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"There is a worksheet to be followed": A case study of a science teacher's use of learning support texts for practical work

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Abstract
Drawing on the notion of the 'didactical transposition' of curriculum texts, this paper takes a critical look at why one science teacher still persists with a traditional teacher-centred approach towards practical work. It flows from a multi-case study on the instructional decision-making of Grade 9 Natural Science teachers currently implementing the new outcomes-based Curriculum 2005 in South Africa. Data were collected through classroom observations, pre-lesson and post-lesson interviews, video-stimulated recall sessions as well as content analysis of various artefacts. The paper describes how and explains why the respondent uses the Learner Support Material (LSM) in a rather mechanical manner to shape practical work for his learners.

Introduction
The implementation of the new outcomes-based Curriculum 2005 (C2005) in South Africa has led to many schools relegating the traditional content-heavy textbook to the storeroom (Land, 2003; Stoffels, 2004). One reason for this phenomenon is the key post-apartheid policy message that teachers are expected to be creative and innovative curriculum developers able to design and develop learning materials according to the needs of their learners (Department of Education, 1998). Yet a number of influential studies indicate that this 'creative drive has not emerged' and that very few teachers can and actually do this (Rogan, 2004, p. 117). Instead, in the context of the under-specification of content in C2005 documents, many schools and teachers have opted for commercially prepared C2005-aligned learning support material (LSM)[1] (Stoffels, 2004; Vinjevold, 1997). In the light of the considerable political, social and economic investment in South Africa's new curriculum, and Love and Pimm's (1996, p. 389) observation that ' the curriculum is also how a teacher interprets or uses … texts', it has become imperative to ask: Exactly how do teachers interpret and use the new learning support material?

Ball (1990, p. 258) reminds us that curriculum-aligned texts "make good policy messengers" because teachers would generally rather engage with a textbook than a policy document. This seems especially true in developing Southern African countries where learner-centred pedagogical policies, so fundamentally different from the traditional teacher-centred approach, are in great currency (Malcolm & Alant, 2004). A crucial part of this policy shift towards more learner-centred and inquiry-oriented interactions in South African science classrooms has been a call for teachers to infuse their practices with more 'practical activities' (Department of Education, 1997, p. 135; 2000). In fact, in most countries, such practical activities have become 'a clear desideratum' (Jenkins, 1999, p. 29). But what is the impact of curriculum support texts on how science teachers structure and facilitate practical activities for their learners?

[1]These printed commercially prepared curriculum texts then serve as an important source of Learning Support Material (LSM), and very often contain different combinations of a teachers' guide, learners' guide and ready-to-use learners' worksheets.

Curriculum support texts and science practical work

There can be little doubt that textbooks, or LSM in C2005 parlance, will continue to play a major role in science classrooms in developing countries (Potenza & Monyokolo, 1998). In these contexts a significant number of teachers lack the professional confidence to facilitate meaningful learning through an outcomes-based approach (Onwu & Mogari, 2004; Lockheed & Verspoor, 1991; Altbach & Kelly, 1988). It is therefore comprehensible that Malcolm & Alant (2004, p. 5) posit that textbooks serve as an indispensable 'source of science knowledge, curriculum planning and teaching ideas …' for teachers. In the same vein, Ensor, Dunne, Galant, Gumedze, Tawodzera, Jaffer and Reeves (2002, p. 22) believe that textbooks 'set up pedagogic pathways' for both teachers and learners. Given the documented evidence of the absence of a strong tradition of practical work in South African science classrooms (Rogan, 2004), it is safe to assume that curriculum-aligned texts could also 'set up (practical) pedagogic pathways.'

