

ARTICLE

Using ‘Semantic Waves’ to Guide Students Through the Research Process: From Adopting a Stance to Sound Cohesive Academic Writing

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Using ‘Semantic Waves’ to Guide Students Through the Research Process: From Adopting a Stance to Sound Cohesive Academic Writing

ABSTRACT

This paper reports on contemporary research on knowledge practices, and in particular how it might inform the teaching and evaluation of critical thinking. Research was conducted during an Ideas and Exposition module for first and second year NUS undergraduates entitled “Sport and Socialization”, within the broader field of sport sociology. Findings are presented on the effectiveness of using a part of the notion of *semantic waves* called *gravity waving* as a guide at both the curriculum design and the assignment text level. Gravity waving can be seen as a strategy for teaching and evaluating critical thinking. In particular, it can be used by educators and students as they select and apply a line of inquiry for a research project; as well as when they produce their written academic texts. The outcome of the research is an educational model entitled the “Instructional model to facilitate gravity waving”. The paper presents the model and evaluates its impact on student learning. This is done through teacher-researcher observations about the challenges met at different stages of the interventions plus detailed pre- and post-intervention analyses of students’ writing. These findings could help to inform lecturers across the disciplines how gravity waving can lead to demonstrable critical thinking as learning outcomes. It is hoped that this research might also stimulate more inquiry in the emerging field of legitimation code theory (Maton, 2009; 2013), specifically the semantics dimension and gravity waving and how this concept can inform practice at tertiary level.

Key words: legitimation code theory; semantic waves; semantic gravity; gravity waving; content and language integrated learning; IMR&D (introduction-methodology-results-discussion); cohesion; critical thinking.

INTRODUCTION

Gilpin and Liston (2009) posit that the scholarship of teaching and learning (SoTL) should establish a “*commons* whereby learning communities grow in their understanding of one another” (p. 2). The *commons* refer to “conceptual spaces for exchange of ideas and community building among education stakeholders” (Huber & Hutchings, 2005, p. 1). This research seeks to create a shared space for practitioners across the disciplines to discuss the development of their students’ critical thinking abilities. This, as Lloyd and Bahr (2010) argue in their article in the *International Journal for the Scholarship of Teaching and Learning*, is needed. For them, the term critical thinking has “lost the precision needed to apply it to...demonstrable outcomes” (p. 2).

Similarly, Szenes, Tilakaratna, and Maton (2015) argue that the notion of critical thinking in higher education practice is unclear. They state:

There is relatively little analysis of what could be called actually existing ‘critical thinking’ in higher education or the knowledge practices actors consider to be educational evidence of this capacity (p. 573).

Demonstrating through educational evidence, the nature and form of critical thinking remains, as they state, “under-explored” (Szenes, Tilakaratna, & Maton, 2015, p. 573). In response to this gap in the field of critical thinking pedagogy, the authors argue that critical thinking can be represented and analyzed using concepts from legitimation code theory (LCT), and in particular, *semantic gravity* (Maton, 2009; 2013).

Knowledge across curricula can be seen to simultaneously comprise both generic and specific attributes. Whether the subject field is social work or business or, they argue, any other, the outcome of effective critical thinking and writing is manifested by the interaction between different knowledge structures. High-achieving students demonstrate an ability to transit from abstract knowledge to contextualized knowledge; in other words, from degrees of abstract, context-independent knowledge to degrees of situated, empirical context-dependent knowledge and vice-versa, a movement that forms part of *semantic waves*. What is in fact occurring during these transitions is movements along the semantic gravity plane, or continuum, and these can be effectively described and analysed by the process of *gravity waving* (Szenes, Tilakaratna, & Maton, 2015; Maton, 2013). This, they demonstrate by analyzing papers from differing disciplines, is considered by lecturers as high-achieving work. The ability to make these transitions is a common achievement goal, and therefore it is important to raise teachers’ and students’ awareness of this.

This SoTL project drew on Szenes, Tilakaratna, and Maton's (2015) work on gravity waving and contributes to this evolving field in educational practices. Using a collective case study approach conducted over three semesters, an instructional model (see Figure 2 on p. 12) based on the concept of gravity waving was developed to guide students in their assignment writing process. Figure 2 depicts the refined instructional model developed and evaluated in this study. The model explicitly raises students' awareness about the importance of the interplay between knowledge structures (Szenes, Tilakaratna, & Maton, 2015; Maton, 2013) and how, in practice, effective critical thinking, in the form of successful research design and academic writing, can be facilitated through gravity waving. Given that academic writing and critical thinking are vital intended learning outcomes of higher education, gravity waving is expected to be useful to students. Ultimately, this research hopes it might inform educators who wish to impact their students' learning positively through the implementation of this gravity waving-based instructional model in other disciplines as well.

The following sections explain the concept of gravity waving, how it was used to scaffold students' academic writing process through an instructional model, the challenges faced by students in using the instructional model, and the outcomes of the study.

LITERATURE REVIEW

Maton (2014) argues that knowledge itself is often sidelined in education research, which he terms *knowledge blindness*. Rather than a focus on the forms of knowledge, there is more often a social constructivist view that knowledge only reflects social characteristics and nothing else, such as viewing knowledge and language as gendered, and focusing on analyzing these in that way alone. Similarly, in educational practices, there is a tradition of instructors tending to a *subjectivist doxa* (Maton, 2014), which sees knowledge building as a focus on knower dispositions or experiential elements. For example, much research on learning styles (Gardner, 1983) has been conducted. What is needed is a move beyond the relativist approach. Maton (2013) attempts to demonstrate that what educators need to be aware of is that knowledge is real and structured. He argues that there are knowledge structures that integrate a large number of "empirical phenomena with the smallest number of axioms" (Maton, 2009, p. 45). The concept used by Maton (2013) to describe transitions between these more abstract knowledge structures or axioms and those more empirically-oriented is semantic gravity. He states that "semantic gravity (SG) refers to the degree to which meaning relates to its context" (Maton, 2013, p. 11). The interplay between these knowledge structures creates *gravity waves*, which is

a process of knowledge building as it enables the accumulation of knowledge across contexts and through time (Maton, 2009, p. 45). It therefore represents *cumulative learning* (Maton, 2009).

