



Enhancing study practices: are first-year students 'resistant to change'?

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Synopsis

One of the strategies for trying to reduce attrition among first-year students and for improving their academic performance generally is to include some kind of study skills module in the first-year programme. One of the reasons often given for the relative lack of success of such programmes is the claim that students are 'resistant to change'. This paper presents a study that investigated this claim by interviewing chemical and metallurgical engineering students in a South African university at the beginning and end of their first year. The basis for evaluating the extent to which students' practices appeared to change was a set of six categories of practice identified in a related phenomenographic study on the learning practices of the same students. It was evident from the interview data that even where some change in practice had occurred, the extent of change was somewhat disappointing. For those who reported changing their practice, the primary change driver appeared to be underperformance in the mid-year exam. Underperformance prior to that seemed to exert less force and students did not appear to give very serious attention to class or textual input/activities on study practices. 'Resistance to change' appeared to be implicit in nature and to be more a consequence of overconfidence and the 'momentum' resulting from habit rather than an explicit attitudinal resistance.

Keywords

engineering education, first-year education, resistance to change, study practices, study skills, student retention.

Introduction

Where the levels of attrition among university or college entrants are high, some form of 'study skills' module in the first-year programme is frequently employed to improve the academic prospects of students. Behind this strategy is the belief that a significant factor contributing to attrition and academic underperformance is that the learning practices and study skills of many entrants are in some ways inappropriate for effective learning at a tertiary level. However, the effectiveness of such learning skills interventions has generally been disappointing. For example, Hattie, Biggs, and Purdie (1996), in a meta-analysis of 51 studies on the effectiveness of learning skills interventions, concluded that the interventions did appear to improve students' attitudes to learning and also reduced their levels of anxiety, but had minimal effect on improving their study skills. This apparent 'resistance to change' has been

noted by several researchers, even in literature (discussed shortly) that reports some degree of success of study skills interventions.

This paper reports the findings of a study that investigated the dynamics associated with students changing their learning practices during their first year at university. The students were entrants to an engineering programme at a South African university in 2008. After a consideration of the literature on the apparent 'resistance' associated with changing learning practices, the study is described and the findings are presented and discussed.

'Resistance to change' associated with learning skills interventions

Several reasons have been offered for the relative lack of effectiveness of interventions designed to improve the learning practices and study skills of entrants to tertiary education. Wingate (2006) argues that *stand-alone* study skills modules are ineffective because 'learning how to study effectively at university cannot be separated from subject content and the process of learning' (p. 457). Others argue that learning practices and study skills are difficult to change because they are inherently stable and that students' prior experiences at school have developed in them 'habitual patterns of study' (Entwistle, 1998) or have 'automated their study habits' (Dembo and Seli, 2004). This kind of stability appears to persist in many students even when considerable effort is made to deploy 'powerful learning environments' intended, among other things,

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to improve the learning practices of those students (Brownlee *et al.*, 2001; Vermetten *et al.*, 2002). A number of studies on South African engineering students have also commented on this apparent stability and cited it as a possible reason for the relative lack of change noted in some students' learning practices (Case and Gunstone, 2002; Cliff, 1996, 1995, 2000; Meyer, 1991; Meyer *et al.*, 1994, 1992; Simelane, 2007).

Another reason given for the relative lack of effectiveness of interventions intended to improve students' learning practices and study skills is that students are 'resistant to change'. In this regard, Dembo and Seli (2004) found that some students failed to benefit from study skills modules because they didn't believe they could change, didn't want to change, didn't know what to change, or didn't know how to change. They also noted that some students failed to benefit much from learning skills interventions because they didn't seek help and they didn't attend regularly. Whether this was the result of the other reasons they quoted they did not say. Yuksel (2006) proposed two additional explanations for students' resistance to study skills interventions: students didn't believe that the skills being taught had any value or, alternatively, did not consider those skills to be useful with respect to their future careers.

