



An analysis of how students construct knowledge in a course with a hierarchical knowledge structure

L Peta Myers

To cite this article: L Peta Myers (2017) An analysis of how students construct knowledge in a course with a hierarchical knowledge structure, South African Journal of Accounting Research, 31:3, 193-211, DOI: [10.1080/10291954.2016.1196528](https://doi.org/10.1080/10291954.2016.1196528)

To link to this article: <https://doi.org/10.1080/10291954.2016.1196528>



Published online: 25 Jul 2016.



Submit your article to this journal [↗](#)



Article views: 250



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 1 View citing articles [↗](#)

An analysis of how students construct knowledge in a course with a hierarchical knowledge structure

L Peta Myers* 

Department of Accounting, Rhodes University, Grahamstown, South Africa

(Received 18 November 2015; accepted 27 May 2016)

Passing the introductory accounting semester is often seen as a challenge for first year students. Being aware of both effective and ineffective ways of constructing knowledge in a discipline with a hierarchical knowledge structure will be of value to students and teachers alike in assisting in the development of effective styles of learning. This article, which is part of a larger body of research, analyses how students in an introductory financial accounting class at Rhodes University constructed knowledge. Previous research described the course as having a hierarchical knowledge structure.

In this research, first year accounting students at Rhodes University were interviewed to gain an improved understanding of how they constructed knowledge in this course. This article describes how students who were successful in passing this semester course used similar, effective ways of constructing knowledge, while students who were not successful also employed similar but less effective ways of constructing knowledge. These different ways of constructing knowledge, both effective and ineffective, were analysed, using the Bernstein's pedagogic device and Maton's Legitimation Code Theory.

This article provides those involved in teaching and learning in a discipline with a hierarchical knowledge structure, with a theoretical explanation of why some methods of constructing knowledge are more effective than others. Understanding and being explicit about more (and less) effective ways of constructing knowledge in a course with a hierarchical knowledge structure can guide those involved in teaching and learning to improve results.

Keywords: Accounting education; introductory accounting; constructing knowledge; pedagogic device; Legitimation Code Theory

Introduction

Studying in a discipline with a hierarchical knowledge structure can be a troublesome journey for a student. A discipline with a hierarchical knowledge structure has a 'conceptual spine' (Hoadley & Muller, 2009) which forms the basis for all concepts. The discipline is 'theory-integrating' (Muller, 2009) as existing knowledge is subsumed by new knowledge. Bernstein (2000) contrasts this with a horizontal knowledge structure, more commonly found in the humanities, where new knowledge is 'theory-proliferating' (Muller, 2009) and more likely to create a new theory.

*Email: L.Myers@ru.ac.za

Myers (2016) has shown that introductory financial accounting has a hierarchical knowledge structure and that this impacts on the teaching and learning activities planned in the course. For a student to be successful in introductory accounting, given the structure of knowledge in the discipline, requires a particular focus when constructing knowledge.

This article is drawn from a larger study which looked at both the structure of knowledge in the discipline, and how students construct knowledge in the discipline (Myers, 2014). In this article the emphasis shifts from describing the structure of knowledge in an introductory accounting course, and the implications this has for teaching and learning in the course, to an analysis of how particular groups of students in this semester course constructed knowledge, and whether this was done effectively or not. Having an understanding of both useful and problematic styles of learning within the discipline can enable teachers to guide students in making informed decisions about how best to use formal contact time and self-study time.

An overview is first provided of the context within which this research was conducted. This is followed by a review of existing literature relevant to this field, after which the methodology employed when conducting this research is discussed. With this background, the article moves on to analysing the findings of the research and finally discussing the conclusions reached.

Context

This research was conducted at a research-intensive (Boughey, 2009), residential university. The class size for this first-year, first-semester introductory accounting course is normally around 400 students. At this institution, students are not divided into Chartered Accounting and General Accounting streams during the first semester of the first year. The first streaming takes place in the second semester of the first year when students elect to register either for an Accounting 1 credit which permits entry into Accounting 2, or for a non-continuing Accounting 1 credit.

According to the South African Qualifications Authority (SAQA), approximately 150 notional hours should be spent developing proficiency in this first semester NQF5 introductory level course. The course outline provided to students for the course suggests that half of these notional hours should be spent in structured lectures and tutorials, while the other half should be spent in self-study, reinforcing the concepts which have been presented in lectures. This self-study takes place through pre- and post-lecture reading, the completion of assignments and in preparation for tests, all of which provide students with formative feedback which should guide them in improving any future submission. Self-study also takes place when preparing for the final, summative assessment in the form of the end of semester examination.

This paper looks at how students in this discipline constructed knowledge during lectures, tutorials and self-study periods, as well as at how they approached the construction of solutions or 'legitimate text' (Bernstein, 2000) required for assignment and tutorial exercises.

The next section first looks at existing research into accounting education in general and then moves on to the various theoretical concepts which were used to understand the phenomena being investigated.

Literature review and theoretical framework

Basil Bernstein's pedagogic device (Bernstein, 2000) was used as a theoretical lens to analyse the interview data on which this research draws. The pedagogic device describes

each of the three fields of knowledge, namely: knowledge production, knowledge recontextualisation and knowledge reproduction (in the form of classroom knowledge). Some of Bernstein's work has been further analysed and developed by Maton (2000) in his Legitimation Code Theory (LCT). Two dimension of Maton's (2000) LCT are specialisation and semantics. Specialisation looks at both what is valued in a discipline and the knowledge of the teacher or student or at the disposition, characteristics or experiences of the teacher or student (Maton, 2010). Semantics, on the other hand, looks at semantic gravity (how abstract the concept is) and semantic density (how much information is contained in a word, a term or a symbol) (Maton, 2011). The analysis of the interview data in this study was supported by the use of these dimensions of Specialisation and Semantics.

Lubbe (2013, 2014) used the pedagogic device to describe and explain the varied demands on accounting academics. The pedagogic device together with LCT was used by Mkhize (2015) to examine knowledge and knower structures in the Certificate of the Theory of Accounting professional accounting programme in South Africa. LCT has been used to examine aspects of teaching in chemistry (Blackie, 2014) and student and student perceptions towards music (Lamont & Maton, 2010), on-line teaching (Chen, Maton, & Bennett, 2011) amongst other topics. However, to the best of the author's knowledge, no other research exists which uses LCT and the pedagogic device to examine teaching and learning within an introductory accounting programme.