In his 2013 paper, Maton defines weaker and stronger semantic gravity. The stronger the semantic gravity (SG+), the more meaning is dependent on its context; the weaker the semantic gravity (SG-), the less dependent meaning is on its context. All meanings relate to a context of some kind; semantic gravity conceptualizes how much they depend on that context to make sense. (p. 11). Semantic gravity varies on this continuum, moving from stronger to weaker dependence and back again. Analysts can record this process of gravity waving on a graph to construct visual waves as *semantic gravity profiles* and *semantic gravity ranges*.

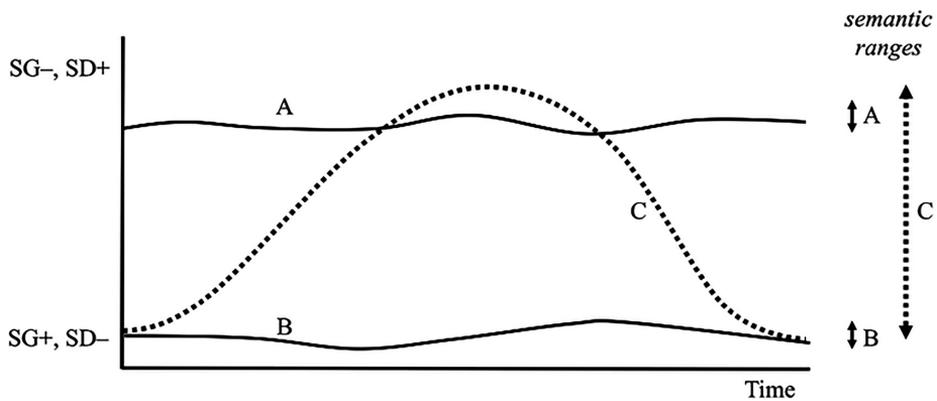


Figure 1. Diagram of semantic gravity profiles and ranges, adapted from Maton (2013, p. 13).

In addition to waves, flatlines can be recorded as profiles with very limited range (refer to A and B in Figure 1). These appear when the meaning of a message remains either consistently abstract (see LJ's extract below in Case Study 1) or consistently contextualized (see K's extract below in Case Study 2).

Before going into the problematic examples from this research, an example of undergraduate writing in social work is presented from Szenes, Tilakaratna, and Maton (2015). Social work students were asked to analyze a critical incident from their practicum experiences. The following is provided as a highly competent extract:

In my incident, the emerging themes that I believe warrant further investigation relate to professional practice, namely the issue of boundaries, gender and power. The irony of my distinction only becomes clear now. While I expect to be able to put on a professional "mask", consisting of the professional

skills and knowledge of social work practice when working with clients, I expect clients like Jared to “bare all”, to reveal to me their personal problems, issues and insecurities. Sommers-Flanagan and Sommers-Flanagan (2007) refer to this concept as “one-way intimacies” (Sommers-Flanagan & Sommers-Flanagan, 2007, p. 163), and as a necessary component of helping relationships (pp. 580-581).

In this example, it is clear that a movement from abstract to concrete is facilitated. The subjects of boundaries, gender and power initiate the discourse, and these represent *weaker* semantic gravity. After that, the student moves on to exemplify and explicate this from personal experience through a short narrative regarding Jared. Evidently, this creates a downturn on a graph towards a relatively *stronger* semantic gravity. The writer then goes on to sum up the extract with a macro theme, which again is related to more generalised practices, “one-way intimacies”, and is accompanied with an academic source (Sommers-Flanagan & Sommers-Flanagan, 2007, p. 163). The discourse therefore mounts again towards *weaker* semantic gravity. This clearly creates a gravity wave and facilitates cumulative learning as there are possibilities for repeating, challenging or extending this report: another reader from the field or from another field might apply the same lens to another related context; or try it for a very different context and make a comparison; the researcher might decide to use another lens for the same context, and so on.

Szenes, Tilakaratna, and Maton (2015) cite a number of studies in their chapter (curriculum design, Shay & Steyn, 2015; engineering, Wolff & Luckett, 2013; English, Maton 2014; environmental science, Tan, 2013; jazz, Martin, 2012; journalism, Kilpert & Shay, 2013; physics, Georgiou, 2015; sociology, Stavrou, 2012; and teacher education, Shalem & Slominsky, 2010) to demonstrate that LCT, and particularly this notion of creating waves through semantic gravity as sound critical thinking, is being applied across the disciplines. Similarly, Shay (2013) analyzes semantic codes of different kinds of curricula and reports, and shows the shift along a generic/theoretical and specific/practical continuum. According to Maton (2014b), in subjects such as Biology or History, effective critical thinking is viewed as being able to weave along this plane of semantic gravity. For example, in Biology, there is often a focus on a specific plant to enhance generic understanding. Similarly, there is a specific focus on an event theory of historical causation in History to explicate influence. Along the same line of argument, as Szenes, Tilakaratna, and Maton (2015) state:

Mastering semantic gravity to achieve a high range is crucial to achievement across the disciplinary map. In this chapter, we are suggesting that waving, weaving, and a high range may also be generic attributes of knowledge practices associated with demonstrating critical thinking (p. 588).

In this research and similarly in other disciplines, it is the theoretical frameworks that are used to integrate knowledge; in other words, these frameworks are used as analytical lenses to interpret empirical data. The interplay between theory and empirical exemplification demonstrates effective critical thinking and is manifested in language in observable ways. For this research, it also became one important way to represent the product of sound and successful cohesive academic writing. This concept, as Szenes, Tilakaratna, and Maton (2015) suggest, is possibly a shared characteristic across the disciplines and this burgeoning field of research is therefore potentially transformative for educational practices from a diverse range of fields. Hence, the potential for the contribution to the commons as a conceptual space for “exchange of ideas and community building” (Huber & Hutchings, 2005, p. 1) is strong. This SoTL project sought to use gravity waving as a pedagogical strategy to instruct students about effective critical thinking in their academic writing process (Szenes, Tilakaratna, & Maton, 2015).