In contrast to the conscious 'resistance' to study skills interventions evident in the above examples, resistance may also be more unconscious in nature. As pointed out earlier, it is inherently difficult to change well-established, stable learning practices or study skills. Accordingly, it could be argued that learning practices and study skills are inherently 'resistant to change' because of the difficulty associated with changing them. This is strongly supported by recent findings from cognitive and neuroscience research. For example, Clark (2008, 2010) indicates that a high proportion (up to 70%) of adult knowledge is unconscious and automated in nature, and in addition, that dysfunctional, automated, unconscious knowledge can be difficult to unlearn. Furthermore, such dysfunctional knowledge can interfere with a student's attempts to change that knowledge and to develop new and more appropriate knowledge along with the associated behaviours. On this basis, inappropriate or dysfunctional learning practices and study skills are inherently 'resistant to change' even if students are consciously open and committed to changing them.

From this brief review, it appears that changing learning practices and improving study skills that have been developed over many years of secondary schooling is inherently difficult and requires considerable time and commitment both on the part of students and teachers if the effort is to be successful.

A study on the dynamics of change in students' learning practices

A study was initiated in 2008 to investigate the learning practices of first-year engineering students at a South African university and how these practices changed during their first year at university. In the study, learning practices were taken to be *orientations or predispositions to study and learn and to act in learning situations in certain ways and with certain intentions that people have developed as a result of their past experience*. The motivation for the study was the high rate of attrition of students entering the school and the possibility

that problematic aspects of their learning practices and resistance to changing these aspects were significant contributing factors. The premise behind the study was that learning practices affect student attrition by the way they influence the quality of student learning and, consequently, the academic prospects of students; *i.e.* that problematic features of students' learning practices contribute to poor academic performance and therefore to attrition by academic failure. The study and its findings are reported in detail by Woollacott (2013).

This paper reports the results of an investigation into the extent to which the students' learning practices changed during their first year at university and the dynamics associated with such change. The investigation was guided by the following questions. What proportion of students changed their practice? To what extent did they change? If change occurred, when did it happen in the year and what prompted the change? Did the level of practice of a student on entry have a bearing on the extent and nature of change? What sort of change processes operated during the year? If no change occurred, why was that?

The methodology employed to address these questions was to interview a sample of students from the 2008 cohort at the beginning and end of their first year at university. Accordingly, how students changed their learning practices was investigated only from the perspective of the students and the findings were based only on what students reported in interviews on the subject. All interviews were semi-structured in nature and were based on protocols that were discussed with research colleagues after trial interviews with students.

In order to obtain a qualitatively representative sample of student experience, 'maximum variation sampling' (Green, 2005) was used when selecting students for the study. Twenty-seven students out of the entering cohort of 156 were selected and were interviewed at the beginning of the academic year and again towards the end of the year. Of these, nine were female.

The interviews at the beginning of the year focused primarily on the nature of the students' learning practices on entry to university and on establishing, through a phenomenographic analysis (Akerlind, 2005; Green, 2005; Marton and Booth, 1997), the qualitative variation in the practices found among the students. The categories of variation established from this analysis, which is reported in detail by Woollacott (2013), provided an analytical framework for the analysis of the changes in learning practices reported by the students in their second interviews at the end of the year. The categories of variation used in the analysis are described next, after which the findings of the study are reported and discussed.

The framework used to characterize the learning practices of the students

The interview data was particularly rich with regard to one type of learning practice, which was termed 'theory-focused study practice'. Accordingly, this paper focuses only on that practice. Theory-focused study practice is the type of practice where a student, studying on their own, is focused only on understanding and mastering the 'theory' of the subject they are studying and concerns about tests and examinations are

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absent or are at the back of their minds – *i.e.* the focus is to learn in order to understand as opposed to learning in order to pass impending tests/exams. Here 'theory' is referring to 'bookwork' and is taken to mean *the conceptual and theoretical knowledge and information presented in course material*. This is in contrast to a focus on developing the problem-solving skills associated with that theory. Here, 'problem' is used in a technical sense as commonly used by the students and in mathematics, science, and engineering courses – *i.e.* as a question or difficulty that cannot be resolved without some kind of numerical or mathematical manipulation.

