Tutors Use of Semantic Waves as a Teaching Strategy to Guide Student Learning: A Case Study

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Abstract

This study investigated teaching and learning strategies, used by peer tutors in a Bachelor of Oral Health (BOH) tutorial class, to enhance active and engaged learning. This study was conducted on tutorial classes that were linked to a BOH high impact module which many students found challenging. Peer tutors who are senior students in the Faculty of Dentistry led the tutorial classes. Tutorial classes refer to small group teaching which allow for one-on-one interaction and increased student engagement with a peer tutor. This study focused specifically on the tutors' unconscious use of semantic waves as a teaching and learning technique to unpack difficult BOH concepts. Semantic waves refer to building knowledge through the construction of recurring up and down movements in the semantic gravity (context-dependent) and the semantic density (condensation of meaning) of knowledge. The construction of knowledge moves from abstract to the concrete and vice-versa. This qualitative study made use of semi structured one-on-one and focus group interviews to collect data from the two BOH tutors and students in the tutorial class. The aim of the study was to investigate effective pedagogical strategies used by the tutors that enhanced students' understanding of abstract oral health concepts. The findings reveal that using semantic waves did assist students with their understanding of difficult concepts. The study also highlighted that the tutors unconscious use of creating 'semantic waves' to transform abstract knowledge into everyday particle examples followed a natural sequence of teaching and engaging with students. The tutors had the ability to use the semantic wave technique to build knowledge in oral health concepts but did not have the skills to move knowledge and meaning-making up the semantic wave to cumulative knowledge-building. It was evident that the tutors were unable to engage students in critical thinking and reconnecting with abstract concepts. The outcome from this study is valuable, as the findings have resulted in the restructuring of the institutional tutor-training workshop to include semantic-waves as a pedagogical strategy to improve student learning. This strategy will explicitly raise tutors' awareness about the importance of knowledge structures and it effectiveness in situated learning.

Keywords: *Peer Tutors, Teaching Strategies, Semantic Waves*

1. Introduction

The Bachelor of Oral Health (BOH) is a three year degree program located in the Faculty of Dentistry. The program is designed to promote health and wellbeing of individuals and communities in private and public health environments. Students in the BOH program develop skills in clinical techniques, health and oral promotion, practice management and applied research. However, many BOH students struggle with the transfer of knowledge from the classroom to chairside assistance during clinical practice. The Local Anaesthesia and Oral Surgery module is regarded as a high impact module in which students struggle to transfer the knowledge to clinical practice. The knowledge and ability to use local anaesthesia effectively is a critical component in the BOH program as it provides the students with the insight of oral surgery so that they could feel competent to practice with confidence. Tutorial sessions were attached to this module to try and support students in understanding these new concepts. The faculty appointed senior students as peer tutors to assist students in the tutorial program. The tutorial group size was intentionally small so as to allow for one-on-one interaction and increased student engagement in the tutorial class. The use of senior students as tutors also allowed the students to feel comfortable enough to ask questions and engage in discussions without feeling judged. This study investigated the tutors' unconscious use of semantic waves and its effectiveness as a teaching and learning technique to unpack difficult BOH concepts.

2. Literature Review

Morillas and Fandos [1] regard tutoring in higher education institutions as a crucial component of the university's learning and teaching process. They view tutoring as a basic strategy for improving the students' academic success and professional goals. An important component in the tutoring process is the tutor as they can be identified as key role players in providing students with appropriate support for

a more personal learning experience [2]. Another effective component in the tutorial process is the small group teaching as it emphasizes the collaborative nature of learning and learning methods which Vygotsky [3] clarifies require students to develop teamwork skills and to see individual learning as essentially related to the success of group learning. The social constructivist learning promotes active participation as students manage to construct their own knowledge drawing from their own realities. Students background knowledge plays a significant role in their understanding of the new concepts being introduced as well as their retention of the word's meaning for later use [4]. By tutors activating the students' background knowledge, the students' related information is brought to the surface where it is used to stimulate questions and build interest in the targeted concepts taught in the tutorial. Rupley, Logan, & Nichols highlight that tutors are able to use this knowledge to guide learning and to help clarify any misconceptions that students may have about specific concepts. This study is informed by Maton's [5] Legitimation Code Theory's (LCT) semantic dimention. Semantic dimension distinguishes between two aspects: Semantic Gravity (SG) and Semantic Density (SD) which can be represented as a wave. Maton [6] explain that semantic waves enable cumulative learning, where new knowledge builds on and integrates past knowledge. Semantic waves refer to building knowledge through the construction of recurring up and down movements in the semantic gravity (context-dependent) and the semantic density (condensation of meaning) of knowledge. The construction of knowledge moves from abstract to the concrete and vice-versa. Semantic gravity and SD may be relatively stronger or weaker. When the semantic gravity is stronger (SG+), then the meaning is more closely related to its context of use and when it is weaker (SG-), then the meaning is less dependent on its context. When a concept is highly condensed in meaning then the semantic density is strong (SG+) and weak (SD-) when the concept is less condensed in meaning. This can be observed in Figure 1 below.