RESEARCH

Context and process

This research study in the Sport and Socialization module was conducted over three semesters during the first and second terms of Academic Year (AY) 2014-2015 (August to December and January to May) and the first semester of AY2015-2016 (August to December). In each semester, there were three groups of eight to twelve male and female second-year undergraduate students from multiple faculties, including Science; Engineering; Business; Law; Arts and Social Sciences who undertook this module. This is an elective course, and each of these classes was used as a context to develop the model presented in the results section in Figure 2 (instructional model to facilitate gravity waving). Each case study involved several research cycles. These cycles became more sophisticated over the three semesters, with practice. The refined model illustrated in Figure 2 was used in this study. The research was managed based on observations of students' writing and informal feedback from face-to-face and email discussions with students.

The problem

One of the key learning outcomes of the Sport and Socialization module includes students being able to demonstrate critical thinking skills, especially in writing an academic paper. As part of their assignments in the course, students were required to adopt a stance and assimilate a theoretical framework as an analytical lens to study empirical data that they themselves would gather. The ultimate goal was for students to write a social science paper. This process

was scaffolded. However, it was found that students experienced difficulty (as seen in Case Studies 1 and 2). Based on students' writing and responses to informal questioning on their academic writing experiences at the beginning of the course, it was clear that most had not had experience with the Introduction-Method, Research and Design (IMR&D) framework of writing.

In general, students were not able to wave, or weave, between more or less context-dependent knowledge. This appeared to be predominantly because they had not developed enough theoretical knowledge of the subject under investigation. As a result, thinking and writing had a tendency to either resemble highly segmented flatlines, what might be coined *disconnected high flatlines*, as conceptual ideas which were not connected to each other because of a lack of generic knowledge; or *low flatlines*, with the writing being overly context-dependent, resembling a more journalistic rather than academic writing style. Using Szenes, Tilakaratna, and Maton's (2015) findings, this could be said to be because students were not creating gravity waves. Ultimately, in neither of these cases were these students able to demonstrate effective critical thinking.

Clear examples of these tendencies are provided through two detailed presentations of drafts that students wrote before the instructional intervention to offer readers some insight into these problems. The same students' writing is then taken up again after the intervention of the instructional model to facilitate gravity waving to provide a demonstration of its impact. The students have been given pseudonyms, LJ and K. These two engineering students are from the case study group from the third semester, when the instructional model of gravity waving had been refined. Both these students struggled at the outset of the course. In the words of LJ, she was someone "who didn't know how to write research papers like the ones we read."

Case Study 1

The following is LJ's submission for Assignment 1, which required students to draft an introduction to a research topic based on some of the core reading materials. These materials were selected as a reading corpus. There were twelve articles from academic journals in the Sport Sociology field, two to be read each week over the first six weeks of the course. Those referred to below, as well as those referred to in the other example student texts, are listed in the reference section. In this initial draft, LJ presents how these readings might relate to each other. She discusses the subject of the female bodybuilder as a counter-hegemonic cultural icon in sport:

Boardley and Grix (2013) provide insight on male bodybuilders and show their socialization process through muscularity. Jones *et al.* (2013) and Curry (1993) explain how one's body affects

self-identity, particularly regarding discipline of the self and the normalization of pain. Wagg *et al.* (2009) bring embodiment into a broader perspective as they illustrate how the media perpetuates the traditional notion of the female body. Connell and Messerschmidt (2005) present hegemonic masculinity and the set of practices that maintain male dominance.

Using gravity waving as a conceptual framework for analysis, this represents an example of what might be coined a high flatline or weaker semantic gravity throughout (context-independent knowledge). Complex notions are clearly related in that there are connections between the field of self-discipline, bodybuilding, and identity. However, LJ's draft appears to be a listing rather than a construction of logical connections. A core theoretical framework to act as the weaker semantic gravity content, or lens of analysis for a research paper, is not pinpointed. Instead, an effective lens of analysis using this abstract terminology might be how bodybuilders normalize pain by disciplining themselves as a source of identity construction. In this case, the term *bodybuilder* has relatively stronger gravity than *identity construction*, which is a more abstract term. As can be seen, semantic gravity helps to explain the student's difficulties in academic writing, and suggests how a pedagogical intervention might be designed to help the student with writing and critical thinking.

Case Study 2

K, a mechanical engineer, submitted the following draft as a potential topic and set of readings for his research: whether pressure from football fans affects an elite footballer's performance.

Having pressure is part and parcel of competitive sports (Wallace *et al.*, 2005). In the 2014 World Cup, Chile and Brazil were tied at 2-2 after four penalty kicks each. Neymar—from Brazil—was tasked to take the fifth penalty for Brazil. It was the deciding shot on whether his team would progress to the next round. With the supporters watching him, he approached the ball and calmly slotted the ball into the net. Next, Gonzalo Jara stepped forward to take Chile's fifth penalty. He knew that his team would be eliminated if he missed. He hit the post. Chile was out, Brazil progressed (Wallace, Independent, 2014). Thus, it is common for some athletes during the actual game, to "choke" due to the pressure. Hendrie Weisinger and J.P. Pawliw-Fry (2015) claim that handling pressure is a skill that can be learnt.

K found a suitable social phenomenon (context-dependent knowledge) and theoretical framework (context-independent knowledge). However, there is too much *stronger* gravity or context-specific information, and not enough *weaker* semantic gravity, or abstraction. Therefore, as with the first case, there does not appear to be sound gravity waving.

Using Maton's (2013) notion of semantic gravity, it can be said that there is an inability to discuss the relevant abstract and context-independent knowledge in a fully comprehensive manner. As the theoretical framework for a research paper, the student is only touching the surface of the context-independent knowledge related to this topic. There are many studies in sport psychology on achievement motivation, in particular task and ego-oriented motivations and how some athletes have a constant need to prove themselves so that they feel others are impressed. Furthermore, there is research outlining how ego-oriented motivation is more related to skills-based rather than effort-based performance, and how it is more difficult to regulate skills. There is also research that posits that if an ego-oriented player is not performing well, this can lead to the subject choking under pressure, a term that the student brings up. What the student mainly focuses on in this extract, as noted, is the empirical information. In fact, one might say that the theory is overwhelmed by the empirical evidence in this extract and, as a result, it has a tendency to be more like an editorial from a popular media site. To represent effective critical thinking, the text required a more extensive focus on content of weaker semantic gravity.

To help these students, including LJ and K, an instructional model based on gravity waving (Figure 2) was employed. The next section presents the instructional model, the challenges faced by students, and the resultant outcomes, especially in the case of LJ and K.