Existing literature within introductory financial accounting (Accounting 101) has dealt primarily with 'relations to knowledge' (Maton, 2007, p. 87; emphasis in original). This has to do with how a student's age, gender, race or prior learning impacts on the student's ability to succeed in the discipline. This information has traditionally been used as predictors for success or to identify students at risk of failing.

The research being discussed in this article has a focus of 'relations within knowledge' (Maton, 2007, p. 87) [emphasis in original]. Here the focus is on factors relating to the nature of knowledge within a discipline and the impact this has on the teaching and learning activities which are required within the discipline. According to Muller, avoiding examining knowledge structures 'lies at the heart of many current pedagogical dilemmas' (2006, p. 26). Examining the structure of knowledge in a discipline with a hierarchical knowledge structure reveals implications for how teachers should teach and how students should learn within the discipline (Myers, 2016).

The central concern of this study is how students constructed knowledge in an introductory accounting course which has a hierarchical knowledge structure. While a hierarchical knowledge structure is theorised in greater detail later on in the paper, it is commonly understood as 'one concept builds on another'. As would be expected, some students constructed knowledge effectively, while others constructed knowledge less effectively. This article uses the pedagogic device and LCT to theorise why the construction of knowledge was effective for some students and not effective for others.

Bernstein's pedagogic device and Maton's Legitimation Code Theory allowed the focus of this research to shift from predicting or analysing students' success or risk profiles (based on demographics and previous academic achievements) to analysing the structure of knowledge in the discipline and what this means for teaching and learning in the discipline.

The Pedagogic Device and Legitimation Code Theory

Bernstein's pedagogic device is a tool which provides us with the rules and criteria that permit 'macro and micro structuring of knowledge' (Singh, 2002, p. 571). It is through the pedagogic device that we are able to describe how knowledge is converted into

classroom practice. In the pedagogic device there are three fields that order the three areas of pedagogy: the field of production, where knowledge is created (generally at higher education institutions and research organisations) and where decisions are made about how the knowledge is to be distributed; the field of recontextualisation where agents (educational departments, researchers, authors and teachers) convert the knowledge into curricula and textbooks; and the field of reproduction, where this knowledge is converted into classroom practice and is acquired by students (Bernstein, 2000).

These three fields are hierarchically ordered, with the field of production controlling and limiting what is available for recontextualisation and the field of recontextualisation controlling and limiting what is available within the field of reproduction. These controls are based on the concepts of classification and framing, more easily understood as power (the strength of the boundaries between disciplines) and control (who influences what within these boundaries) which vary from discipline to discipline and context to context (Bernstein, 2000). A discipline like History, for instance, has boundaries that are more permeable, as 'truth' within the discipline could be contested, whereas in a discipline like accounting, where the 'truth' and its distribution are tightly controlled by the International Accounting Standards Board (IASB),¹ these boundaries are fairly rigid.

It is within the field of production, the discipline's 'worthwhile store of knowledge' (Maton & Muller, 2007, p. 18), that knowledge structures can be analysed and a determination made regarding their degree of verticality, i.e. whether the knowledge structure is more hierarchical or horizontal in nature. An earlier article, which was focused on the field of production, demonstrated that in the discipline of accounting, at the introductory level, knowledge structures are hierarchical, with a high degree of verticality (Myers, 2016). The implications of this for teaching and learning in the discipline will be explained in greater detail in the next section.

In Maton's Legitimation Code Theory, Bernstein's theories of education are further examined and elaborated. This article makes use of Maton's LCT dimensions of Specialisation and Semantics. Specialisation has to do with what is valued in the discipline, knowledge of the discipline, or the disposition, character or experience of the individual engaging with the discipline, whether teacher or student. If knowledge of the discipline is what is valued, this is termed a knowledge code field. If the experience or characteristics of the individual is what is valued, this is a knower code field (Maton, 2000, 2007, 2010).

Semantics on the other hand deals with semantic gravity and semantic density. Semantic gravity, which was used in this study, has to do with 'the degree to which meaning relates to its context' (Maton, 2011, pp. 65–66). Abstract concepts have a weaker semantic gravity, whereas making a scenario more context dependent increases the semantic gravity. For example, when introducing a new module, an accounting teacher may start with the theory behind the topic, which is likely to be abstract. Working through an example, or a demonstration of the theory being applied, will strengthen the semantic gravity and therefore increase the context-dependence of the classroom interaction. It would be when working on a company's financial statements in an office, perusing invoices and other documents, and seeing goods entering or leaving the premises, that semantic gravity will be at its strongest. Semantic density on the other hand has to do with how much meaning is contained in a word or a symbol (Maton, 2011). To the man in the street, the word 'depreciation' would commonly be understood to be a loss in the value of an asset. This could be an example of weak semantic density. 'Depreciation' to an accounting student, would however be an example of strong semantic density, there is a great deal of meaning contained in one word. The student would understand that this is the allocation of the depreciable amount of an asset over its useful life. However, each of the terms 'depreciable amount', 'asset' (does

it meet the definition and recognition criteria?) and ‘useful life’ would in themselves need to be understood.

How the pedagogic device and LCT impact on teaching and learning in introductory financial accounting

Using the pedagogic device and LCT, Myers (2016) showed how financial accounting, at the introductory level, has a hierarchical knowledge structure. A hierarchical knowledge structure implies that the discipline has a ‘conceptual spine’ (Hoadley & Muller, 2009) and is ‘theory-integrating’ (Muller, 2009). According to Myers (2016), what this means for teaching and learning in introductory accounting is:

