Ms Carim focuses Sue's attention away from the literal meaning to the metaphorical meaning, such as when she says, 'What is he comparing?' Sue has recognised the verb 'was' as an indicator of a metaphor in the same way that 'as' and 'like' indicate a simile. In preventing Sue from forming a misconception, Ms Carim draws boundaries of how to identify the metaphor, by working at a relatively weaker level of SG, asking Sue in Turn 70, 'Is that a metaphor?' and in Turn 74 she keeps the SG at the same weakness by asking, 'But are we comparing "I was afraid" to anything?' This focus on the comparison of the categorisation is reinforced as Ms Carim realises that Sue is pursuing a rule to identify the metaphor. Therefore, she poses eliciting questions to help Sue unravel the misconception of the 'was'. She wants Sue to classify the metaphor as a 'combinatorial item' (Johnson & Pascual-Leone 1989:12) relating in a '– was a –' sentence frame to identify the metaphors embedded in the story. Ms Carim did not recognise the metaphor that the fear the narrator feels at the dentist could be projected on the fear that one would feel as a captive monkey.

In describing her pedagogic decisions of this episode, in the interview, Ms Carim explained:

> 'I used questions to sort of lead in the direction of thinking that having a "was" in a sentence doesn't always mean that it will be a metaphor. I didn't just want to tell her, but I wanted to allow her to figure that out for herself. I wanted her to realise this so that she understands that a metaphor is used for comparative reasons.'

Ms Carim later tests to see if Sue is still holding onto the misconception. In Turn 98, she asks, 'Also is "the mall was very busy" a metaphor?' This question generates more of an upward movement that is realised through Sue's answer specifying that the vehicle is absent and therefore there is no comparison: 'they're not comparing the mall to anything'.

Enabling Sue to independently describe the comparison

Even though Ms Carim makes connections to real-world experience, she engages the story as a task that requires precise interpretation. She directs Sue's attention, focusing on the shift from the literal meaning to the metaphorical meaning in ways such as:

- Identifying the metaphor as a 'combinatorial item' (Johnson & Pascual-Leone 1989:12).
- Describing the implied comparison.

Ms Carim moves focus between conceptual criteria and text-based examples. By modelling a semantic wave with Sue, Sue corrects herself, clarifies criteria and then is able to speak more confidently about the task at hand, identifying and explaining metaphors. In the pathway illustrated by E on the semantic wave, Sue is now replicating the upward escalators that Ms Carim has modelled. She reads the phrase from the story, identifies the metaphor, and then describes the comparison without being asked to explain. Sue is working independently, and this process sets up conditions of possibility for her to produce her own imagery using metaphors.

The lesson analysis just described, demonstrates how Ms Carim modelled pathways that Sue could eventually traverse herself. While Jayshree's lesson includes less successful pathways into learner independence regarding the metaphor, the lesson contained several examples of strong semantic pathways. These pathways of strong SG were less valued since they demonstrate how the lesson became more context specific and therefore did not fully focus on the implied comparison of the metaphor.

Discussion

The important characteristics of this metaphor lesson included an analysis of how Ms Carim supported the learners' identification of the metaphor in texts, and this required that the SG and semantic waves be analysed for the purpose of illustrating the teacher/learner interaction. From a socio-culturalist stance, the teacher and learners had created zones of proximal development for each other. Each learner worked within her ZPD, with Ms Carim through her role of mediating support, to assist each learner in identifying metaphors from the text. While Jayshree's lesson and Naseema's lesson adhered to the identification of the metaphors in a text only, and were able to meet the expectations the task elicited, they were less effective at transferring the comparative nature of the metaphor. Therefore, the lessons were also less effective at establishing the implied comparison in the metaphors represented in the story. In particular, lesson interaction between the teacher and learner explicitly connected the text to the metaphors in the story.

Teaching the learners how to identify metaphors depended on them relating the categorisation in a '– was a –' sentence frame, and did not necessarily depend on the linking to the learners' personal experiences to explain the comparison. Therefore, the task did not explicitly call for an understanding of the implied comparative value of the metaphor. I hoped, however, that the teacher would help learners to understand the comparison. The analysis of the lessons found that the lesson in which Ms Carim was focused on Sue identifying the metaphor and describing the comparison tended to address the implied comparison of the metaphor more thoroughly, and that Sue also tended to model the pathways created.

The analysis showed that the pathways modelled by Ms Carim played an important role in helping Sue to work independently when identifying and analysing metaphors from a text. The analysis also indicated that Ms Carim weakened the SG when addressing Sue's misconception about the use of 'was', by using probing questions to enable her to identify a metaphor as a comparison between two things that are unrelated and to push her to describe this comparison. While all three lessons in the data set oscillated between strong and weak SG along a semantic wave, the rate of occurrence and relative value with which the teacher worked along these pathways was a distinguishing factor in the outcome of the interaction. Sue was able to understand the implied comparison in the metaphor without Ms Carim exploring her experiences of going to the dentist and the mall, but using the visit to the dentist and the mall allowed Jayshree to make some implied connections even though she relied more on the combinatorial rule to explain her understanding of the metaphor. While Ms Carim did not explicitly explore the combinatorial rule with Naseema, the verb 'was' presented criteria for her to look for when identifying a metaphor in a text.