RESULTS AND DISCUSSION

Impact of the instructional model to facilitate gravity waving and the challenges faced by students during its application

To deal with the problems presented above, students were guided through an instructional process designed to develop their understanding of effective critical thinking, and in particular, how it relates to the way knowledge moves from weaker to stronger semantic gravity following Maton's (2013) concept of gravity waving. This was approached at both macro and micro levels. On the macro level, students were guided through a critical thinking process in which they had to choose a theoretical framework in order to adopt a stance

and design a research proposal, conduct a study and then analyze the data as an analytical lens for the discussion. On a micro level, samples of students' paragraphs were analyzed, and through face-to-face discussions with students during consultations, as well as in more formal whole class settings, they were encouraged to identify gravity waving and in particular, how, when engaged in effective cohesive academic writing, meanings have a tendency to transit from more general, abstract or context-independent to more specific, context-dependent knowledge and back again. They were also guided to note how this represents effective critical thinking.

The instructional model depicted in Figure 2 describes the stages explicitly followed to help raise this awareness at macro and micro levels. As noted, it is the accumulation of findings from focused action research over three semesters. Stages 1 and 2 of the model are whole class or group-based input and output tasks and Stages 3, 4 and 5 are individualized input and output tasks. Stages 4 and 5 are about the students' own developing IMR&D (introduction-methodology-results-discussion) papers.

Examples of the tasks conducted during those stages are then presented along with the rationales to enable the reader to have a good grasp of the method behind the strategies. After that, samples of the drafts from the same two students were presented but at the post-intervention stage. This was done to demonstrate how the strategies from the model enabled the students to improve their work in conjunction with what was evidenced as high-achieving critical thinking and academic writing by Szenes, Tilakaratna, and Maton (2015). It is hoped that the rationale behind the model might enable educators from other disciplines to consider how their own instructional design might relate to gravity waving.

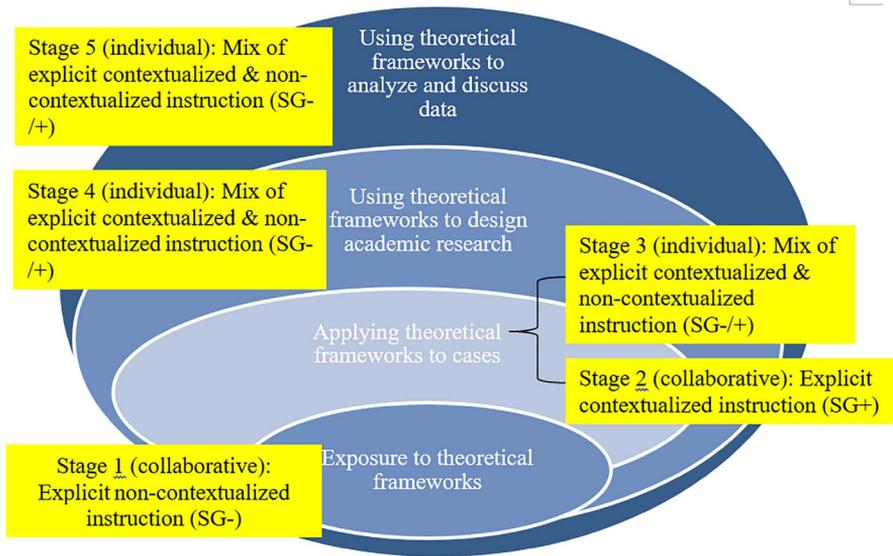


Figure 2. Instructional model to facilitate gravity waving.

Stage 1 (collaborative): Explicit non-contextualized instruction (SG-)

Description

Stage 1 was a teacher-fronted presentation of selected theoretical frameworks. Students were provided with generic definitions for five major theoretical frameworks used in the module to develop the core abstract thinking of the course. At this stage, these notions tended to be new to students as none had a sociological background. Only three descriptions are provided here: critical; functionalist; and feminist theories. These theories are substantially different analytical lenses for understanding social phenomenon related to sports. Students were asked to read descriptions of theories and match these descriptions to the respective theories; this was done to get students to identify the relevant theories. These theories and descriptions were adapted from Jay Coakley's (2010) work, a well-known figure in the sport sociology field.

Challenges students faced in Stage 1

Students were able to deduce which theories these definitions described from the wording provided. The mention of gender oppression clearly pointed to feminist theory, and the references to conflict or stability generally led them to guess critical or functionalist respectively. If more information was required, a simple point such as "functionalists wish to maintain the status quo", and "critical theorists wish to see more social justice" could direct students to choose correctly. Using Maton's conceptual framework, it was the most context-independent knowledge as it could be transferred to different contexts to be used as an analytical lens.

Stage 2 (collaborative): Explicit contextualized instruction (SG+)

Description

Stage 2 required students to apply these theoretical frameworks to a teacher-selected and then a self-selected context. The context provided to students was “strikes in sports”. To contextualize the theories learnt in Stage 1, students were asked to apply the theoretical perspective learnt in Stage 1 to the context of “strikes in sports” and examine how attitudes to player strikes in sports might differ. Then, to consolidate, students were asked to work collaboratively and to discern what the attitudes might be towards the main stakeholders such as the owner and player in a strike. The answers were provided to students once they had completed the task, which can be seen in Table 1 (adapted from Coakley, 2010):

Table 1

An overview of the functionalist perspective on player strikes in sports

Theory	Image of strike	Image of owners	Image of striking players
Functionalist	Dysfunctional or disruptive of the stability of sport.	Responsible for well-being of sport; need to exercise strong control for the good of the majority.	Disruptive troublemakers or rebels.

Once it was established how these stances with very differing views of the social world might react to players’ strikes, students were asked to work collaboratively to conduct research on selected areas to consider other social phenomenon through the lens of these theories. The topic in this case was on player strikes and might not have been an interesting one for the students; however, it was an introduction to how these theories can be employed. Using Maton’s framework, it was moving towards linking context-independent with context-dependent knowledge, as it showed how the lenses could be transferred to a specific empirical context. As already noted in semantics, this has been viewed as an essential element of effective critical thinking. An example of one such task was: How might a functionalist perceive doping in bodybuilding?