- ‘There is one truth in introductory accounting’. Teachers are looking for the one ‘correct’ solution to a problem, and not a student’s personal interpretation of the question.² Financial accounting is therefore a knowledge code field. In a knowledge code field, what is valued is knowledge of the discipline and not the experiences or disposition of the teacher or the student (Maton, 2007).
- ‘Students need to obtain mastery over the “procedures of investigation”’³. In producing the one ‘truth’ (Bernstein, 1999), students need to understand the theory on which the accounting principles are based and should be able to apply these principles correctly in changing situations. In practising and gaining expertise in these changing scenarios, students gain the expertise required to understand a question and produce the correct solution required. In developing mastery over the procedures of investigation, students would:
 - Have acquired ‘recognition’ and ‘realisation’ rules (Bernstein, 2000). In acquiring recognition rules, students would be able to identify which of the information in a given question is relevant to the question; while in acquiring realisation rules, students would know how to provide this information in the ‘legitimate text’ (Bernstein, 2000) or correct format required.⁴
 - Be able to access ‘low-road transfer’ (Salomon & Perkins, 1989, p. 118), where applicable. Salomon and Perkins state that in order to access low-road transfer what is essential is that there has been ‘varied practice’ and there is ‘automatic triggering’ (1989, p. 120) of these practised skills. In accessing low road transfer, these tasks are automated and do not require significant contemplation, which frees up thought processes for more cognitively demanding aspects of the question.
 - In developing mastery over the procedures of investigation, students develop a ‘trained gaze’⁵ (Maton, 2011, p. 77). This gaze is generated by expertise in the procedures and guides students’ understanding of which of the information provided is relevant to the question, and how to proceed to answer the question.

Having examined the theories which frame this research, this article now looks at how students were selected for participation in the study, how the interviews were conducted and how the data was analysed.

Methodology

All students registered for Accounting 101 in the year in which this research was conducted, were invited to participate in this study through completion of an online questionnaire. From the 121 responses received, and from the 66 students who volunteered to participate

in further research, 15 participants were purposefully selected to participate in the interview stage. Purposeful selection was used to ensure that there was even distribution according to, firstly, the three predetermined levels of academic performance in the June examinations, secondly, race and, thirdly, gender. Purposeful selection was used as it 'facilitates comparison' (Wengraf, 2001, p. 102) and to identify 'variations rather than to identify a common theme' (Patton, 2002, p. 240). This suited the researcher's intention, which was to identify and compare differences between how participants constructed knowledge within the three groupings of academic performance, race and gender.

Five students were selected from each of the academic groups of less successful (did not pass the semester), moderately successful (had passed with overall marks of between 50% and 69%) and very successful (had obtained a final mark of 70% or higher). This was the first grouping of research participants and within each of these, the researcher ensured that there was a fair distribution of participants in terms of race and gender.

The semi-structured interviews took place during the third term of the year. All participants were asked the same interview questions which were framed in terms of the research question, which was: How do students construct knowledge in an introductory accounting course? As the larger research project covered additional aspects, only those interview questions relevant to this article (numbered 1 to 3 below) are discussed here.

1. What does 'being successful' in introductory accounting mean to you?
2. When you are faced with a new concept in accounting, how do you make sense of the topic? How do you identify the main factors in the topic? Are there any other techniques you use to help you better understand accounting?
3. When you are given an accounting question, how do you go about answering the question? Why do you use this method?

Question 1 was asked primarily to get students to relax and to talk about themselves in relation to the discipline. Although this was not the original goal, it provided insight into how students viewed the discipline which, in some cases, revealed a clash between the student's academic engagement with the discipline and what is required for success in the discipline.

Question 2 was asked to understand how students constructed knowledge in the discipline; and whether or not they understood that the foundation of financial accounting is based on debits and credits, the double entry system and the accounting equation. Responses to this question also revealed whether students used learning aids, like mnemonics, in trying to understand new topics in the discipline.

The aim of question 3 was to understand how students approached the construction of a solution to an accounting question. This allowed the researcher to determine whether or not the students were aware of the 'procedures of investigation' to be followed; to identify whether or not they understood that some processes needed to become automated, i.e. whether they were accessing 'low-road transfer'; and, finally, whether or not they were developing an expert eye or 'trained gaze' when reading questions.⁶

Prior to the commencement of each interview, consent was obtained from the participants. In the consent form, participants agreed to their participation in the research and to the researcher accessing their June examination script and other academic information relevant to the discipline, for the year of the research. Each interview took approximately one hour, depending on how much information the participant wished to share and how much probing was required from the researcher. The researcher personally transcribed

each electronically recorded interview and the transcripts of each interview were sent to the participant within a couple of days of the actual interview for member checking.

Using thematic analysis, the various theoretical themes were grouped and analysed. The participants' responses were initially grouped according to the academic group into which they had been divided and the various similarities and differences were noted. The same was done within the groupings of race and gender.

Differences in how students constructed knowledge were noted between participants within the three different academic groups, while no significant differences were noted between the groupings of race and gender. It is therefore the differences between and similarities within these groupings of less, moderately and very successful academically that form the focus of this article.

As social research takes place in an open environment with limited controls, it is necessary to consider issues of validity and reliability of the data, as well as the potential for bias.

Validity, reliability and bias

In considering validity what is important is determining whether the research investigates what it intends to investigate (Hammersley, 1992). This portion of the research was planned to provide an improved understanding of how introductory financial accounting students constructed knowledge in the discipline. Given that the interview questions were structured around the research questions being asked, and that analysing the data obtained during the interviews allowed the research questions to be answered, this research should be deemed to be valid.

Reliability of the research has to do with being able to replicate the results in a similar study (Golafshani, 2003). Given that social research is conducted in an open system and it cannot be completely controlled (Danermark, Ekstrom, Jakobsen, & Karlsson, 2002) it is possible that another researcher may conduct similar research and obtain different results. Qualitative research will seldom make a claim of being generally applicable. It can only speak about what was revealed within a particular piece of research, given these particular circumstances.

Issues of bias were also considered when conducting this research. Bias can appear in different forms and can impact on both the validity and the reliability of the data obtained from the research. The following types of bias were considered possible in this research:

- Selection bias (Collier & Mahoney, 1996), where certain students are more likely to want to participate in a research project. Given the large number of students who volunteered to be part of the research and given that there was purposeful selection from that pool, selection bias should not be a threat to the validity and reliability of this research;
- Response bias (Furnham, 1986), where a participant in the research provides a response they believe to be 'correct'. As this research was an investigation into the way students constructed knowledge, there were no correct or incorrect responses, and response bias should not be a threat to the reliability of this research; and
- Researcher bias (Bailar, Bailey, & Stevens, 1977), which occurs where the researcher has formed an opinion about a participant prior to the interview. As this aspect was something the researcher was aware of prior to the interviews, every effort was made to avoid leading participants during interviews and to ensure that participants' responses were not anticipated prior to the interviews. Researcher bias should therefore not be a threat to the reliability of this research.