Semantic Gravity (SG): Refers to how much meaning is related to the context		Semantic Density (SD): Refers to how highly condensed a concept meaning is	
Weak Semantic Gravity (SG-)	Abstract concepts	Strong Semantic Density (SD+)	Highly condensed symbols
Strong Semantic Gravity (SG+)	Context related	Weak Semantic Density (SD -)	Common meanings of words
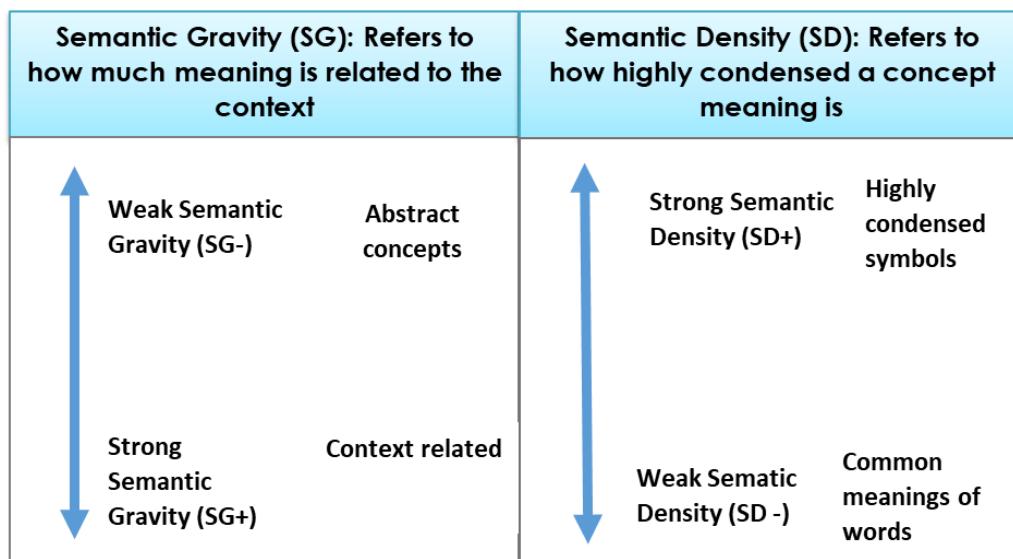
Figure 1: Semantic Gravity and Semantic Density on a Continum

Semantic gravity and semantic density processes work together. Hugo [7] provides an example of how the two processes work in a classroom: (SD-) when a teacher unpacks a concept into its specific components, by giving concrete or local examples (SG+). However, these two processes independently vary. It is quite possible for a teacher to unpack the concept into its specific elements (SD-) and not give concrete examples, just as it is possible for a teacher to give a located example to illustrate a general concept (SG +) without unpacking the specifics of the concept. This process could be seen seperately in figure 1 above or together in Figure 2 below. Hugo adds that an increase in abstraction results in a lowering of SG, descending to more concrete and located examples results in an increase in SG. Cumulative learning depends on weaker semantic gravity (SG-) and segmented learning is characterised by stronger semantic gravity (SG+) constraining the transfer of meaning between contexts.
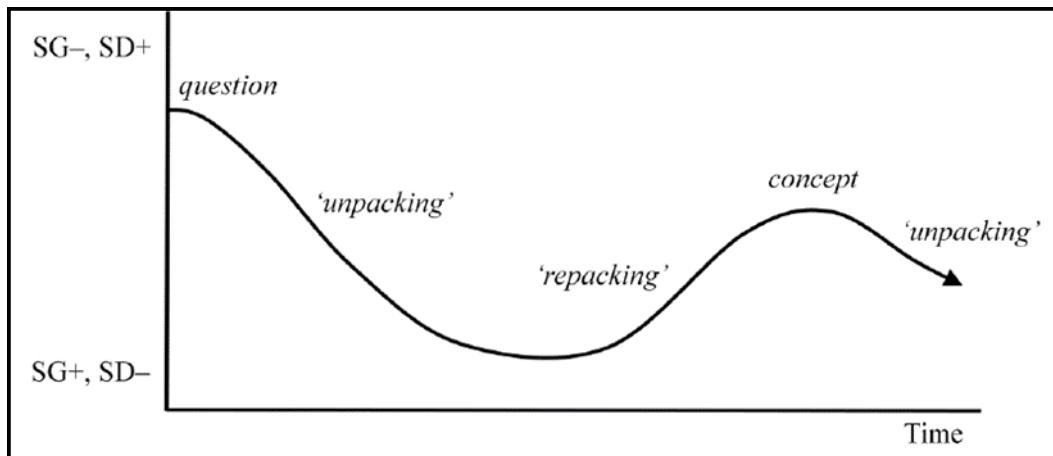
Figure 2: Semantic Waves