After this, students researched a topic of their own choosing with one of the three frameworks as a lens for analysis and presented their findings. This was the first stage in making semantic waves using semantic gravity (Maton, 2013) by shifting from context-independent to context-dependent knowledge. Example research topics presented were:

- Importing foreign sporting talent from a functionalist theory perspective;
- Women's soccer from a feminist theory perspective.

Challenges students faced in Stage 2

Although the technical wording students used was not the same as that found in Table 1, the meanings that they provided were very similar. Students recognised how those supporting the establishment and the status quo (functionalist theory) might criticise this kind of bottom-up drive for change through strike action. The opposite was also clear from the critical theory standpoint: players in some cases struggled to accept that their share of the profits can be radically different to that of the owners. By the end of these classroom activities, the students reported that although they were not very confident of their grasp of the basic theories presented, they felt that they had acquired a general understanding of how these lenses differed and how they could be used for conceptual analyses of sporting phenomenon.

Stage 3 (individual): Mix of explicit contextualized and non-contextualized instruction (SG+/-)

Description

Stage 3 was an individual task building on the collaborative work facilitated. Students first presented a paper to the class from a list of tutor-recommended titles selected as the reading curriculum for the course. Then, individually, they wrote a summary/reflection of the paper selected as part of an annotated bibliography. All of these readings comprised sections on theoretical frameworks and were from renowned academic journals in the field. The theoretical frameworks were generally related to the ones already studied but were more specific. For example, LJ focused on feminist theory and delved into this to examine other terms related to it, such as hegemonic masculinity (a set of male practices such as sport to maintain male domination) and emphasized femininity (ways of acting to demonstrate dominance to men). K used a functionalist and interactionist perspective to study a field of sport psychology, achievement motivation. Interactionist theory is a micro-level theoretical perspective in sociology. Its main focus is on how individuals construct reality through meaningful interaction (Carter & Fuller, 2015). During the reading of the papers for these annotations, students' knowledge of the theories and sub-theories tended to expand quite significantly.

The framework provided to students to help them to break down the papers for presentation and annotation comprised several elements. Students were asked to identify the *overall purpose framing the investigation*, in other words, how the paper was situated within the academic field. They were also asked to state what the *primary objective of the research* was, or how it aimed to extend or challenge the existing research in the academic field. In addition, students presented the theoretical framework used in the paper, the methodology of the research, the results and conclusion of the research and finally, any limitations to the paper that they might observe and how they might deal with that. An example draft annotation from LJ is provided below in Table 2. This is a template that could be used for multiple disciplines, particularly those from the social sciences.

Table 2

LJ's draft annotation of the journal article: Wheaton, B. & Tomlinson, A. (1998). The changing gender order in sport? The case of windsurfing subcultures. Journal of Sport & Social Issues, 22: 252-274.

Overall purpose framing the investigation

Wheaton and Tomlinson examine the persisting gendered basis of the windsurfing subculture and the tension between dominant masculinity and the potentially empowering dimensions of the activity for women.

Primary objective of the research

They contemplate whether the subculture of windsurfing can alter the patriarchal gender order, and contribute to women's emancipation.

Result of study

It is found that windsurfing women are both active agents in the transformation of culture but also determined by structures. This article supports Aitchison (2006) regarding the various femininities in sport.

Methodology

The authors conduct a three-phase ethnographic approach consisting of participant-observation phase, in-depth unstructured interviews, and a media research phase.

Theoretical framework

The article supports my research using the Hegemonic Masculinity and Critical Feminist Theory to discuss the potential of various uncommon femininities in sports that may diminish gender differences.

Limitation(s) to the paper and suggested means to deal with it/them

The limitation of this paper is that it addresses only one sport windsurfing; and I am doing a paper on bodybuilding. Hence, I am also using another paper on elite female bodybuilders to illustrate how these various femininities are also present in bodybuilding (Chare, 2004).

From the draft annotation of the paper, it is apparent that the student has been guided to identify both context-dependent and context-independent knowledge structures both in the paper that she annotates and in how it links to her own research. LJ brings up the concept of hegemonic masculinity and links this to the context, which is women who windsurf at an advanced level. In the section on the study's limitations, she links this to her own study on women bodybuilders. There is a building of understanding about theory and context, and how the two are working together at the research design level. It can also be observed from the annotation that there is a clear improvement in using abstract and concrete knowledge together at the micro level, compared to the first draft of her writing. Based on feedback from LJ, this improvement was due to the framework provided (Table 2). Assignment 1 comprised of five to six of these annotations, presenting a potential reading scope for a research paper.

Table 3

K's draft annotation of the journal article: Wallace, H. M., Baumeister, R.F., & Vohs, K. D. (2005). Audience support and choking under pressure: A home disadvantage? Journal of Sports Sciences, 23:4, 429-438.

Overall purpose framing the investigation

Wallace *et al* explore how performance pressure is constructed and how players can choke under high pressure in team sports, particularly football.

Primary objective of the research

Their objective is to analyse the causes for performance pressure. They point out how some individuals perceive that their performance is instrumental for the achievements of the team. If they perceive their performance to be below expected, these individuals might choke under pressure.

Result of study

It is found that choking under pressure occurs amongst individuals who can be said to have more of a leaning towards skill-based performance rather than effort-based performance. Effort can be controlled much more than skill on a given day. It is very difficult to master one's skill consciously.

Methodology

The authors conduct a literature review of academic papers from social psychology research and theory.

Theoretical framework

The framework from this research is grounded in social psychology, particularly the relationship between types of personality and dealing with pressure. I wish to discuss this by joining it to other research that argues how strikers in football tend to be skill-based performance oriented. If this is the case, this can lead to the potential of choking under pressure.

Limitation(s) to the paper and suggested means to deal with it/them

The limitation of this paper is that it addresses football in general and not particular players or team positions. Hence, I will find another paper on strikers in football to illustrate how players in this position are potentially more prone to choking.

From K's draft annotation of the paper in Table 3, it is also apparent that both context-dependent and context-independent knowledge structures are present. The theoretical grounding is related to an interactionist analysis of how a football player's personality can be linked to the ability to deal with pressure.