The interview questions were semi-structured. Asking semi-structured questions means that the same primary questions were posed to all participants. Constructing interview questions in this manner allows for the comparison of responses and would additionally have acted to minimise the impact of any possible bias.

Having discussed how the interview data was obtained, sorted and analysed, as well as the validity and reliability of the research, the next step is to discuss the findings of this research.

How participants constructed knowledge in an introductory accounting course

The focus of this article is on how the research participants constructed knowledge in an introductory accounting course. The article builds on a previous article which examined the structure of knowledge in introductory accounting and the implications this has for teaching and learning in the discipline; these implications were covered earlier in this article. This article now moves to examining how these participants constructed knowledge in this course: how they acquired knowledge (learned and revised) and how they constructed the ‘legitimate texts’ (solutions) in the June examination.

While the research method permitted the contrasting of findings between male and female as well as between black and white participants, there were no significant differences in responses between these groups and so there is no discussion around these groupings. The most significant differences in participants’ responses emerged among the three academic groupings of less successful, moderately successful and very successful. As a result, these groupings are used as the basis for analysing the findings.

To provide consistency and structure for the participants’ responses, these have been grouped in the same order as the earlier section on ‘How the pedagogic device and LCTs impact on teaching and learning in introductory financial accounting’. This section provides a guideline for how students need to construct knowledge in financial accounting, given the hierarchical nature of knowledge in the discipline.

Point 1. To construct knowledge in introductory financial accounting students need to recognise that there is one ‘truth’, or one correct solution. This means that this is a knowledge code field where knowledge of the discipline is valued and not the lecturer’s or the student’s personal interpretation of the ‘truth’.

Point 2. To construct this one truth, students need to obtain mastery over the procedures of investigation. This is achieved by:

- Understanding the theory and acquiring recognition and realisation rules, which will allow students to ‘recognise’ what information is relevant in a given question and to ‘realise’ this in the correct format required.
- Working through and becoming skilled in answering many and varied examples will allow students to access low-road transfer which will automate some aspects when constructing the solution and will allow students to focus on more cognitively demanding aspects of the question.

Point 3. Having obtained mastery over the procedures of investigation, students are likely to have developed a trained gaze. When reading through a scenario, a trained gaze allows students to draw on knowledge of the theory and expertise gained from having practised varied examples, to identify what is relevant and be able to put this together in the correct format required.

In the discussions that follow, the participants are referred to by their participant number, which indicates the academic groups to which they were allocated:

- P1 to P5 – less successful group (obtained less than 50% in the final semester mark);
- P6 to P10 – moderately successful group (50%–69%); and
- P11 to P15 – very successful group (70% and above).

It should be noted that participants were ranked from the range of least successful to most successful, with participant number 1 being the lowest achiever academically in the group and participant number 15 the highest achiever academically. The quotations which are provided are typical of the responses from most students within each group, unless otherwise stated.

The one ‘truth’ in introductory accounting

In a discipline with a hierarchical knowledge structure, ‘what is important is mastering the procedures of investigation ... and understanding the theory ... the only and sole pathway to “truth”’ (Bernstein, 1999, p. 165). Students in the discipline need to understand that in accounting questions this one ‘truth’ is being sought and not a personal interpretation of this truth.

Participants were not asked questions relating directly to introductory accounting being a knowledge or knower code field. However, their responses to the question of ‘success’ in accounting as well as to other questions provided some insight into how they view the discipline.

Less successful students

P4 felt that if he had had a teacher who understood how he thought ‘things should be done’ then he would understand the subject. In so saying, P4 revealed his belief that he could engage with the discipline as a knower code field, that it was his personal understanding which should be valued. P4 continued by saying that he felt frustrated as he had not been allowed ‘any degree of creativity, especially in terms of questions and how I should answer questions’. This reveals P4’s frustration at not being able to provide a personal interpretation of his knowledge in the discipline, to engage with accounting as if it were a knower code field. P4 was exhibiting a ‘code clash’ (Freebody, Maton, & Martin, 2008, p. 194) where what he wanted to invest in the discipline conflicts with what is required by the discipline.

Moderately successful students

P8 in discussing how he made sense of new knowledge, said ‘it all makes sense, the debit side will always equal the credit side, and when there’s a transaction there, the same thing happens on this side, no matter what’ and, according to P10 ‘if you do this, [then] this is what you do’.

In speaking about the rules in accounting and the one way that a question should be approached and a solution constructed, these students demonstrate that accounting is a knowledge code field.

Very successful students

P12 felt that being successful was ‘understanding [the work] and being able to apply it to different situations and scenarios’. This theme was continued by P13 with ‘being open to

new concepts and accepting them and applying them in terms of what you do know'. She continued by saying 'I always relate the whole debit and credit to it balancing out, that's kind of like the foundation'.

The very successful students seemed to have an understanding that there is one truth in accounting, and that the foundational concepts always remain the same, even when the scenarios change.

Summary

Without this understanding, that there is one 'truth', one correct answer that they are working to construct, students will engage with the discipline in a manner that is not conducive to academic success.

The focus now shifts to how the participants in the research understood their construction of knowledge in accounting.

Obtaining mastery over the procedures of investigation

To be able to construct knowledge in a discipline like accounting requires students to focus their learning in a particular way. Students need to understand the theory and obtain mastery over the procedures of investigation. To obtain this 'mastery', students need to have acquired both recognition and realisation rules, and need to be able to access low-road transfer through sufficient practise of varied accounting exercises.

Participants were asked how they made sense of the new knowledge they were required to obtain in introductory accounting and about the techniques which they used to better understand accounting procedures. As obtaining mastery over the procedures of investigation leads to developing a trained gaze, some of these responses have been included in the section on trained gazes which follows.

Less successful students

P1 struggled with this question eventually responding that 'it was a lot more like reading and understanding' and that she 'didn't get into the practical side of it ... it was more of knowing all the terms and understanding it that way'. P3 said he was 'more into words and essays and stuff' so he would 'make notes in an essay form' and 'try to read' and this was done to 'try to describe what you are recording in accounting'. However, in these notes he would *not* go into the detail of recording whether there was a debit or a credit.

