Making sense of contextualised tasks in *Prevocational Mathematics*: a critical discursive perspective

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Abstract

This study investigated how, and how much, one school’s Prevocational Mathematics students and teachers drew on the new reform discourses for senior schooling in general and senior school mathematics/numeracy in particular to make sense of the contextualised tasks that were an integral part of the subject. It is situated within a critical research perspective that conceptualises mathematics education as a complex, multi-layered network of social practices.

Critical Discourse Analysis (CDA) provided the main theoretical and analytical foundations for the study. An approach to CDA that foregrounds the relationship between discourse and social change was considered to be particularly salient for investigating the subject-specific translation of senior schooling reforms into the Prevocational Mathematics syllabus and their subsequent enactment in the classroom. The notion of recontextualisation—a process of relocating elements of one social practice in the context of another—was central to the conceptualising of policy discourses (instantiated in curriculum reform and subject-specific syllabus documents) and classroom discourses (instantiated in written task specifications) as links in a genre chain. The process of operationalisation, whereby changes in discourse are transformed into new ways of acting and interacting, and new ways of organising time and space also contributed to the conceptual framework. Together, the concepts of genre chains, recontextualisation and operationalisation were used to theorise the research ‘across the nodes’ of the network of social practices. Thus, the study traced (dis)continuities between (i) the discourses associated with senior school educational reform processes, (ii) their recontextualisation and operationalisation into subject-specific discourses in the Prevocational Mathematics syllabus, and (iii) the further recontextualisation and operationalisation of these discourses in the classroom practices of one school’s Year 11 and 12 classes.

Four key discourses identified in the initial reform document—discourses of inclusion, diversification/flexibility/choice (combined because of their close interdiscursive ties), vocationalism and support—were traced through to the syllabus document and classroom texts. By following these discursive threads across the fields of policy reform, syllabus development and classroom practice, the analysis
showed how multiple discourses were articulated together in shifting configurations in the policy and classroom texts. The disentangling of multiple discourses revealed how discursive tensions emerged as system-wide reforms were interpreted and translated in subject-specific ways first by syllabus developers and then by teachers (and students) as they were enacted in Prevocational Mathematics classrooms. Teachers and students drew on a range of senior school and mathematics education discourses promoted by the reform and syllabus documents. They seemed willing to take up the policy imaginations of an alternative approach to learning mathematics. However, at times they struggled to align these discourses with more traditional ones that still held currency in the hierarchical structure of senior school mathematics.

A key contribution of the study is its examination of classroom practice in a previously neglected sector of senior schooling. It corroborates research that has drawn attention to the problematic aspects of contextualised mathematics tasks with other student cohorts (e.g. that they often make assumptions about shared understandings of the contexts themselves and the implicit rules about what aspects of contextual knowledge are appropriate for consideration in a mathematical task; and that they may limit student access to the more highly valued, abstract, disciplinary knowledge of mathematics). But, while much of this research foregrounded the differences between abstract and everyday knowledge, this study’s critical discursive perspective shifts the focus to practice. Contextualised tasks in Prevocational Mathematics were shown to be different to traditional mathematics tasks, not just in terms of knowledge. They were also conceptualised as an alternative genre in that they invited students and teachers to enact new forms of teacher-student relations.
Statement of originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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Jill Ryan
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<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACARA</td>
<td>Australian Curriculum, Assessment and Reporting Authority</td>
</tr>
<tr>
<td>BGC</td>
<td>Bankside Girls' College (a pseudonym for the secondary school where the fieldwork was undertaken)</td>
</tr>
<tr>
<td>CDA</td>
<td>Critical discourse analysis</td>
</tr>
<tr>
<td>ETRF</td>
<td>Education and Training Reforms for the Future</td>
</tr>
<tr>
<td>MCEETYA</td>
<td>Ministerial Council on Education, Employment, Training and Youth Affairs</td>
</tr>
<tr>
<td>NAPLAN</td>
<td>National Assessment Program – Literacy and Numeracy</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PVM</td>
<td>Prevocational Mathematics</td>
</tr>
<tr>
<td>QCE</td>
<td>Queensland Certificate of Education</td>
</tr>
<tr>
<td>QSA</td>
<td>Queensland Studies Authority</td>
</tr>
<tr>
<td>SAS</td>
<td>Study area specifications (for Prevocational Mathematics)</td>
</tr>
<tr>
<td>SCOTESE</td>
<td>Standing Council on Tertiary Education, Skills and Employment</td>
</tr>
<tr>
<td>SET plans</td>
<td>Senior Education and Training plans</td>
</tr>
<tr>
<td>TAFE</td>
<td>Technical and Further Education</td>
</tr>
<tr>
<td>VET</td>
<td>Vocational education and training</td>
</tr>
</tbody>
</table>
Acknowledgements