In exploring this issue it is important to clarify that in this study 'practical work' specifically refers to those teaching-learning transactions in which learners are given ample opportunities to practise the 'processes of investigation' (Department of Education, 1997, p. 137). These would involve any 'hands-on', 'minds-on' practical learning opportunities where learners practise and develop various process skills such as questioning, observation, hypothesising, predicting and the collection, recording, analysis and interpretation of data. At this point it is important to bear in mind there is a growing body of scholarship that problematises the commonly accepted and variegated forms of science practical activities, and that casts doubts on its effectiveness as a teaching and learning strategy (Jenkins, 1999; Millar, Le Maréchal & Tiberghien, 1999). The purpose of this paper is not to engage in that particular debate. Instead, given South African teachers' history of dependency on the traditional content-heavy textbook (Potenza & Monyokolo, 1998), this paper illuminates how one teacher uses the reform-based LSM to shape investigative practical work for his learners.

An investigation into the interface of reform-based curriculum support texts and practical work is of immense import given the dearth of research on science curriculum reform in developing countries (van den Akker, 1999). There is also much that we do not know about how and why teachers use or do not use commercially available science curriculum texts. In South Africa, research on science texts has largely been restricted to the structural features of textbooks such as availability (Vinjevold, 1997), gender representivity (McKinney, 2004), and how learners use and benefit from textbooks. However, scholarly inquiries into how science teachers interpret and use support texts have been rather limited, particularly with regard to C2005-aligned LSM (Baxen & Green, 1997; Adler, Reed, Lelliot & Setati, 2002). Malcolm & Alant (2004), for example, highlight the tenuous relationship between the profit-driven nature of the publishing industry and their mandate to produce learner-centered, locally contexted texts. They conclude that this "… creates an important space for research into texts, text design … the quality, purchase and uses of texts." (p. 74). Similarly, Vinjevold (1997, p. 184), in her analysis of C2005 implementation, cautions that: "… there is an urgent need to establish the extent … of teachers' ability to read and use these textbooks".

Statement of problem

Given the crucial role of learning support material in the implementation of C2005, as well as the thrust towards a more practical approach to science teaching and learning, this study was framed around the following questions:

- How does a science teacher use published C2005-aligned LSM to shape practical work?

- Why does this science teacher use LSM for practical work in these particular ways?

Theoretical framework

In making sense of the relationship between LSM and how and why it shapes science 'practical work,' I draw on Candela's (1997, p. 500) notion of the "didactic transposition" of curriculum texts. In brief, this refers to the process by which an object of knowledge (in this case the LSM) is transformed into an object of teaching, including adapting, adding to or omitting from the text according to the context and needs of the class. Candela (1997) for example reports that for the most part the respondents in her study did not follow or replicate the learner-centred, 'problem-solving' tone of the practical work suggested in their textbooks. In practice, teachers transposed or adapted the majority of the suggested 'practical activities' into teacher demonstrations, primarily in order to avoid digressions and disruptions to the class order. Candela adds, however, that a few suggested 'teacher demonstrations' were transposed to problem-solving group-oriented practical exercises.

Didactic transposition resonates with Ben-Peretz's (1990) use of the concept 'curriculum potential' to indicate that that any text has the inherent potential to be interpreted and used by teachers "in ways which go beyond the explicit intentions of their developers" (p. 47). She adds that the realisation or "reading" (p. 47) of this curriculum potential of text, depends on the one hand on the quality of the text, but more importantly, on the interpretive abilities, practical knowledge and professional imagination of the teacher. This notion of the didactic transposition of curriculum support texts is appealing given the South African policy shifts to greater teacher agency in curriculum matters. It is therefore fair to assume that LSM will continue to play a pivotal role in teachers' instructional decision-making. However, given the vast resource disparities that still exist across the country, and the inherent differences in learners' developmental levels, interests and experiences, teachers would ideally transpose, adapt or customise the suggested activities and practicals to the needs of their particular learners.

Within the context of the notion of 'didactical transposition', this study set out to investigate the extent to which the respondent science teacher employed LSM texts. In other words, my prime focus was on gaining insight into how and why this teacher adapted, omitted from or added to the practical activities suggested in learning support texts.