Among the students, six qualitatively different categories of theory-focused study practice were identified by the phenomenographic analysis of the transcripts from the first set of interviews. These are summarized in Table I and discussed thereafter.

The most elementary category of theory-focused study practice is information-oriented practice. Here the focus is on assimilating or memorizing information with no particular regard for making sense of it. In the next category – comprehension-oriented study practice – the focus is on comprehending the material being studied by simply reading the relevant texts. This does not include any activity other than reading those texts. In consolidation-oriented study practice, the next category, the focus is on reinforcing and consolidating what has been comprehended by using one or more consolidation technique such as making summaries, vocalizing what has been learned, or memorizing concepts or principles. A sub-category of consolidation-oriented practice – integration-oriented study practice – involves consolidating and reinforcing comprehended theory further by integrating the learning of theory and the development of problem-solving skills; *i.e.* problems are attempted explicitly as a means of applying the theory being learned in order to deepen one's grasp of that theory.

In the four categories of study practice discussed so far, learning is conducted within the framework and structures of the theory as presented to the students. In the next category of study practice – refinement-oriented practice – the focus is on deepening personal mastery of that theory by explicitly

looking for new conceptual connections and linkages and, consequently, restructuring one's understanding of that theory. Techniques used to do this include developing concept maps, elaborating study notes, asking oneself questions about aspects of the theory, or trying to think about the theory from different perspectives. The sixth category – know-how-oriented practice – takes this refinement process a step further by explicitly trying to relate theory to real-world situations.

The five categories of study practice form a progression with one category including, but going beyond, the orientations of the previous category in the progression. Comprehension-oriented practice works with learned information to develop comprehended theory. Consolidation-oriented practice works with comprehended theory to develop consolidated theory. Refinement-oriented practice works with consolidated theory to develop a refined grasp of disciplinary knowledge, and know-how-oriented practice works with refined disciplinary knowledge to develop practical know-how. As such the progression constitutes an increase in the sophistication of the study practice and involves an increase in the sense made of information and theory, and in the degree of consolidation, integration, and refinement of understanding and the relatedness of that theory to the real world.

In the study, it was found that while an individual student may be oriented to exercise several of the categories of practice under different circumstances, the range of practices they might exercise is constrained by their prior experience. Specifically and logically, students cannot be *oriented* to exercise categories of study practices with which they have had no prior experience. This observation provides a simple basis for characterizing the theory-focused study practice of individual students, namely by indicating the *most sophisticated level* of practice with which they have had prior experience. This observation was used as a basis for characterizing the students' learning practice and evaluating the extent to which these changed during their first year at university. So for example, a student could be characterized as having a theory-focused study practice at a consolidation level if their prior experience included a consolidation-

Table I

Categories in students' theory-focused study practice

	Category	Description
1	Information-oriented practices	Oriented to learning facts, formulae, or information by assimilating, memorizing, or cramming that information with no particular regard for its meaning or relevance.
2	Comprehension-oriented practices	Oriented to making sense of course material by reading through it, going through it, or working through it in order to develop personally comprehended theory with no particular regard for consolidating or restructuring the material as it is presented in the course.
3a	Consolidation-oriented practices	Oriented to consolidating or reinforcing personally comprehended theory by using consolidation tools such as vocalizing, memorizing, or summarizing in order to develop personally consolidated theory with no particular regard for refining it beyond the content or structure presented in the course.
3b	Integration-oriented practices	Oriented to further consolidating and reinforcing personally comprehended theory by integrating the learning of theory and the development of problem-solving skills so that appropriate problems are selected and worked on for the express purpose of consolidating one's grasp of the theory.
4	Refinement-oriented practices	Oriented to deepening personal mastery of consolidated theory by using refinement tools such as restructuring, self-questioning, elaborating, concept maps, or visualizing in order to develop a personally refined grasp of disciplinary knowledge with no particular regard for how it relates to real-world situations.
5	Know-how-oriented practices	Oriented to deepening personal mastery of disciplinary knowledge by relating it to real-world situations in order to, implicitly or explicitly, develop practical know-how.