Without the generosity of the teachers and students of the Year 11 and 12 Prevocational Mathematics classes at Bankside Girls’ College (a pseudonym), the collection of data on which the classroom component of this study is based would not have been possible. I owe a debt of gratitude to them and to the college principal for allowing me access to the classes.

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During my candidature, I have worked in secondary schools and on several university teaching teams and research projects. There is not enough space here to fully explain how much I have benefited from sharing office space and working with diverse groups of colleagues in teaching and research roles. However I am sincerely grateful for the opportunities that working with them have made to the development of my own thinking, and ultimately to the completion of the thesis.

Final thanks go to Michael, Rosie, Thom and Chris for their unwavering support. Over the years they have listened patiently to many iterations of developing arguments when I’ve had little else to contribute to the conversation during #ryanfamilydinners. They have surely heard more about senior schooling, mathematics education and critical discourse analysis than they ever imagined they would need to.
Chapter 1

Introduction

The motivation for the study

This study investigates how one school’s students and teachers made sense of contextualised tasks in Prevocational Mathematics, a subject offered to students in the senior secondary years in Queensland schools. Across Australia, in the later years of schooling, “terminal” (Teese & Polesel, 2003), “low” level (Dekkers & Malone, 2000), or “fundamental” (Ainley, Kos, & Nicholas, 2008) mathematics subjects have been available for students who do not require specialised mathematical foundations for tertiary study, for many years. However, subjects such as Prevocational Mathematics, which have been designed specifically for senior secondary students who have achieved limited success in mathematics in their earlier schooling, are a more recent offering.

The topic for the study was initially prompted by a dilemma grounded in professional practice. On the one hand, the syllabus specifications for Prevocational Mathematics (Queensland Studies Authority [QSA], 2004a) recommended teachers design learning experiences around “meaningful”, “realistic” or “real life” tasks. “Contextualised learning” it was argued was “more likely to interest and motivate students” (p. 34) who had previously had limited success in school mathematics. “[R]eal and meaningful” assessment for such students would be “practical and realistically related to the world of work, personal organisation, and interpreting society” (p. 41). Contexts that had relevance to students would “foster cooperation”, be “supportive, enjoyable and non-competitive” and enable students to “develop positive attitudes towards the use of mathematics” (p. 1). Teachers therefore needed to provide students with a range of learning experiences including “concrete, practical, hands-on activities” drawn from “a variety of everyday and workplace contexts” (p. 7) that would present opportunities for them to “work together and in teams” (p. 4). Furthermore, contextualised learning would “provide opportunities for
success and show them that mathematics is a necessary lifeskill that can also be fun” (p. 34).

However my professional experience suggested that groups of teacher-colleagues and class groups of students held a range of views about what might be considered realistic, meaningful, and motivational, let alone fun, contexts. The unproblematic assertions made in the syllabus were at odds with classroom experiences that suggested not just that some students might fail to engage with—a particular contextualised task, but that such ideal tasks might not be possible in student cohorts marked by diversity. Moreover, there seemed to be reluctance on the part of some students to engage with this alternative approach to learning. This reluctance appeared to stem from their previous experience of traditional ‘real’ school mathematics. That is, not only did some teachers hold, perhaps predictably, firm ideas as to what counted as mathematics learning, so too did many students. Alternative approaches framed around contextualised tasks challenged these notions.

The next section describes how these personal observations of the disconnection between policy and practice were transformed into a research issue of wider significance. First, an outline of policy initiatives which saw Prevocational Mathematics become a more likely choice for senior students in many Queensland schools situates the study into a broader policy context. Next, a comparison of the four mathematics courses made available to Queensland senior students highlights the distinctive features of Prevocational Mathematics—what set it apart as a new subject designed to cater for a new category of student. The lack of Australian or international research that looks specifically at subjects like Prevocational Mathematics is then briefly discussed as a preamble to the particular research focus adopted for the study.