Research method and data collection

This case study followed a qualitative-interpretative approach, which, as Erickson (1998, p. 1172) puts it 'lends richness and depth to the study of the teaching and learning of science.' The data, on how the case teacher, Martin (pseudonym), selected, planned for, and facilitated practical work in his classroom, were collected over a ten-month period. Tracing just one of Martin's Grade 9 classes, I undertook non-participant classroom observations of 25 lessons to get a sense of his classroom practices. This data was enriched by pre-and post-lesson interviews in which I sought insight into what he was planning, and why he made certain instructional decisions regarding, for example, content, teaching strategies, assessment and the use of learner support material. The observed lessons were video-recorded and used for post-active stimulated recall sessions (Calderhead, 1981). The purpose here was to allow the teacher an opportunity to provide a detailed account of his interactive practices and the causative decision-making processes and frame factors experienced 'in-flight'. A more holistic picture was gleaned by analysing appropriate artefacts such as learners' completed activity sheets, as well as a content analysis of the LSM is use. Data analysis was done in an iterative and recursive manner (Hatch, 2002).

Sample and context

This case study takes a look at the practices of Martin Stevens, a Grade 9 Natural Science teacher conveniently sampled to participate in a 10-month long study on teacher decision-making. At the commencement of this research (2003), Martin had ten years teaching experience in Grade 9 to 12 Science and was, for that year, responsible for Grade 9 Natural Science and Grade 10 Physical Science. He was in his third year of employ at Taylorville High (pseudonym), a school with nearly 1500 learners, situated in a predominantly 'coloured' township east of Pretoria. He held a 4-year composite science education degree (BSc. Ed), with Chemistry and Physics up to second-year level.

Taylorville High had three laboratories, although these were not well-equipped and much of the apparatus, such as a Van der Graaf generator, was not functioning properly. According to the Gauteng Department of Education (GDE) grading system, Martin's school was 'moderately resourced,' although it frequently happened that the equipment or chemicals that he needed to use were either not in stock or were not working properly. Martin taught science in a standard 5 x 6 meter classroom. The three science laboratories were reserved for those teachers responsible for the senior secondary science classes, that is, Grades 11 and 12. A single, fixed and elongated demonstration table in the front of the class, the only hint that he had a Science classroom, had a water tap with sink, but neither was in working order for the entire period of this research.

The school is situated in an area with a relatively high unemployment rate, and a significant number of parents struggle to meet the R200 per annum school fee. This partly explains why learners were not expected nor encouraged to buy any of the *SciGuide* books, the science LSM series that the school leadership had selected to buy. Each science teacher was then provided with a single copy of the *SciGuide* Learner Activity Book and Teacher's Guide. The Learner's Activity Book consists of learner activities, primarily in the form of worksheets. The Teacher's Guide provides the teacher with the answers to the worksheets, an outline of the learning outcomes of each theme, and supplementary enrichment notes. As I will discuss in greater detail later, Martin made extensive use of the worksheets in the Learner Activity Book. He either photocopied the necessary pages for all his learners or, when there was no photocopying paper available at the school, duplicated the activity on the chalkboard and asked the learners to copy and complete it in their exercise books.

It is important to add that Martin was very conversant with the post-apartheid curriculum reform efforts, and attributed this to the fact that he had just completed (and thoroughly enjoyed) a one-year GDE-funded OBE course at a local university. Moreover, despite the fact that he was aware of the challenges and complexities of C2005, he consistently communicated a devotion to the outcomes-based principles that underpin it. In Martin's mind there was a powerful relationship and connection between the traditional curriculum and the apartheid government. At one point, in a sudden surge of activist passion, he made his allegiance to the demise of the apartheid curriculum known in the following way:

> I was at UWC. We threw rocks to get our freedom. OBE was instituted because we wanted to break away from the former apartheid educational system. We had to design a system that moves away from teaching students in a way where they mean nothing to society. But that is the reason why so many people criticise OBE, it is mainly people that still want to cling to the previous system, that it was right.