Challenges students faced in Stage 3

Primarily, at this stage, what was challenging for students was finding academic papers to fill the gaps that others left. The section "Limitation(s) to the paper and suggested means to deal with it" was therefore a very important element of this task. In LJ's case, this reveals how one paper by Chare (2004) presents female bodybuilders rather than windsurfers. The Wheaton and Tomlinson paper summarized and reviewed by LJ explores, in some detail, the geography of femininity so it can be used by the student as a more general, theoretical base. She then links this paper to the article by Chare (2004) as a more empirical context for her research. The student is therefore building the core readings for her paper by understanding the relationship between the context-dependent and context-independent knowledge here in this task. In this case, the context-independent knowledge is the theoretical content of the Wheaton and Tomlinson paper, while the context-dependent knowledge is the one from Chare (2004). In the same way, K states that he is trying to find a paper on strikers to develop the context-dependent content.

Following on from Stage 3, the students were required to transfer the frameworks to their own ideas for research projects and to submit these. The framework was slightly adjusted for the final section, which was entitled "Limitations and possible outcomes of the research".

Stage 4: Mix of explicit contextualized and non-contextualized instruction (SG+/-)

Description

Stage 4 required the students to write about how they might design a research project using a framework (to facilitate an interplay between weaker and stronger semantic gravity input). For Assignment 2, students were required to submit a research proposal of a potential field of inquiry that they might follow. As already noted, a very similar template as the one in Table 3 was used for this. Below are short extracts from LJ's draft proposal. The section on the purpose of the study stated the following:

The purpose of this research is to apply critical feminist theory to explore why female bodybuilders choose to embrace masculinity.

This draft proposal then went on to present more of the context of her paper:

The public tends to side-line [*sic*] female bodybuilding. Given its controversy, the sport has received little or no funding... Female bodybuilding reshuffles gender relations...and possesses the potential to improve the status of females.

After that, the draft for the research design was presented. The design included a focus on the data collection and data analysis processes. LJ stated that she wanted to:

Conduct a semi-structured interview with a female bodybuilder recruited through purposive sampling.

She would conduct a content analysis of the transcript data collected from the interview through a process of textual immersion to identify themes. Finally, in the section of the draft on limitations and possible outcomes, LJ stated that she hoped she could learn more about female bodybuilders and that, if published, her research could help to educate the public to “accept female bodybuilders as normal athletes”.

K's draft proposal was to explore how ego-oriented players were more prone to choking under pressure. He had found core theoretical papers for this purpose and had selected to link observational data to his research topic based on striker behaviour in high-stakes sporting circumstances.

Challenges students faced in Stage 4

Generally, the challenge for this task was making the transition from deconstructing academic papers in the field, as in the last section in which the annotations are presented, to actually constructing a research proposal for students' own research. Several students found it difficult to find a suitable theoretical framework to use as an analytical lens. However, students were able to describe the core position that they wished to use, for example, functionalist; critical; feminist. It was then necessary to guide them to select a framework related to these basic notions and to enable them to go beyond them. For example, K's theory is related to functionalist and interactionist perspectives as he wishes to understand how meanings can be made through communicative interaction between individuals in society; additionally, he sought to improve understanding of these psychological factors within the status quo. He did not wish to invoke a significant change to the status quo. The fact that students were able to align with these more general frameworks at Stage 4 demonstrates the effectiveness of Stages 2 and 3. In fact, students had acquired the ability to

theorise at an abstract level using general frameworks, and this allowed them to look in closer detail at more specific channels related to these macro-structures.

Once their draft proposals at Stage 4 had been reviewed and the drafts had been rewritten into finalised versions, the students conducted their research. This occurred over a period of approximately two weeks. Individual consultations took place during this period to discuss the results obtained. These conversations were about how the results related to the inquiry of the research, and the general theoretical discussion of the students' papers. Then, students set about writing up their research in draft form. As already noted, to help them with their academic writing, students were also shown how to perform gravity waving at the micro level. This was Stage 5 of the instructional model.

Stage 5: Mix of explicit contextualized and non-contextualized instruction (SG+/-)

Description

Stage 5 required students to present how they used the framework to analyze the data collected. This is represented in the actual research paper that they submit (interplay between weaker and stronger semantic gravity input). The data shown here is from the drafts written by the same students, LJ and K, to present Stage 5 of the instructional model. As already noted, the movements from more or less context-dependent knowledge occurred at both the macro and micro levels. This represents an understanding of semantic gravity and a grasp of how these meanings interrelate. This section demonstrates how gravity waving at the micro level depicts effective critical thinking. It also guides students to produce cohesive academic writing.

Students were first shown an extract and given an explanation of how it demonstrated shifts from *weaker* to *stronger semantic gravity*. They were also shown how this could be used to plan and write an effective paragraph. They then critically analyzed another paragraph in groups and plotted the gravity waves themselves. Once the concepts had been understood, students wrote their own draft paragraphs for their own research applying a conceptual framework. LJ submitted the following draft as what might be a potential part of an introduction to her paper:

Durkheim (1933) suggests that deviance exists because actions from those outside the norm "shock the collective conscience" (p. 38). In the case of female bodybuilders, pursuing their sport is seen as challenging the social distinction between masculinity and femininity. It is taken as a blatant attempt to defy the traditional notion of the female body (Aitchison,

2006). Unfortunately, female bodybuilders are often met with disapproval. From stares from fellow gym users to insensitive comments, female bodybuilders suffer from forms of opposition. Linda agreed wholeheartedly when I brought this up. "People talk about female athletes and they expect track stars and netballers," she said. Chare (2004) labels the resistance of female bodybuilders against this cultural norm as the "radical politics of muscle". The female bodybuilder's physique strongly opposes the traditional female body and representation of femininity.

Using Maton's (2013) work as a model, it can be observed that 'deviance and collective conscience' help to explain the phenomenon of the 'female bodybuilder' and how this may 'shock'. Deviance is a collective term and can relate to gender but also criminality, disability and other very broad-based fields of study. It is therefore the most abstract notion with the weakest semantic gravity. The student then explains why this 'shock' occurs. During this section, there is a movement from more to less context-dependent meanings forming a wave. From the more generic gender-related terms 'masculinity and femininity', the writing goes on to contextualize femininity with regard to its physical representation, a generic term, the 'female body'. As femininity can relate to more than physical appearance, it is weaker in semantic gravity. After that, the subject becomes more context-dependent. There is a focus on 'female bodybuilders' and the reactions or 'shock' that they elicit as gender outlaws followed by the most context-dependent information, the student's own empirical source or research case study. This is a female bodybuilder with the pseudonym Linda, and data is provided. This clearly has the strongest semantic gravity. The gravity wave then ascends again to refer to the same notions brought up at the beginning of this extract and to return to the relatively abstract context-independent term 'femininity'.