**The policy and research context**

Australia’s education system, like others around the world, has increasingly come under pressure to respond to widespread social, economic, political and cultural changes (National Curriculum Board, 2009). Apple (2000) located such calls for reform in a neoliberal view of education that he characterised as underpinned by
“seemingly contradictory discourses of competition, markets, and choice on the one hand and accountability, performance objectives, standards, national testing, and national curriculum” (p. 244). Drawing on research in Australia and New Zealand, Davies and Bansel (2007) similarly noted that a neoliberal market ideology had been translated into the field of education through policies that gave weight to individual choice and system accountability.

It was within this context that the state of Queensland initiated the Education and Training Reforms for the Future (ETRF) (Queensland Government, 2002). A major plank of the initiatives was the reform of the Senior Phase of schooling to encourage greater numbers of students to remain at school to Year 12 in some form of education or training. This reform resulted in a more diverse group of students remaining in senior schooling than was the case in previous years, and consequently schools offering a wider range of learning options for completing post-Year 10 education.

One aspect of the reforms that had particular consequences for the discipline of mathematics at the senior level was the inclusion of minimum numeracy standards in the Queensland Certificate of Education (QCE)—a new senior school qualification established as part of the ETRF. There were avenues available for a student to be awarded a QCE without completing a mathematics subject in Years 11 and 12. However, many schools developed a practical and vocationally oriented subject, Prevocational Mathematics or a Numeracy short course to complement the existing range of more academically oriented senior mathematics subjects, developed at the state level by the Queensland Studies Authority (QSA). The two Authority-

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1 In 2006, legislation was introduced in Queensland, which mandated a period of compulsory participation that required all young Queenslanders to be ‘learning or earning’. That is, unless young people were in full-time employment, they would be required to participate in some form of education or vocational training
   • for two years after they completed compulsory schooling or
   • until they turned 17 years of age or
   • until they completed the Queensland Certificate of Education or a Certificate III vocational qualification. (Queensland Government, 2006, p. 153)

2 In Queensland, Authority subjects (such as Mathematics A, B and C) are based on syllabuses that have been approved and issued by a statutory body responsible for syllabus development including issues of assessment accreditation and certification—the Queensland Studies Authority (QSA) at the time of the study. The Queensland Curriculum and Assessment Authority (QCAA) replaced the QSA
registered subjects (Prevocational Mathematics and Numeracy) offered students who previously may have had limited success in school mathematics a way of meeting the numeracy requirement of the QCE. According to their documentation, the subjects were designed to offer such students one more chance during their school life to develop positive attitudes towards mathematics, become more proficient in basic number skills, and develop their understanding of basic mathematical concepts in real-life contexts (QSA, 2004a, 2006).

Queensland was not alone in offering such subjects as a response to neoliberal imperatives. Other Australian states developed policies and enacted legislation to improve senior school retention rates premised on a belief that students would need to be prepared to participate fully in a more highly skilled workforce and more complex society, see for example New South Wales Government (2009), Victorian Government (2008) (Thomas & Hay, 2012). The subsequent changes evident in senior school mathematics offerings across Australia are discussed next.

**A policy imperative: the expansion of terminal mathematics subjects in senior schooling in Australia**

The category of ‘terminal’ mathematics subjects was proposed by Teese and Polesel (2003) to differentiate between preparatory and advanced mathematics subjects, which prepare senior secondary school students for the study of mathematics at the tertiary level and terminal mathematics subjects, which do not. An inquiry into the promotion of mathematics and science education in Victoria (Education and Training Committee, 2006) noted the growth in participation in senior level mathematics in recent years in that state had occurred largely through an increase in the numbers undertaking terminal subjects.

The trend in student numbers in terminal mathematics subjects in Victoria is also evident in Queensland. In Queensland, the Authority-registered Prevocational Mathematics and the Numeracy short course, along with the Authority subject, in 2014. Authority-registered subjects (such as Prevocational Mathematics) differ from Authority subjects in that they were developed by schools from study area specifications (SASs) provided by the QSA. Generally Authority-registered subjects include vocational and/or practical components. The terms ‘syllabus’ and ‘study area specifications’, abbreviated to SAS, are used interchangeably in the thesis to refer to the syllabus document for the subject Prevocational Mathematics.
Mathematics A, would be considered terminal subjects. Of the two Authority subjects, Mathematics B would be considered a preparatory subject and Mathematics C an advanced subject. Table 1.1 shows the total enrolments (combined Years 11 and 12 numbers), and these expressed as a percentage of the total enrolments, in senior Mathematics subjects in Queensland schools in 1999, 2004, 2008 and 2013.