Findings

An illustration of Martin's didactic transposition of the SciGuide text

Throughout the 10-month engagement with Martin it was clear that *SciGuide* was the most important factor that shaped various aspects of his instructional decision-making (Stoffels, 2004). Just like the other Grade 8 and 9 Natural Science teachers at the school, he followed this LSM as a virtual script of what to teach and to a certain extent, how to teach it.

Martin's interpretation of the *SciGuide* LSM was nowhere more vividly portrayed than in his approach to practical work. He performed all the 'practical work' sections as demonstrations, even where *SciGuide* presented them as group problem-solving activities. These practical demonstrations took a rather mechanical format. In all but one of the seven practical demonstrations I witnessed, Martin went through each of the steps on the worksheet, physically performed them in front of the class, and after making sure that all the learners had made the correct observation related to a particular step or question, asked them to fill in the correct answer on the worksheets. This is well exemplified by the following pre-lesson interview extract

> most of the time I work strictly with the worksheets in the SciGuide series and then let them fill in the answers as I do the … practical work.

The day after Martin completed a 'theoretical' lesson on the reaction of acids with metals, metal oxides and carbonates, he continued with *SciGuide's* suggested practical on the reaction of acids with metals. However, whereas the activity and worksheet were structured as if learners would be doing the 'experiment' in groups, with each group having its own set of test tubes, acid and metals, Martin set up a demonstration in front of the class. At the post-lesson interview, he noted:

> I focused mainly on the worksheet so that whatever I was doing there in front, that they could then be able to answer questions on that worksheet. I focused very much on the worksheet…

A few days after this, I observed a similar practical activity in the *SciGuide* worksheet entitled: *Reaction of an acid with a carbonate.* The activity sheet starts with the following instructions to learners:

> Work in groups to conduct this experiment. Fill two side arm test tubes two-thirds with hydrochloric acid. Connect a tube to the side arm and place the other end in a test tube half-filled with clear limewater. Add a little calcium carbonate to one test tube and a little sodium carbonate to the other.

The worksheet asks learners to sketch the apparatus and continues then with a number of observation questions (with space provided for the answers), starting with: "What do you observe in the test tube with acid?" Martin again set up the demonstration in front of the class, on the demonstration desk, and performed the aforementioned instructions himself. Learners remained seated at their desks, and in his customary manner, he stressed that they should observe closely what happens. As he dropped the calcium carbonate in the test tube with acid, some of the learners shouted out that they see bubbles and a fizzing effect. Martin responded that this was correct and asked learners to copy this answer in the space provided for that question. The rest of the worksheet was then completed in the same step-by-step manner, with individual learners venturing answers and Martin either confirming or correcting their answers. During the post-lesson interview, Martin made the following comment:

> I am quite really pleased that the learners could listen to me and value the experiments that I was doing and that somehow I could manage to bring the message across that *there is a*

> *worksheet to be followed* and I managed to work through the worksheet as well (my emphasis).

This notion that "there is a worksheet to be followed", resurfaced towards the end of the second term, when I asked him about his tendency to do a lot of explications and writing on the board.

> I do use an overhead projector but mostly for the Grade 10s. Grade 9s so far I have not used it … But with the Grade 10s I use it a lot. I think it simply could be that the Grade 9s are making use mostly of worksheets that are already there and then any practical demonstrations done by me, and then for them just to fill in the worksheets.

Explaining Martin's didactic transposition of *SciGuide* practical work

Intrigued by Martin's employment of the *SciGuide* 'practical worksheets', I asked him why he preferred the mechanical and perfunctory approach of learners filling in the answers as he went through the demonstration. Over the course of the study, it became clear that a number of factors framed his didactical transposition of the *SciGuide* practical suggestions.

A focus on learners' observational skills.