This kind of written text analysis demonstrates the effectiveness of gravity waving as a guide for an instructional model developed to identify and promote these shifts from context-independent to dependent knowledge structures. The student has developed her understanding of the importance of knowledge practice making *semantic waves*: moving from theoretical abstract to empirical concrete meanings. The student does this by manipulating generic notions related to gender identity in order to move between levels of abstraction and to guide the reader through their thematic connections. She descends in the wave towards *stronger semantic gravity* to define and exemplify at the most concrete level using her own empirical research. Finally, the subject of her writing moves up towards *weaker semantic gravity* and thus towards finishing a *gravity wave* by referring again to the generic notion of femininity. To sum up, and in line with Szenes, Tilakaratna, and Maton's (2015) samples, this

extract can be deemed as effective critical thinking. It also represents a sound cohesive structure with sound knowledge of lexical relations.

The following paragraph is an extract from K's introduction after completion of Stage 5:

Ironically, ego-oriented players' efforts to succeed could result in failure. This is because, in response to supporters' demands, these athletes feel a constant need to prove themselves (Wallace *et al.*, 2007). In football, strikers who constantly demand their teammates for the ball are frustrating if they regularly lose it or often miss opportunities. For example, fans were unsatisfied with Real Madrid's Gareth Bale who was unable to score for several games (Telegraph Sport, 2015). This made Bale work harder but he missed multiple good opportunities (Collins, Bleacher Report, 2015). His action prompted fans to label him as selfish (ibid, 2015). Therefore, pressure from fans can affect an athlete's ego orientation causing him to either underperform or behave selfishly on the pitch (Wallace *et al.*, 2007). This results in poor performance from individuals and teams, and can further increase frustration and pressure from the supporters (Wallace *et al.*, 2007). This may create a cycle of underperforming.

It is clear that this extract is quite different from the first one from K. We can analyse it using gravity waving as a guide. This can help us to observe how the awareness of knowledge structures is manifested, and how the interplay between these structures represents effective critical thinking and cohesive writing. First of all, the more context-independent, theoretical content has greatly increased in significance; secondly, the context dependent knowledge is more gradually developed; thirdly, a wave is created as the student relates ego-oriented players to pressure and increased frustration. Additionally, the language is much more technical or field-specific: ego-orientation; and cycle of underperforming. This is, again, because of a greater focus on context-independent knowledge.

In this example, there is a correlation between ego-orientation, effort and poor performance. These notions are claimed, in the literature, to be generalizable concepts based on extensive research results in the field of sport psychology. The relationship between these concepts forms the weakest point of *semantic gravity*. Next, there is gradual exemplification, strong contextualized knowledge, introduced hierarchically: athletes; football; striker; then Gareth Bale. After this, there is a move back to less context-

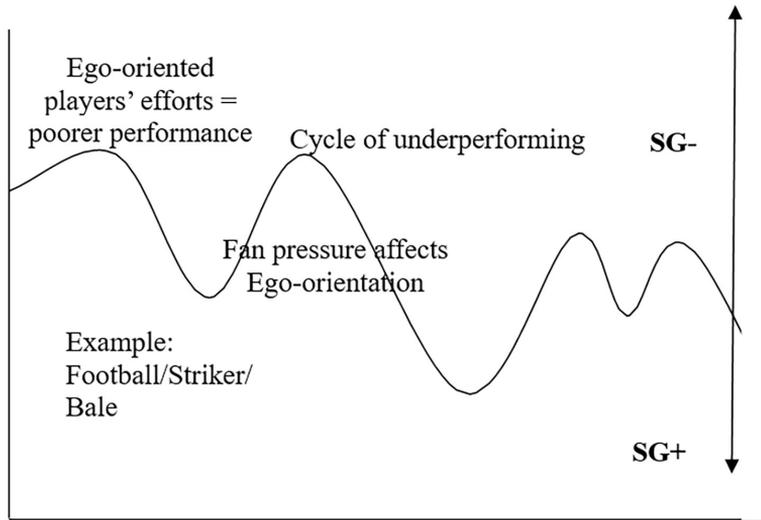


Figure 3. Analysis of K's writing at Stage 5.

specific knowledge (fan pressure & ego-oriented players); then finally, to a more generalizable concept: poor performance increases frustration, which in turn increases fan pressure. So this is a self-perpetuating cyclical process and this cycle acts as the theoretical underpinnings of the student's paper. Again, it is clear how gravity waving of this nature is connected to effective critical thinking and also sound cohesive academic writing.

Challenges students faced

As reported by several students, it was often a challenge to perceive and then present the hierarchies in the knowledge structures studied. For example, in LJ's extract, it is relatively easy to decide which conceptual information is more context-independent as *femininity* is deconstructed in her paragraph. However, in K's extract, it is more problematic judging whether *ego-oriented players' efforts may lead to poorer performance* is more context-independent than the *cycle* that is created based on *fan pressure*. To deal with K's concerns, and those of other students, it was highlighted that it was not essential to be able to make exact comparisons through measured means. Rather, it was important to demonstrate a good grasp of the tendencies of these knowledge structures to be more or less context-dependent, and to be able to create *gravity waves*. Therefore, whether *ego-oriented players' efforts leading to poorer performance* is more context-independent than the *cycle* offered at the end of the paragraph is not important as long as these are presented logically with a grasp of the general gravity waving process; and in relation to the more context-dependent meanings. It is believed that K's later work based on this instructional pedagogy demonstrates that this awareness was helping him to develop his critical thinking ability as well as his academic writing.

Pedagogical potential of the research

As noted at the beginning of this paper, this research seeks to discuss how critical thinking can present 'demonstrable outcomes' (Lloyd & Bahr, 2010, p. 2). As Maton (2014b) posits, mastery of semantic waving represents 'powerful knowledge' (p. 181). Indeed, he (ibid) argues that these shifts in meaning are 'rewarded across subject areas and levels of education' (p. 188). A burgeoning range of research studies are supporting this view and as Maton (2014b) points out, the research is beginning to:

Illustrate the capacity of the concepts to underpin research and praxis and how they are revealing the contours of 'powerful' intellectual, curricular and pedagogic practices (p. 193).