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oriented practice and did not include more sophisticated practices such as integration-, refinement- and know-how-oriented practices.

Findings of the study

The extent of change in students' theory-focused study practices

The extent of change of each student's theory-focused study practice during their first year at university was gauged by the degree to which their practice appeared to have shifted from one category of practice to another. Four types of change were evident and were labelled 'no change', 'minor change', 'adapted', and 'shifted'. 'No change' speaks for itself. Changes labeled as being 'minor' were ones in which the small degree of change reported by a student was considered to have involved only their adjustment to the teaching and learning environment and not a discernible change in the study practice itself. Changes labelled as 'shifted' were those where a student's practice had 'shifted' from one category of practice to another. Change labelled as 'adapted' is an in-between category where some change was clearly discernible but did not involve a shift from one category to another; it consisted of discernible change within one category of practice. For example, several students with a consolidation level of practice on entry did not shift to another category but reported that, at the end of the year, they paid more attention to developing understanding than they had done at the beginning of the year.

For convenience the five levels of theory-focused study practice were coded SP1 to SP5 (Study Practice level 1 to 5), which correspond respectively to information-, comprehension-, consolidation/integration-, refinement-, and know-how-oriented practice respectively. The study practice of several students appeared to lie somewhere between these categories, either because the data was unclear or because some students reported having had some experience at a level of practice more sophisticated than the one at which they tended to operate. In such cases, the researcher's discretion was exercised to represent the actual level of practice as appropriately as possible – either at the less or

more sophisticated level or as somewhere between.

Of the 27 students, 10 (37% of them) shifted their practice, three students (11% of them) adapted their practice but did not change category, two students (7%) appeared to change in only minor ways, while 12 students (44% of them) did not appear to change their study practices at all. Interestingly, one student adapted his practice by trying out some of the strategies recommended in class. However, after finding they 'didn't work for him', he intentionally reverted back to the practice he had used at school.

Figure 1 breaks the results down further to explore the extent to which students who entered university with a particular category of practice changed that practice. The breakdown is presented both in the form of a bar chart and as an accompanying table – the information in both is the same.

The figure indicates the following. Ten students entered university with relatively unsophisticated study practices – up to and including comprehension-oriented practice (SP2 and SP1/SP2 categories) – and had much scope for improving the quality of their practice (they could progress to levels SP3, SP4, or SP5); it was important for them to do so if they were to improve their academic prospects at university. Of these 10, the majority (7 of the 10) shifted their practice, one adapted, but two did not appear to change their practice at all. However, in all but one case, the extent of change involved only a shift to the next most sophisticated level of practice.

At the other end of the spectrum, nine of the students entered university with relatively sophisticated study practices – up to the level of refinement-oriented practice and also those with some know-how oriented dispositions (SP4, SP3/SP4, and SP4/SP5 categories) and did not have as much scope for improving their practice (they could only progress to SP5). The majority of these (8 of the 9) did not change their practices or made only minor changes and only one adapted their practice.