One of the first frame factors that surfaced was his focus on refining and developing learners' observational skills. He verbalised this aim during a post-lesson and stimulated recall interview as follows:

> I decided that all the practical should be about, besides the worksheet, is that learners should sort of develop a skill where they must observe and write down what they observe. First of all, you see that that worksheet is actually leading them, they are supposed to first of all write down the colour of copper carbonate without even looking at the worksheets.

This rationale of focusing on learners' observational skill sounds all the more plausible when one considers that in two of these practical lessons, Martin adapted this approach by asking learners to make notes on what they observed in the demonstration, and only afterwards did he issue the practical worksheets for them to complete. However, this emphasis on 'observation skills' appeared to be favoured at the expense of other critical science process skills, skills which *SciGuide* was evidently trying to inculcate through its group experiment format. As I will argue later, my sense was that there were *other potent factors* that framed Martin's conscious decision to use the *SciGuide* texts in the way that he did.

Limited content knowledge

Martin took a slightly different approach with a practical on "The water retention of different soil types", when he asked learners to do it for themselves at home. In this case he followed the *SciGuide* suggestion to allow learners to do the 'practical' themselves, although he asked them to do it at home instead of in the class. It later transpired that the reason for this didactic transposition that he did not feel too confident with certain content strands of Natural Science. He volunteered, on numerous occasions, that his limited content knowledge in the Geography or Biology oriented themes, made him reluctant to engage in such *SciGuide* practical activities. He was very forthright about the fact that his expertise and experience was in Chemistry and Physics and that he felt much more confident in engaging with experiments in this field. In his own words:

> I have to consult now with Mr. Abbott in order to verify whether those are facts, you know, on Biology. Even me myself, I couldn't mark those sheets, their answers that they gave me today, so I have to consult with Abbott. But when it comes to my own field like Physics or Chemistry, I would feel much more relaxed and be able to get them excited and get them interested in what I am doing.

The impression that I gained during the classroom observation sessions is that he rushed through the Biology and Geography sections, touching on them superficially. In contrast to the Chemistry and Physics sections, he did not venture into supplementary questions or exercises outside what was asked on the *SciGuide* worksheets. In fact, following consultations with his colleagues, he skipped a number of *SciGuide* worksheets dealing with worrisome sections.

Control over learner discipline

Martin never explicitly admitted that having a relatively large class of 38 learners made it somewhat cumbersome to facilitate group practical work as outline in *SciGuide*. This was articulated in a more implicit way by referring, on numerous occasions, to the fact that group activities could lead to him losing control over learner discipline. During the post-lesson interview of the 'soil types' lesson, he articulated some of the reasons for his distinctive didactical transposition of *SciGuide* in the following way:

> I do not know if I can generalise, but learners … as far as practical work is concerned, they are quite ill motivated, they are quite playful at times and it can be irritating. And I know the culture at this particular school. They can even throw each other with the soil (sic) ... But then again, I think it is my responsibility to then to enforce discipline. But like I said, it is the first time that I have been teaching this topic and I am weighing up all the options.

This reference to 'it is the first time that I have been teaching this topic' was a reference to the fact that he did not have the experience and confidence to tackle this Biology oriented practical work.

Lack of resources

According to Martin, lack of resources was another factor that led to his decision to transpose the suggested group practicals into teacher demonstrations. This was particularly evident when he dealt with the *SciGuide* practical activities on electricity and electrical circuits. All four of the practical activities in this section had introductions and directives similar to the following one given to learners on practical worksheet entitled:

> The use of an ammeter in a circuit. Effect of more cells or more bulbs in series on the ammeter reading.
>
> Build a circuit as shown in the diagram below. Start by using one cell and increase to three cells. Take the ammeter reading every time a cell has been added and complete the table.