Conclusion

Hammond and Gibbens (2005) argue that parents/teachers and learners work collaboratively and this active participation in scaffolded activities can build knowledge and extend understandings. The problem is that Hammond and Gibbens and other researchers who have explored scaffolding as a pedagogic tool do not demonstrate how scaffolding looks in practice. This paper offers a visual representation of the learning pathways across three lessons. The LCT concept of SG provides a promising yet pedagogically responsive approach to illustrate how teachers could scaffold activities in lessons to support learners in producing these pathways independently. Using semantic waves, I show how the teacher

works with concepts, criteria, text resources and learner understanding. Therefore, semantic waves provide a way that teachers can operationalise and design the learning pathways that do all these things that Hammond and others talk about in decontextualised ways. As a teacher-educator, I present pre-service teachers with concepts like scaffolding as part of their theory of learning, but this does little to provide them with models of pedagogic practice of what such learning pathways would look at. The analysis exposed pathways that could now be purposefully designed for teacher/learner interaction to support learners in developing independence. Making these pathways evident offers affordances for teaching scaffolding to pre-service teachers. Further research is necessary for investigating the value of semantic waves as a means of enabling pre-service teachers to track the kinds of interactions that result in learner independence.

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Competing interests

The author declares that no competing interest exists.

Author's contributions

Z.J.A. declares that she is the sole author of this research article.

Ethical considerations

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Data availability

The datasets generated during and/or analysed during the current study are available from the author on reasonable request.

Disclaimer

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Appendix 1

A visit to the dentist

(Story with embedded metaphors)

(Jina Asvat 2020)

'I woke up on Saturday morning with a toothache. Mom said that the tooth was a deep red volcano. Mom helped me rinse my mouth with warm salt water, and when I gargled, I choked. Saltwater drained down my throat, and I was a swimmer in the salty ocean. Mom said that it was time to visit the dentist.

The dentist's chair was a submarine, and it dropped lower and lower. I was afraid. I was a captive monkey to be analysed. The tools on the tray were a fence of strange wires that crisscrossed in a crazy pattern. The dentist was a masked scientist looking down from above. He lowered the chair again. I opened my mouth wide. He put strange wires into my mouth. The pain had disappeared, and I was a silver-lined cloud floating above. On the way home, we stopped at the pharmacy to buy the medication. Unfortunately, the mall was very busy. We were tiny fish swimming in a sea of people. I couldn't wait to get out of there and go home. The drive home was a frustrating experience because the holiday traffic had turned the street into a parking lot. I promised to keep my teeth clean. I do not want to be a captive monkey ever again.'

Lesson extract: Ms Carim and Sue

58	T	So, is he saying that he was swimming in the salty ocean? What is he comparing?
59	L	He's comparing that when he gargles…
60	T	Yes …
61	L	[… *H*]is mouth, the saltwater drained down and then he is comparing himself to a swimmer in a salty ocean.
62	T	Yeah. So, you know like when you swim in the salty ocean or not? If you have before, already, you know you inhale that salt and you can taste this salt in your mouth and in your nose and even in your … you can feel it everywhere, isn't it?
63	L	(Nods)
64	T	So that, that is what it means: 'Mom said it was time to visit the dentist.' Do you like the dentist?
65	L	Hmm. I've never been.
66	T	You're lucky then. 'The dentist's chair was a submarine, and it dropped lower and lower.'
67	L	Um. Was … the dentist's chair *was* a submarine?
68	T	Yes. So, we are comparing the dentist's chair to a submarine? Okay, now listen carefully to the next one: 'I was afraid. I was a captive monkey to be analysed.'
69	L	I was afraid.
70	T	Is that a metaphor?
71	L	Um. Yes.
72	T	Why?
73	L	Because it has the word *was* in it.
74	T	But are we comparing 'I was afraid' to anything?
75	L	No.
76	T	No. So, okay, so let's look at the next one: 'I was a captive monkey to be analysed.' What do you think of that sentence?
77	L	That one is 'was' because they're comparing the boy to a captive monkey.
78	T	Exactly. So can you see … can you see the difference between those two sentences?
79	L	(Nods)
80	T	Yeah. Did you manage to underline it, or must I wait for you?
81	L	I underlined.
82	T	Okay. 'The tools on the tray were a fence of strange wires that crisscrossed in a crazy pattern.'
83	L	And the tools on the tray were a fence of strange wires that crisscrossed in a crazy pattern, the[*y*] were …
84	T	Very good, so what, because you're comparing the tray to …
85	L	Um, the tray of the tools to 'like a fence of strange wires that crisscrossed in a crazy pattern'.
86	T	Yes. 'The dentist was a masked scientist looking down from above.'
87	L	The dentist was a masked scientist looking down from above.
88	T	Yeah
89	L	So, they [are] comparing the dentist to a masked scientist who was looking down from above.
90	T	Okay, 'He lowered the chair again. I opened my mouth wide. He put strange wires into my mouth. The pain had disappeared, and I was a sliver-lined cloud floating above.'
91	L	'The pain that disappeared' and 'I was a silver-lined cloud floating above'. They[are] comparing … the boy is comparing himself 'to a sliver-lined cloud floating from above'.
92	T	Could you perhaps explain what he means there, though? Why is he saying [he] is floating above?
93	L	Um, because the dentist lifted the chair.
94	T	Yeah, it could be that also, that's not a bad observation. But it could also be that, you know, like sometimes when the dentist injects in your mouth and then they numb the pain in it [and it] feels like you're floating because you can't feel anything. But it could be also like you said, he lowered the chair and then he felt almost like he's flying. You know, down. 'On the way home, we stopped at the pharmacy to buy the medication. Unfortunately, the mall was very busy. We were tiny fish swimming in a sea of people'.
95	L	We were tiny fish swimming in a sea of people. Compare, they [are] comparing him and his mommy, to tiny fish who are swimming in a sea of lots of people.
96	T	Yeah, so have you been to the shop when it's really busy? And you just see crowds and crowds of people in front of you.
97	L	Yeah.
98	T	Okay. Also is 'the mall was very busy'. Is that a metaphor?
99	L	Umm, no.
100	T	Why?
101	L	Because they're not comparing the mall to anything.