Between these two groups of students were those who entered university with an intermediate level of study practice – practice up to the level of consolidation-oriented practice (SP3 and SP2/SP3 categories). Here, the scope to improve their study practice was still substantial – they could progress to SP4 and SP5. Of the eight students with this profile, only

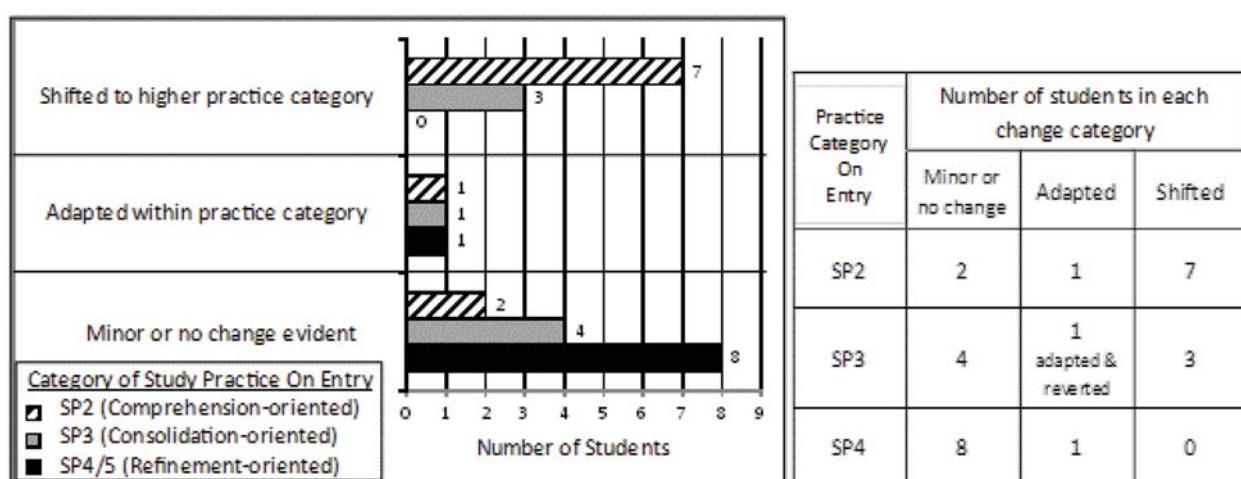


Figure 1 – How students (with different study practices on entry) changed their practice

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three shifted, one adapted (and then reverted to his old practice), and four did not appear to change or only made minor changes to their practice.

The dynamics of change

With regard to the dynamics behind students changing their learning practices, data from only 15 students was available; the other 12 students appeared not to have changed their practice at all. Of the 15 where some degree of change was evident, two had changed little, three had 'adapted' their practice, and 10 students had 'shifted' their practice. The findings from the study are as follows.

- *The extent of change appeared to be limited to crossing from one practice category or subcategory to the next most sophisticated.* This was the case with five of the 10 students who shifted their practice. The study practices on entry of four of the 10 students were between two adjacent categories and the change appeared to involve moving more fully into the more sophisticated practice
- *Most students who realized they needed to be serious about changing their study practice seemed to take about half the academic year to reach this conclusion.* Of the 15 students who indicated they had changed their study practice in some way – minor change, adapted, or shifted – only five started to do so in the first semester. Of these, two were making only minor changes to their practice, and two were responding to class input
- *Few students shifted their study practice as a result of class or textual input on the subject.* Of the 13 students who shifted or adapted their practice, only three did so as a result of formal input in class and one as a result of receiving a faculty newsletter on study skills
- *The primary driver of change in study practice appeared to be the stress created by getting poor grades and the students' recognition that their current study practices weren't 'working for them' in the sense of not facilitating the achievement of satisfactory grades.* Even in the case of the four students who responded to formal input on study practice, two of them appeared to be responsive because their current practice was not 'working for them'. Of the 13 students who adapted or shifted their practice, only three were not pushed by marks pressure to change their study practice. Two of these took their lecturer on trust and started using recommended study strategies. The other made the change through a 'eureka experience' of discovering the efficacy of using summaries effectively when preparing for a mid-year supplementary mathematics examination
- *Poor performance in the first semester appeared to be far less of a change driver than poor mid-year marks.* Of the nine students who were pushed towards change by pressure directly or indirectly because their practices 'were not working for them', only two did so on the basis of poor performance in first semester tests and assignments. For the other seven it appeared to take poor performance in what they perceived to be their 'major' assessments – namely, the mid-year examinations – before poor grades had the impact of pushing them towards change.