Clearly, *SciGuide* expected learners to be supplied with the materials (cells, wire, ammeter etc.), and that they would do the investigation on their own. However, Martin set up a single demonstration of the circuit in front of the class. In a slight variation from what had been the norm, he involved learners by asking different individuals to come to the front and take the different ammeter readings. In the post-lesson and stimulated recall interviews I probed why he did the suggested additions (of bulbs) himself, and why he did not make use of the opportunity to allow the learners to get a hands on feel of how to set up or modify electrical circuits.

> I think, and there again I might have made a mistake, I admit, but it is mainly because of lack of apparatus. That particular experiment shouldn't be a teacher demonstration. I feel that learners would learn much more if it wasn't for my HOD being restricting us in getting the equipment and also a lack of cells. I can bring [them] but like you see it is quite a large number of learners and I don't even know how to pick them …

Throughout the research period a number of incidents occurred which underscored the fact that the availability of resources impacted on Martin's approach to practical work. At times the school simply did not have the required resources. Sometimes they were there, but were dysfunctional, while at other times the appropriate functioning resources were available, but he refrained from using them to their full potential. A potent indication of how, in Martin's mind, resource availability limited the kind of instructional decisions he could take surfaced in a comment that the tap and sink in his classroom, which could have made experiments so much easier, could not be used and were not being repaired.

Martin expressed some frustration with the fact that scientific chemicals and equipment were not readily available in his 'normal' classroom, and that he had to request and fetch them from his HOD, who occupied the laboratory. Although this was not a serious gripe, what really fuelled his discomfort, and his reluctance to go through with this procedure, was a comment made by the HOD early in the year that he should make sure that the Grade 9 learners did not break the set of ammeters/voltmeters that he had requested. This might seem like a rather innocuous remark, but the fact that he referred to it on a number of occasions suggests that he took it quite personally. As the following quote demonstrates, it seems that he perceived this remark as belittling of what happens in Grade 9 NS. On another occasion, he gave the impression that it reflected negatively on his ability to facilitate and monitor practical work, and that it placed an unnecessary burden on him to be extraordinarily cautious.

> ... it is a lot of inconvenience, especially if it comes to practicals where learners must work on their own. We have got enough circuits, but you know what my colleague told me … I went to borrow the circuits and I was told that his Grade 12s are using these circuits, 'make sure nothing gets missing'. So I left there not knowing what to say.

On another level, Martin indicated that opportunities for learners to do experiments by themselves in a group was severely limited by the fact that the school often did not have the necessary resources, or as in the case of the circuit boards, only had a small number. This meant that he had to resort to teacher demonstrations, as exemplified by his response to a question on why the practical work on series and parallel connection took a teacher demonstration format:

> Well, you know, involvement is quite limited due to the fact that those apparatus are not freely available. They are there, but I don't want to cause any friction between myself and my HOD, because he once said to Mr Thyssen that he does not know what will happen. In fact, he said to him that he suspects those children will break all the ammeters and they will break all the voltmeters, so it limits learner involvement. So basically now it comes to myself demonstrating. I have three cells now that I can make use of, the rest are all flat. Maybe I should put my hand in my pocket and then go to the shop and buy. Otherwise I don't see my way clear here. That is a problem, so it will basically be teacher demonstrations. I would just demonstrate to them what I expect from them to observe and then give a feed back from what they have observed.

Martin felt that although he was constrained to use teacher demonstrations as a result of the problems with resources, his demonstrations were done in such a way that learners could get a solid understanding of the relevant content.

Intensification of workload

Another factor that, according to Martin, framed his particular didactic transposition of the *SciGuide* practical activities, was the intensification of workload that followed the introduction of C2005. He believed that this was exacerbated by the concomitant rationalisation and redeployment of teachers. Martin articulates the severity of these factors in the following response to a question on why he does not develop his own practical worksheets or draw more widely from other curriculum support texts.

> I feel that if given more time we can actually maybe come up with our own ideas and bring up our own sort of material, learning material, instead of just taking something that is just dumped on us and then followed slavishly.