Lucas & Mladenovic (2007, p. 404), refer to this clash as a 'non-congruent, or problematic, form of learning engagement'. These students did not seem aware of the need to practise the procedures of investigation at all, and did not try to master this essential part of understanding in the discipline.

In answering this question, P4 advised, 'I wouldn't be able to tell you because I've always found it to make sense. To me it was like reading a book, everything just fell into place, I can't tell you why that is so.' P4 felt 'everything just fell into place', however, he had not passed the course. While he believed they had, concepts could not have been grasped and understood. It seems he had little 'metacognition', i.e. very little understanding of his learning processes. Metacognition is the concept of 'thinking about thinking' or 'knowing about knowing' and was introduced by Flavell (1971, 1979).

Moderately successful students

In responding to this question, P6 felt that what was important was ‘understanding the concepts and being able to apply them’. She said that she made sense of knowledge in accounting by ‘doing the theory and doing calculations’. In so saying, P6 showed an understanding of there being a flow from theory to practice, and of the importance of practising. P8 felt it was ‘Practise, practise, practise and making sure you understand those concepts of always debit credit, debit credit’, but also ‘understanding those concepts and being able to apply them in any situation’. P8 showed an understanding of the importance of knowing the theory, but also of how critical practising was. P8 was also speaking about developing low-road transfer in being able to apply concepts in any situation. In responding to this question, P10 said that she would use ‘a recipe for how to do the transaction so I know each step to follow’; the ‘recipe’ refers to the procedures of investigation.

Very successful students

P11 also used a ‘recipe’ when trying to construct knowledge in the discipline. He said, ‘what I did was that I write down almost a recipe for how to do the transaction so I know each step to follow’. He continued by saying, ‘and then once ... I understand ... then I just practise to reinforce that’. In practising to reinforce a concept, P11 demonstrated how he worked to acquire mastery over the procedures of investigation.

P13 spoke about how ‘[I] kept reminding myself of the definitions and then the formula of $A=E+L$, that helped me a lot, because I ... still use that’. She also spoke about how she would ‘make a step-by-step process for how I answer it, but that is normally just initially and then when I start to understand the concept, then I don’t really use these steps anymore’. Through her comments P13 reflected her awareness of the importance of understanding the procedures of investigation, and how these need to be practised initially, but how they become automated with time. She also demonstrated how she moved from theory to the procedures of investigation with everything based on the foundational aspect of the accounting equation.

Continuing on this theme P14 said, ‘I think initially you try to remember it through the little tricks like word rhymes in your head or some or other study technique, but in the end you have to understand it ... so to initially memorise it and regurgitate it ... but I find that is just memorising and repeating ... so most of the time, I will try and see why they are doing that and then understand how it is affecting the books’. P14 was clear that memorising was not sufficient for success in the discipline; he needed to move to understanding the concepts. He also demonstrated a need to understand the procedures of investigation and not just follow a set of rules.

In looking at more advanced questions in accounting, P15 said, ‘it now needs more practical examples, [it is no longer just] a theory subject like in the first years ... now you have to know different ways questions can be asked, get used to all the ways’. Here P15 indicates how the procedures of investigation are being mastered. In recognising the time constraints in an exam situation P15 commented, ‘if you have got some understanding you will be thinking fast and writing fast’. P14 and P15 were showing an awareness of actively practising many and varied examples and, in so doing, were demonstrating accessing low-road transfer.

Summary

Participants in the less successful group struggled to explain how they made sense of knowledge in the discipline. Most students in this group also exhibited more of a

knower code engagement with the work and seemed to want to work with words and not figures or principles.

In the moderately successful group, participants were starting to move towards understanding and correctly using the procedures of investigation. On the whole, the participants understood that there is one correct answer which is being sought (one truth); that there is a flow from theory to practice; and that practising examples is important in the discipline.

Participants in the very successful group were aware that the foundational concepts were important, that these concepts are situated within all theory and that practising is important for understanding. The goal amongst this group seems to have shifted from understanding the terminology to obtaining mastery over the procedures of investigation and they had acquired recognition and realisation rules. This group also spoke about using aids to assist in obtaining mastery over the procedures of investigation. Participants in this group also showed increased evidence of accessing low-road transfer. There was an awareness among these participants that sometimes it is necessary initially to memorise aspects of the work, but that this must move to understanding.

Having obtained mastery over the procedures of investigation, students should be able to look at a given scenario with a 'trained gaze' and determine which information and procedures are required to construct the solution.

Developing a trained gaze

In this question, the researcher was trying to understand how participants focused their attention when reading and answering a question, to understand to what degree each participant had developed a trained gaze. These responses were then compared to the participants' solutions in the June examination paper to determine whether these students had acquired recognition and realisation rules, whether they had started developing mastery over the procedures of investigation and as a result of that, whether they were starting to develop a trained gaze. Participants were asked how they approached answering an accounting question.

Less successful students

P1 seemed to struggle with the question, needing clarification and guidance, eventually saying she would 'break it down and see what they are asking' and 'to see which accounts apply'. This inability to understand the question, and her subsequent responses, show little real understanding of how to approach an accounting question and a limited acquisition of recognition and realisation rules. P3 said he would first change the name of the business to one with which he was familiar, he would then 'first read the information, read the question, then read the information again ... to understand really what they are saying' and to look for keywords and dates. In changing the name of the business to one that was familiar to him, P3 was trying to increase the semantic gravity of the question to make the scenario less abstract and in so doing to assist him in making meaning in the scenario. In this instance this was a superficial strategy with limited effect; being more 'comfortable' with the name of a business in a question was not a useful technique for P3. However, in looking for 'keywords' P3 demonstrated that he was starting to acquire recognition rules, and he was also trying to trigger low-road transfer which would assist him in automating his responses.