The following extract gives other reasons why poor performance in the first semester did not seem to have the impact of poor performance at mid-year. The student in question felt she could still catch up; she was still adjusting to 'varsity; and she didn't realize that it was her study practice that needed to change. (In the extract, statements by the interviewer are italicized to distinguish them from statements by the students.)

'OK, I changed when I come back now, the 2nd semester, 'cuz I've seen already ... the way I am studying it was not working. ... There was something serious that needs to be done or else I am just going to end up regretting. Ja. *You didn't realize that after the first set of tests after the 1st quarter?* Not really. *Why was that?* I think it's because I used to tell myself that I'm going to catch up ... [But] I've been trying to catch up and still it's not working. So now it's like, OK. *You did have results at the beginning of 2nd quarter.* Ja, I did but I just thought ... I'm just adjusting to varsity life, all those things [laughs] and then I can see that no, it's actually the way that I am studying, it's not really that effective. *So it took until mid-year. What made you realize that it wasn't working?* 'Cuz I was still not progressing. *By progressing, what were you looking at?* I'm looking at passing as a whole, you find that some of the things I am passing, but not ... really that much even though some I was failing like really failing, but now, since I have started practicing these things [the new practices], that's why I have so much hope and so, so much confidence in myself 'cuz I've seen that it's working [in] the second [semester]. I am actually passing and I thought I was never going to pass like that.

Discussion

The limitations of the study findings are fairly obvious. The findings derive only from the student's perspective and from student reports, and more objective data was not included in the analysis. In addition, the number of students in the study was quite small (27) and only 10 to 13 of these appeared to have changed their learning practice to any discernible degree during their first year at university. Accordingly, the findings are not generalizable and provide only indications. However, the indications are very interesting.

In the first place they are in accord with the literature discussed earlier. The stability of the study practices is clearly evident in that many students tended to continue with the practices they were used to until they came to the realization that these practices were 'not working for them' and some kind of change was necessary if they were to succeed academically. In the study there was no evidence of students being consciously 'resistant' to change in the manner described by Dembo and Seli (2004) and Yuksel (2006). It appears that many students were quite open to changing their study practice once they became aware that this was necessary. What can be said, however, is that these students were consciously resistant to change only in that *they were not aware or convinced that change was or might be necessary*. This possibility is not mentioned by Dembo, Seli, or Yuksel and so should be added to the list of ways in which 'conscious resistance to change' can manifest.

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'Unconscious resistance to change', derived from the difficulty associated with changing one's practice, was clearly evident among the students. It was partially evident in statements made by students about how difficult it was to change. It was also evident from the observation that when students did attempt to modify their practice the extent of modification was only modest – change was limited to shifting from the current category of practice to the next most sophisticated category.

There are two significant pedagogical implications of the study findings that stand out: the need to open students' awareness about alternative study practices and the possibility that they might need to modify their own practice; and the effect of the diversity of student practices on the design of 'study skill' interventions.

The need to open student awareness

It was noted earlier that, despite considerable input in class on the need for students to give serious attention to their study practices, many students appeared to remain unaware or unconvinced that such attention might be necessary. Even when warning indications such as poor grades in first-semester tests were evident to students, some failed to realize their need to modify their study practice because they attributed the problem to other factors such as 'I am still adjusting' or 'I am just behind and can catch up'. It was clear from the study that, with the majority of students, class input was not effective in bringing about the necessary shift in awareness. Only the pressure of poor performance in 'tests that count' (such as mid-year exams) appeared to have the necessary 'power' to generate the needed 'wake-up call' for those students who needed to change their study practices.