During another interview, when I tried to get a sense of the degree of collaboration with other science staff member regarding, for example, the planning and execution of practical work, he again made reference to the intensification factor:

> consultation with each other that is not in place. We are so much over-worked at the present moment. We are short of two teachers. Two teachers were redeployed and now we are running short of two teachers, we are overloaded. We do not find time to come together as Grade 9 science teachers to talk about such aspects of the work.

From this selection it seems that in Martin's mind, the intensification of his administrative and teaching load, impacted negatively on his will and capacity to plan and set the *SciGuide* practicals up in the suggested ways. Furthermore, the time crunch stifled his ability to collaborate with his colleagues on meaningful didactic transposition of the suggested *SciGuide* practical activities

Discussion and conclusion

The foregoing evidence suggests that Martin, a relatively well-qualified science teacher, draws entirely on the *SciGuide* to shape practical work for his Grade 9 learners. This is well exemplified by his not statement that he was glad that he could get it across to learners that during practical lessons "there is a worksheet to be followed". This primacy of the LSM in shaping practical work stands in contrast with Peacock and Gates' (2000) sample of science teachers in England who seemed to adapt and 'pick and mix' different sources to design practicals and practical worksheets.

After analysing the interplay between the LSM and practical work in Martin's teaching through the conceptual lens of 'didactical transposition', it is evident that his use of the curriculum support text was not very different from Candela's (1997) respondents. Like the teachers in her study, Martin did not follow the suggested problem-solving experiments designed to be performed by learners primarily in groups. Instead, in a typical cookbook approach, he simplified most of these activities by transposing them to teacher demonstrations. What is peculiar, though, is his mechanical step-by-step following of the procedures in the suggested activities, and the insistence that learners write down the answers to the *SciGuide* worksheets as the demonstration unfolds. Needless to say, this particular use of the LSM, which I characterise as reductionist didactical transposition, has serious implications for the extent to which learners in his class are exposed to the 'processes of investigation' pursued by South Africa's learner-centred science education policies.

The simplification of practical work evident in this case resonates with McNeil's (1983) reference to the 'defensive teaching' that teachers often engage in order to maintain control in the classroom. The main concern of the teachers in McNeil's study was "control" over students, and they ensured this by trivialising the course content, employing simplistic forms of representation, limiting their teaching strategies and omitting controversial or difficult topics. In extending McNeil's (1983) notion of defensive teaching, I wish to argue that control is but one of a number of significant factors that lead to defensive teaching as it manifest itself in the reductionist didactical transposition of texts. Martin confessed to his efforts at limiting learner disruption. But he was also highly expressive of the debilitating impact of the lack of resources, his low self-efficacy in certain science strands and the stifling intensification of his workload. In Martin's mind, these were the most potent forces that constrained his ability to sufficiently disclose the 'curriculum potential' (Ben-Peretz, 1990) of the LSM-in-use, particularly as it relates to practical work.

How generalisable are these findings on the ways how and the reasons why science teachers use commercially published LSM to plan and enact practical work? I am not sure. But it is instructive that Rogan (2004), in his study of the implementation of C2005 in science classrooms, reported that the largest percentage of instructional time was spent on lecturing. More worrying in the context of this paper is his finding that in the practical domain there was 'room for lots of improvement' (p. 174). What the findings do point to is 'a significant empirical agenda' (Apple, 1986) on science LSM and science teachers. This agenda includes (but extends beyond) Potenza & Monyokolo's (1998) call for an improvement in the quality of published texts and Rogan's (2004) plea for greater initial text 'structure' for communities of teachers. What is ultimately needed is a comprehensive and far-reaching teacher development initiative geared at boosting teachers' confidence and competence to interpret, transpose and customise curriculum support texts. For it is only by gaining competence in fully disclosing the 'curriculum potential' of learner support material texts that science teachers will be able to realise the fullness of the new curriculum's potential.

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