P4 said he would 'read through the extract first, then highlight key points before actually seeing the question'. He added that once he had done that he would read the 'required'⁷

section, and then highlight 'the even more significant points'. He would then look for a 'trigger' to identify which of his learned structures he should be using. Highlighting the text before reading the required section in a question was of limited value to P4, as he could not know what was important, and therefore what needed to be highlighted, before he had read the 'required' section. In looking for a trigger, P4 was trying to find something familiar in the context provided which would prompt the automated processes. While P4 spoke about looking for a 'trigger', this was not a successful technique for him as his examination script did not demonstrate an understanding of the procedures of investigation. Having earlier commented that she had not spent enough time revising, P5 said she would highlight the key points and try to understand what was being asked in the question. In not having spent sufficient time practising, in the examination P5 struggled to understand the questions, demonstrating that while she may have acquired recognition rules (highlighting the key points) she had not acquired realisation rules sufficiently to allow her to be working towards mastery over the procedures.

In the examination: All students in the less successful group made very basic errors by mixing up debits and credits, the foundation of accounting. While these students demonstrated having acquired recognition rules as they were able to identify some relevant figures, they showed little evidence of having obtained realisation rules, as they had struggled to put these figures in the format required. It seemed that as a result of lack of sufficient practice, P3 and P4 in particular had not obtained mastery over the procedures of investigation and low-road transfer could not be accessed. Some of the participants did not seem to read the 'required' section and were therefore not able to focus their gaze and provide the correct information in the solution.

Moderately successful students

In her response, P6 demonstrated that she was developing a 'trained gaze': 'I try just to look at the required first, then go through the information which is given, the additional [information] and try to extract what applies to that question'. This latter statement points to the acquisition of recognition rules, knowing which meanings can be put together. P7 did not refer to the 'required' section in his response, but demonstrated an acquisition of recognition rules, saying, 'I will identify what [element or account] it is first, then do the calculations, make sure I have included everything that I can find about that and then I will answer the question'. In saying, 'I have included everything', P7 refers to developing a trained gaze. This comment also indicates that he was acquiring recognition and realisation rules, and was working towards obtaining mastery over the procedures of investigation.

P8 gave a comprehensive response on how to approach a question, saying he would first look at the 'required', then he would do 'a quick 5 second skim through what kind of information they have given us, then I would read the requirements, then I would go back to the information and read through it thoroughly, looking for exactly what I am looking for and I find everything that I need and then compile the answer'. Showing that he was developing a 'trained gaze', and having identified what was 'required', P8 scanned the question to identify important information which was required for his solution, and which meanings (details and figures) could be put together through recognition rules. He would then 'realise' this information in the legitimate text required.

For more cognitively challenging aspects in the question, P8 would go to his 'knowledge base on all the formulae or steps to take to working out something'. As P8 was consciously accessing his existing knowledge it is clear that this was not an

instance of accessing low-road transfer, but rather what Salomon and Perkins refer to as 'backward-reaching high-road transfer' (1989, p. 113). P8 was consciously searching within his existing knowledge for a procedure which would assist in solving the current problem. When a question or topic was a little difficult, P8 would use a t-account⁸ to assist him in deciding which account to debit and which to credit. P10 also used a t-account when struggling to decide which accounts to use. She would, for example, start with the account she understood and try to determine what the other (contra) account should be. As with P3, P10 would also try to make the question less abstract, but in this case it was done more effectively, as she would visualise the transaction, understanding 'what gets' (what should be debited) and 'what gives' (what should be credited). Visualising the transaction and applying 'what gives' and 'what gets' to provide a context for the scenario, is a more useful strategy to strengthen semantic gravity than renaming the company as P4 had done.

In the examination: Participants in the moderately successful group seemed not to have fully revised all work covered, as most of these participants had one question which they seemed unable to answer competently. These participants seemed to use the 'required' section to focus their gaze in the questions. There were some examples of where these participants had not practised concepts sufficiently to have obtained mastery over the procedures. These participants had started developing a trained gaze as a result of having mastery over certain of the procedures. It seems that these participants were strategic in how they approached revision in the discipline, given the 'spotting' of examination questions and topics.

Very successful students

Similar to P8, P11 would 'first try to get a grasp of the question and what is involved', by reading through the question in its entirety. He would then 'focus on what we are required to do ... look back to the additional information and see what is relevant'. In seeing what was 'relevant', P11 was demonstrating having acquired recognition rules, while in using the 'required' to focus his attention, he showed evidence of developing a trained gaze. In the same way, P12 would 'go to the required and then just look for the words that cover, like interest expense, look for interest and then with interest look for date and the time and whether the loan is repaid'. In looking for keywords, P12 demonstrated having acquired recognition rules; she knew which meanings should be put together.

When constructing her solution, P13 (who was a first-time accounting student) said she would first draw up the skeleton of the answer to ensure that she obtained any formatting marks,⁹ and she would then simply fill in the figures. For example, with a journal entry, she would first write in the accounts to be debited or credited and then calculate the amounts to be included. In drawing up the journal or general ledger format required for the solution, P13 found this would trigger what she needed to be doing next, which would allow her to access low-road transfer for some of the procedures.

In constructing his solution, P14 said he would only use a t-account if he was really struggling, but generally he just used the bank account as his point of reference. If the Bank Account was debited, the other (contra) account had to be credited and vice versa. Debiting or crediting the bank account, where relevant, shows he was accessing low-road transfer, albeit to a limited degree. Where the contra account needs to be contemplated, this is again an example of backward-reaching high-road transfer, where a student uses existing knowledge to help construct an understanding

in another scenario. P15 said she felt it was important to be clear on the concept being tested and to understand the structure of the question. She also felt that it was important to understand where the figures came from and how they relate to the question being asked. For P15, complete understanding was a recurrent theme. It was not enough for her to work to complete an assignment or pass a test or exam; she was working with the intention of laying a foundation for success in the discipline in later years.

In the examination: Most of the participants in the very successful group seemed to have revised the curriculum in its entirety. There were very few instances of the foundational concepts being applied incorrectly. These participants used the 'required' section to guide them in answering the questions and demonstrated having obtained mastery over most of the procedures of investigation. These participants demonstrated having developed a trained gaze in most topics.

Summary

On the whole, the less successful group of students did not appear to read the 'required' section and therefore struggled with answering the questions. They showed limited acquisition of recognition rules and little evidence of having acquired realisation rules and therefore limited understanding of the procedures of investigation.