These observations have several pedagogical implications. First, teachers need to find effective measures for generating the necessary wake-up call as early in the year as possible. The study findings suggest that without such measures, hearing the wake-up call will probably take about half the academic year for most students who need to hear it and this may very well be too late. Secondly, poor marks in 'tests that count' appear to be the most effective vehicle for conveying that call, and assessments should be designed and scheduled accordingly. Finally, while some input on study skills is needed early in the year (*e.g.* for those who will pay attention to it), some thought should be given to reviewing this input in class at whatever point in the academic year students begin to be convinced that they need to modify their study practices and are therefore more open to paying serious attention to the input provided.

The effect of diversity in student study practices

The study identified three groupings of students with different levels of study skills and different attitudes towards modifying their study practices. The first grouping consists of students with study practices at the comprehension level. From the study findings, it appears that such students are typically open to or are 'open to becoming open' to developing their learning practices once they become aware of the limitations of their current practice. The comments made earlier, about the need to engineer circumstances that foster the opening of students' awareness about alternative study practices and their need to modify them, apply to these

students. In view of the extent of change that students in this grouping must negotiate, it is important that such awareness is developed as soon as possible in the academic year and that appropriate instruction, materials, and student support should be provided early in the year so that these students have available what is needed for them to begin the process of changing their learning practice when they become serious about wanting to do so.

The second grouping of students consists of those with a consolidation level of study practice. Here the pedagogical challenge is somewhat different. The indication from the study is that if these students do make the effort to improve the quality of their learning practice they are likely to be successful in developing to the refinement level of learning practice. The problem with these students lies in the word 'if'. Only about-half of the students in the study made the effort to modify their learning practice. It seems that with these students, the level of sophistication of their learning practice is high enough that it can mask their need to develop it further. Accordingly, it is particularly important to provide measures for sensitizing these students to their need for change and development – to engineer the 'wake-up call' discussed earlier.

The third grouping of students consists of those who enter university with a refinement level of study practice. Here a different kind of wake-up call is needed because these students do not appear to recognize that there is still room for them to develop their learning practice further – *i.e.* to the know-how level. To help students to gain this awareness, formative 'what if' or 'think about' exercises could be incorporated in tutorials or in lectures and possibly in tests as optional questions. The purpose of these formative measures should be made clear to the students; they should be presented as forerunners to 'higher level, world-related' questions that will appear in tests/exams later in the year when all students have had a chance to develop their learning practice to the extent needed to address such questions effectively.

Conclusion

The study described in this paper set out to address a number of questions about how, when, and why students modify their study practices. The findings suggest that, with regard to study practices, there is considerable diversity among South African students entering engineering education today. Many enter with practices at only a comprehension level and must develop their practice to at least a refinement level in order to improve the quality of their learning and their chances of passing. Some enter with a consolidation level of practice which, although more sophisticated in nature, still requires further development to raise the quality of their learning and to improve their chances of performing well academically. However, these students are more 'resistant to change' in that it is more difficult for them to become convinced that they do need to pay attention to modifying their study practice. Students who enter with a refinement level of study practice do not have much scope for developing their practice further but can benefit from developing to a know-how level of practice.

The findings with regard to the dynamics of change

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associated with modifying one's study practice suggest that opening the awareness of students with regard to the possibility that aspects of their learning practices need to change is critical but difficult to engineer. For students who enter with comprehension and consolidation levels of study practice, it appears that the most effective means for engineering the appropriate wake-up call is to implement 'tests that count' early in the academic year so that students who are likely to perform poorly come to this realization as early as possible. (Obviously, care must be taken that such assessments should contribute to their final mark only to the extent necessary for an effective wake-up call to be engineered, and should not count so much that failure in these assessments is demoralizing and cripples their chances of passing the year.) For students who enter with a refinement level of study practice a different kind of sensitization appears to be necessary – one that is more motivational in nature and facilitates reflection and deepens interest in how the material being learned is relevant to real-world situations.

Although the findings presented in this paper are idiosyncratic to the students involved in this study, it is very likely that the conclusions that have been reached are more widely applicable to entrants to South African engineering education in general.

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