This study investigates tutors unconscious use of semantic waves as a teaching and learning technique to unpack difficult BOH concepts. The next section describes the methodology used in this study.

3. Methodology

The aim of the study was to investigate the tutors' unconscious use of components within the continuum of the semantic waves that contributed to enhancing the students' understanding of abstract oral health concepts. The case study approach was used as the main research strategy of enquiry in this study. The case study strategy was deemed appropriate for qualitative data collection, especially since we needed to conduct an in-depth study of the two tutors teaching strategies in a tutorial class. The study focused on one tutorial lesson in the second year Local Anaesthesia and Oral Surgery module in the BOH program. The lesson taught was on nerve conduction and how impulses are conducted in presence of pain. Quantitative data was collected from semi structured interviews with the two tutors. Each interview was forty-five minutes in duration including the one focus group interview with eight students that attended the tutorial lesson. The transcripts from the interviews were analysed according to Themes. Thematic analysis was a suitable method for identifying, analysing and reporting on how the tutors and students made meaning of learning and teaching in the tutorial.

4. Findings and Discussion

The findings reveal that using components of the semantic waves did assist students with their understanding of difficult concepts. The evidence shows that tutors moved down the semantic wave, relating the abstract subject content to everyday language and lived experience context. For example, in the tutorial lesson on nerve conduction, the tutor needed to introduce the new concept of local anaesthesia, this concept on its own is less dependent on its context (SG-) and highly condensed in meaning (SD+). The tutor starts of by asking students some questions to try and relate the new context to their backgrounds. The tutors asked student's in the tutorial about their personal experience with a sore tooth and describe the pain they experienced. This created an interest in the topic of discussion. This activity resulted in moving students understanding or learning down the wave, weakening the SD and strengthening the SG bringing the meaning more close to the context of use by the students. The tutors made use of an analogy of a banana which is high in potassium and by placing it in acid liquid which is high in sodium chloride; the potassium is exchanged for sodium. This demonstration highlights pain stimulus (tooth ache); how the pain stimulus activates the porous cell membrane to develop an affinity for sodium to move inside the cell and exchange potassium ions for sodium ions. This demonstration brought into focus how administration of local anaesthesia blocks the movement of sodium into the cell and prevents the impulse (pain) to reach the brain. Students found this activity and discussion to be very useful in transferring their learning (knowledge and understanding) from one context to another and using it in clinical practice. The following quotes by the students in the tutorials expressed their experience in the learning process:
As one participant said "We *all struggle with nerve conduction but the illustration of the banana and the peel made it simple, we gained a better understanding*" another student commented: "*We were having difficulties comprehending how the sodium potassium mechanism works. The tutor wanted to*

bring the information to our level so that we can actually understand, he used the same concept in a situation with the banana peel as the membrane layer, his explanation I think helped in understanding the concept and we all laughed" The findings acknowledge that although tutors were able to move down the semantic wave to strengthen sematic gravity (SG+) and weaken semantic density (SD-) by transferring understanding and building knowledge, the tutors did not have the skills to move knowledge and meaning-making up the semantic wave to cumulative knowledge-building. The tutors were unable to engage students in critical thinking and reconnecting with abstract concepts.

5. Conclusion

The learning and teaching activities used by the tutors in the BOH tutorial positively contributed to students transfer of knowledge from the classroom to their clinical practice sessions. Activating and building cumulative knowledge is essentail for BOH students. First time concepts relating to the Local Anaesthesia and Oral Surgery module needs to be explicitly linked to students prior experiences with connections made to practicle everyday examples. This allows the BOH students to have the opportunity to make a concrete connection between their understanding and knowledge of the oral health environment.

The outcome from this study is valuable as the findings have resulted in the restructuring of the institutional tutor-training workshop, to include semantic-waves as a pedagogical model to improve student learning. This model will explicitly raise tutors' awareness about the importance of the interplay between knowledge structures, and the value of unpacking and repacking conceptual terms to bring about effective and situated learning.

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