In the moderately successful group, most students used the 'required' section to direct their gaze at what was needed in the question, demonstrating that they were moving towards developing a trained gaze. Participants showed evidence of having acquired both recognition and realisation rules and they demonstrated having obtained mastery over some procedures of investigation; they were moving towards being able to access automated low-road transfer of processes and to developing a trained gaze. This group showed evidence of being strategic in their preparation for the examination, as some topics had not been revised.

Both less and moderately successful participants used a technique of strengthening semantic gravity in a question to provide more context (semantic gravity) in an otherwise abstract scenario. The ways in which they tried to do so were not equally useful. In increasing the semantic gravity in a scenario, these participants were accessing consciously contemplated backward-reaching high-road transfer. They were consciously trying to apply what they understood to a different and unfamiliar scenario.

Most participants in the very successful group demonstrated a high level of competency in the acquisition of both recognition and realisation rules; they demonstrated that they had successfully obtained mastery over the procedures of investigation, allowing low-road transfer to take place where appropriate and had developed the trained gaze necessary for this knowledge code field.

Overall, the participants' explanations of how they constructed a solution to an accounting question would have focused on questions they felt they were competent answering. Given this lens through which to view their responses, the comments made by participants were, on the whole, validated by what was seen in their examination scripts.

Conclusion

The purpose of this article was to provide an improved understanding of how students constructed knowledge in a discipline with a hierarchical knowledge structure. Previous research had explored the knowledge structure found in introductory accounting and

what this meant for how students should construct knowledge in this discipline. This article is of value to both teachers and students as it will be useful in guiding students in the various procedures which are required for constructing knowledge in the discipline and highlighting problematic forms of study.

The research question was: How do students construct knowledge in an introductory accounting course?

Using the pedagogic device and Legitimation Code Theory to understand the interview data, the following was revealed about various aspects of how participants within the three groups constructed knowledge in this course:

Less successful students in this study

- Seemed to have a stronger inclination towards a knower code field and did not seem prepared to invest what the discipline required of them.
- Focused more on theory and showed little evidence of the paying attention to the procedures of investigation (the rules of accounting). In so doing they:
 - had not acquired recognition and realisation rules; and
 - seemed unable to access low-road transfer because of insufficient practice; most work seemed to be achieved using consciously contemplated high-road transfer.
- Had not developed a trained gaze and were therefore not aware of how to focus their attention in a question or how to formulate a solution.

These students were also:

- Unable to explain what it was they did or did not understand in the course; they showed little evidence of metacognition.

Moderately successful students in this study

- Understood the core principles in accounting and that all concepts are based on these.
- Understood the need to practise and develop mastery over the procedures of investigation, thereby:
 - showing that they had acquired recognition rules and were acquiring realisation rules for some concepts; and
 - showing evidence of low-road transfer being accessed, with backward-reaching high-road transfer being used for more challenging topics.
- Showed evidence of developing mastery over the procedures of investigation and therefore were starting to develop a trained gaze in practised concepts.

These students also:

- Used learning and remembering tools to help them in the learning process as they developed understanding.
- Were aware of which concepts they did not understand and showed some evidence of metacognition.

Very successful students in this study

- Were clear on the core principles in introductory accounting and that all future concepts are based on these.
- Exhibited mastery over the procedures of investigation, and:
 - understood the importance of these skills in recognising and realising the legitimate text required;

- were able to access automated low-road transfer in relevant procedures.
- As a result of the above, these students had developed a trained gaze which guided them in how to construct a solution.

These students also:

- Showed greater metacognitive awareness and worked towards having a complete understanding of a given concept.

During the course of this research, students spoke about issues like approaches to learning, memorisation and understanding. Additional issues, such as metacognition and approaches to learning, also surfaced during this research. As these were not the focus of this research, they have not been discussed in any detail in this paper. They are, however, topics for further research and analysis.

Acknowledgments

Thank you to Judith Reynolds, one of my Master's degree supervisors, who felt this would be valuable research to share and encouraged me to write the article.

Notes

1. The IASB, consisting of a board of 15 members, develops the International Financial Reporting Standards. Although input is sought from outside sources, this board takes ultimate responsibility for the development and dissemination of these standards.
2. This research refers specifically to technical questions at the introductory financial accounting level.
3. 'procedures of investigation' is a term used by Bernstein (1999, p. 165)
4. Myers (2016) highlights a potential problem where students watch an 'expert' complete a task and recognise the figures and then think the task is easy to complete. However, when trying to complete the same task on their own, they are unable to do so. These students have acquired recognition rules, but not realisation rules.
5. This can be contrasted with, for example, a knower code where the gaze generates the procedures (Maton, 2011).
6. These terms were discussed earlier, in the subsection 'How Bernstein's pedagogic device and LCTs impact on teaching and learning in introductory financial accounting'.
7. Accounting questions usually provide a scenario which is followed by a section where what students are required to do in the question is explained. This is what students refer to as the 'required'. Without knowing what they are required to produce in their solution, it is difficult to identify what is relevant in the scenario.
8. A t-account is a simplified version of a general ledger account. It is useful to provide an illustration of which accounts are involved and what amounts should be debited and credited in a given scenario.
9. Formatting marks are given to ensure that students present the question in the correct format. Correct presentation of the solution is important at the introductory accounting level, as this provides the foundation for future years.

ORCID

L. Peta Myers  <http://orcid.org/0000-0002-6676-5239>

References

- Bailar, B., Bailey, L., & Stevens, J. (1977). Measures of interviewer bias and variance. *Journal of Marketing Research*, 14(3), 337–343. <http://dx.doi.org/10.2307/3150772>
- Bernstein, B. (1999). Vertical and horizontal discourse: An essay. *British Journal of Sociology of Education*, 20(2), 157–173. <http://dx.doi.org/10.1080/01425699995380>