The strategy of facilitating shifts from more or less context-dependent knowledge has great capacity for educational practice. Knowledge of gravity waving can inform educators about how to approach their syllabus design and delivery. It can, as Georgiou (2014) has argued, enable educators to be aware that they are venturing too high on the gravity continuum and perhaps challenging their students too much; or in contrast, they are pitching their content too low and are not challenging them enough. In the same way, knowledge of gravity waving can help to provide a gauge to analyse the point of entry and exit for knowledge practices in subjects. It might also be utilized for analysing if a subject tends to present 'upshifts, where theorizing is foregrounded, or downshifts, where applications in practice are central' (Shay & Steyn, 2014 cited in Maton, 2014b, p. 195). This knowledge of gravity waving has many potential benefits to educational practitioners and the SoTL community. The instructional model presented in this paper is one such application of scaffolding gravity waving to help students learn, think critically, and write academically.

CONCLUSION

The purpose of the paper has been to present action research from a specific module but it is hoped that the rationale and the impact of the set of strategies can inform other educationalists. The instructional model to facilitate gravity waving demonstrates how these shifts in knowledge practices relate to critical thinking and cohesive academic writing. This project is based on relatively new ideas, in the form of gravity waving, from Semantics, a dimension of LCT. It is hoped that the notion that gravity waving is important for our students has been conveyed. It has been presented that waving can represent effective critical thinking informing research project development and academic writing. It is also hoped that it has been presented as a very useful strategy for educators across the disciplines to guide syllabus design and delivery. As Szenes, Tilakaratna, and Maton (2015, p. 573) have noted, gravity waving can be seen as a generic attribute of knowledge across curricula. The concept can therefore inform our educational practices in multiple disciplines.

While the traditional framework of writing based on IMR&D is meant to be useful, students often fail to write a well-thought out paper. For instance, students may not refer to the literature/known theories, or they may simply list out theories without actually applying them to the context. This may be depicted by low or high flat lines in gravity waving respectively. The instructional model employed in this study addresses these limitations. The concept of gravity waving and the instructional model used in this study gets students to (1) identify relevant theories, (2) relate theories to context, (3) analyse relevant articles, (4) apply theories and research methods to chosen context and subsequently, (5) write a paper based on contextualized, relevant theories using gravity waving. This allows students to be able to write a quality, critically analysed paper in a step-by-step manner. Indeed, the instructional model was appreciated by students in this study. At the end of each, students were asked: "Was learning about gravity waving useful? Why?" All respondents said that it was. The qualitative responses included the following:

- "It made me more aware of what I was lacking in my use of theory."
- "It showed me exactly how to plan and write a paper."
- "It helped my writing as compared to previous comments that simply said: "you need to have a good command of English to write well.""
- "It gave me a very visual representation of how to think and write well."
- "It showed me how to write a cohesive paragraph."

It is interesting to note how students were able to understand gravity waving and connect the thinking, research design and writing processes using this conceptual framework. There was clearly a significant learning outcome for

the students. From my point of view as a course coordinator and educator, gravity waving has become a pedagogic code and a dominant organizing principle of my practices.

One possible explanation for the successful implementation could be that gravity waving was introduced in this study implicitly first, before making it explicit. That is, an inductive approach was used to introduce gravity waving. For instance, Stages 1 to 4 in the instructional model carefully guided students in contextualizing relevant theories and research methods. This was done before the explicit introduction of gravity waving in Stage 5. This careful, step-by-step introduction of abstract theories and contextualization, before a primer on gravity waving, could have helped students grasp the difference between theories, context, and the interrelationship between context and theories, which is necessary for understanding the concept of gravity waving. This is in contrast to starting with a lecture on gravity waving and asking students to apply gravity waving to writing, in which case, students may not have been that successful. It is likely that while gravity waving could be important for critical thinking and academic writing, the application of gravity waving in a suitable instructional model is also important.

Future research in this field might investigate if lecturers and students find awareness of gravity waving useful in their own disciplinary practices. If they perceive this to be so, in what ways is this manifested? What instructional models would they apply in their disciplines? Also, is effective cohesive writing depicted in the same way as it has been demonstrated in this module? These are perhaps interesting ways forward for this developing field.

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APPENDIX 1

Begin your paragraph with general academic content/context-independent knowledge. This normally introduces the abstract, conceptual content. It introduces the main idea/point that you intend to develop. For example, *research on ego-oriented players demonstrates that their efforts to succeed could ironically result in failure....*

After the above, there is the first unpacking of the more general point/context-independent knowledge. This begins to make the idea more context-dependent. This part might elaborate on the concept to specify it further or it might answer the question: why is this so? Or how is this so? For example, *this is because pressure leads to conscious control, which can result in a decrease in ability.*

After the above, there is further development of the context-independent idea. To do this, there is exemplification and more context-dependent knowledge. This exemplification usually simultaneously qualifies the content so far presented. For example, *in football, striker Gareth Bale might be described as having an ego orientation causing him to choke and underperform.*

Finally, a rounding up occurs. This is done by emphasizing how the context-dependent knowledge relates to the context-independent concepts brought up in the first section. At this stage, more conceptual content might be added to help to complete the entire message of the paragraph e.g. *choking under pressure and underperforming leads to more fan pressure and a vicious cycle is created.*

The whole can be summed up in this way:

1. Topic/ first sentence(s) present controlling idea at abstract/conceptual level. Abstract general nouns for general reference are common. For example, *knowledge/research/information/the importance of/the quality of/progress in.../; the idea that...*
2. The controlling idea is developed. This might involve describing further; or comparing and contrasting concepts. It will probably entail citing supporting evidence. It might also entail challenging or questioning information or perspectives relating to the controlling idea. Deictics such as *this, these, one such...; synonyms (research—one recent study) or hyponymys (e.g., athletes—football players);* are also commonly used for this development.
3. Next, there are degrees of exemplification. Terms such as *for example* or *the findings demonstrate* are common to illustrate the controlling idea.
4. Finally, the rounding off or concluding sentence normally summarises points made using abstract general nouns as synonyms to those already used. There is normally use of linking words such as *therefore; consequently; in sum*. This helps to draw together the points made about the controlling idea. ■