- Bernstein, B. (2000). *Pedagogy, Symbolic Control, and Identity: Theory, Research, Critique* (Rev. ed.). Lanham, Md: Rowman & Littlefield Publishers.
- Blackie, M. A. L. (2014). Creating semantic waves: Using Legitimation Code Theory as a tool to aid the teaching of chemistry. *Chemistry Education Research and Practice*, 15(4), 462–469. <http://dx.doi.org/10.1039/C4RP00147H>
- Boughey, C. (2009). *A meta-analysis of teaching and learning at the five research intensive South African universities Not Affected by Mergers*. Pretoria: Council on Higher Education.
- Chen, R. T., Maton, K., & Bennett, S. (2012). Absenting discipline: constructivist approaches in online teaching. In F. Christie & K. Maton (Eds.), *About Disciplinarity: Functional Linguistic and Sociological Perspectives* (pp. 129–150). London: Continuum International Publishing Group.
- Collier, D., & Mahoney, J. (1996). Insights and pitfalls: Selection bias in qualitative research. *World Politics*, 49(1), 56–91. <http://dx.doi.org/10.1353/wp.1996.0023>
- Danermark, B., Ekstrom, M., Jakobsen, L., & Karlsson, J. C. (2002). *Explaining society: critical realism in the social sciences*. Oxon: Routledge.
- Flavell, J. H. (1971). First discussant's comments: What is memory development the development of? *Human Development*, 14(4), 272–278. <http://dx.doi.org/10.1159/000271221>
- Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *The American Psychologist*, 34(10), 906–911. <http://dx.doi.org/10.1037/0003-066X.34.10.906>
- Freebody, M., Maton, K., & Martin, J. R. (2008). Talk, text, and knowledge in cumulative, integrated learning: A response to “intellectual challenge”. *Australian Journal of Language and Literacy*, 31(2), 188–201. Available at http://www.legitimationcodetheory.com/pdf/2008Freebody_AJLL.pdf
- Furnham, A. (1986). Response bias, social desirability and dissimulation. *Personality and Individual Differences*, 7(3), 385–400. [http://dx.doi.org/10.1016/0191-8869\(86\)90014-0](http://dx.doi.org/10.1016/0191-8869(86)90014-0)
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *Qualitative Report*, 8(4), 597–607.
- Hammersley, M. (1992). *What's Wrong With Ethnography? Methodological Explorations*. London; New York: Routledge.
- Hoadley, U., & Muller, J. (2009). Codes, pedagogy and knowledge: Advances in Bernsteinian sociology of education. In M. W. Apple, S. J. Ball, & Armando Gandin, Luis (Eds.), *The Routledge International Handbook of the Sociology of Education* (pp. 69–78). London; New York: Routledge.
- Lamont, A., & Maton, K. (2010). Unpopular Music: Beliefs and Behaviours towards Music in Education. In R. Wright (Ed.), *Sociology of Music Education* (63–80). Basingstoke: Ashgate.
- Lubbe, I. (2013). Educating accounting professionals: Development of a theoretical framework as a language of description of accounting knowledge production and its implications for accounting academics at South African universities. *South African Journal of Accounting Research*, 27(1), 87–124. <http://dx.doi.org/10.1080/10291954.2013.11435172>
- Lubbe, I. (2014). Educating professionals: Describing the knowledge agency of Accounting academics. *Meditari Accountancy Research*, 22(1), 107–127. <http://dx.doi.org/10.1108/MEDAR-02-2014-0031>
- Lucas, U., & Mladenovic, R. (2007). The potential of threshold concepts: An emerging framework for educational research and practice. *London Review of Education*, 5(3), 237–248. <http://dx.doi.org/10.1080/14748460701661294>
- Maton, K. (2000). Languages of legitimation: The structuring significance for intellectual fields of strategic knowledge claims. *British Journal of Sociology of Education*, 21(2), 147–167. <http://dx.doi.org/10.1080/713655351>
- Maton, K. (2007). Knowledge-knower structures in intellectual and education fields. In F. Christie & J. R. Martin (Eds.), *Language, Knowledge and Pedagogy: Functional Linguistic and Sociological Perspectives* (pp. 87–108). London; New York: Continuum.
- Maton, K. (2010). Analysing knowledge claims and practices: Languages of Legitimation. In K. Maton & R. Moore (Eds.), *Social Realism, Knowledge and the Society of Education: Coalitions of the Mind* (pp. 35–59). London: Continuum.
- Maton, K. (2011). Theories and Things: The Semantics of Disciplinarity. In F. Christie & K. Maton (Eds.), *Disciplinarity: functional linguistics and sociological perspectives* (pp. 62–84). London, New York: Continuum.
- Maton, K., & Muller, H. (2007). A Sociology for the transmission of knowledges. In F. Christie & J. R. Martin (Eds.), *Language, Knowledge and Pedagogy: Functional Linguistic and*

- Sociological Perspectives* (pp. 14–33). London; New York: Continuum International Publishing Group.
- Mkhize, T. F. (2015). *An analysis of the Certificate of the Theory of Accounting knowledge and knower structures: A case study of professional knowledge* (Unpublished doctoral dissertation). Rhodes University, Grahamstown.
- Muller, J. (2006). On the shoulders of giants: verticality of knowledge and the school curriculum. In R. Moore, M. Arnot, J. Beck, & H. Daniels (Eds.), *Knowledge, power and educational reform: applying the sociology of Basil Bernstein* (pp. 11–27). Oxon: Routledge.
- Muller, J. (2009). Forms of knowledge and curriculum coherence. *Journal of Education and Work*, 22(3), 205–226. <http://dx.doi.org/10.1080/13639080902957905>
- Myers, L. P. (2014). *An analysis of the structure of knowledge and students' construction of knowledge in an introductory accounting course*. (Unpublished master's thesis). Rhodes University, Grahamstown.
- Myers, L. P. (2016). Knowledge structures and their relevance for teaching and learning in introductory financial accounting. *South African Journal of Accounting Research*, 30(1), 79–95. <http://dx.doi.org/10.1080/10291954.2015.1099215>
- Patton, M. Q. (2002). *Qualitative evaluation and research methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Salomon, G., & Perkins, D. N. (1989). Rocky roads to transfer: Rethinking mechanism of a neglected phenomenon. *Educational Psychologist*, 24(2), 113–142. http://dx.doi.org/10.1207/s15326985ep2402_1
- Singh, P. (2002). Pedagogising knowledge: Bernstein's Theory of the Pedagogic Device. *British Journal of Sociology of Education*, 23(4), 571–582. <http://dx.doi.org/10.1080/0142569022000038422>
- Wengraf, T. (2001). *Qualitative Research Interviewing: Semi-Structured, Biographical and Narrative Methods* (1st ed.). London: Sage Publications Ltd. <http://dx.doi.org/10.4135/9781849209717>