**Table 1.1** Year 11 and 12 combined student enrolments\(^1\) in senior Mathematics subjects in Queensland (1999 - 2004 – 2009 - 2013)

<table>
<thead>
<tr>
<th></th>
<th>1999 enrolments (% of total maths enrolments)</th>
<th>2004 enrolments (% of total maths enrolments)</th>
<th>2008 enrolments (% of total maths enrolments)</th>
<th>2013 enrolments (% of total maths enrolments)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics – Authority Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maths A</td>
<td>40230 (44.3%)</td>
<td>43077 (44.4%)</td>
<td>47735 (44.1%)</td>
<td>52723 (43.8%)</td>
</tr>
<tr>
<td>Maths B</td>
<td>34839 (38.3%)</td>
<td>34007 (35.0%)</td>
<td>33377 (30.1%)</td>
<td>36282 (30.2%)</td>
</tr>
<tr>
<td>Maths C</td>
<td>6901 (7.6%)</td>
<td>6817 (7.0%)</td>
<td>7011 (6.5%)</td>
<td>6346 (5.2%)</td>
</tr>
<tr>
<td><strong>Mathematics – Authority-registered subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevocational Maths (or equivalent)(^2)</td>
<td>4506 (5.0%)</td>
<td>9554 (9.8%)</td>
<td>19895 (18.4%)</td>
<td>24131 (20.1%)</td>
</tr>
<tr>
<td>Other</td>
<td>4404 (4.8%)</td>
<td>3594 (3.7%)</td>
<td>332 (0.3%)</td>
<td>812 (0.7%)</td>
</tr>
</tbody>
</table>

**Total enrolments** | 90880                                        | 97049                                        | 108350                                        | 120294                                        |


1. Students who are enrolled in Maths C are likely to be concurrently enrolled in Maths B i.e. number of enrolments does not equal number of students.


The first two years’ figures (1999 and 2004) show the general trend in enrolments across senior Mathematics subjects prior to the development of Prevocational Mathematics—its implementation in schools commenced in 2005 (Cordiner & Trussler, 2005). The 2008 figures present the corresponding proportions for the combined first and second cohort of students to be subject to the new senior schooling arrangements resulting from the ETRF. That is, the total enrolments capture the Year 12 students who were the first group to be eligible to receive a QCE, and the Year 11 students who would go on to be eligible to receive a QCE in
The most recent 2013 figures are indicative of the senior mathematics enrolment trends since then.

Looking first at the preparatory and advanced mathematics subjects, Mathematics B and Mathematics C, it is evident that numbers of enrolments remained fairly steady over the 15 years between 1999 and 2013. However, when considered as a proportions of the total enrolments in senior mathematics there was an overall decline in both subjects—from 7.6% in 1999 to 5.2% in 2013 in Mathematics C, and from almost 40% of students in 1999 to just over 30% in 2013 in Mathematics B. In contrast, the number of enrolments in Mathematics A—a terminal subject, though results in the subject can be used to rank students for entrance to tertiary institutions—rose over the period. However as a proportion of total enrolments, they also remained relatively steady.

More striking has been the increase in enrolments from Trade and Business Mathematics (the precursor to Prevocational Mathematics before 2005) to the Prevocational Mathematics numbers in 2008 and 2013. Some of this might be accounted for by the consolidation of a wide variety of other school-developed subjects into alignment with the Prevocational Mathematics specifications. Nevertheless, it is clear that in 2008 and 2013 this group made up a significantly larger proportion of the overall senior mathematics enrolments than in the previous decade. In 1999, only about 5% of the total mathematics enrolments were in Trade and Business Maths. By 2008 this had increased to around 20% in Prevocational Mathematics and has remained at this level. Even if the ‘Other’ enrolments are combined with the Trade & Business Maths enrolments in 1999, there was still a doubling in the proportion of senior mathematics students completing terminal mathematics subjects over the 15-year period.

The Queensland and Victorian trends in enrolments in mathematics in senior secondary schooling were shown to be Australian-wide trends by Ainley et al (2008). They drew on a number of research studies carried out since 2000 to develop a three-tier categorisation of Year 12 mathematics subjects across Australia, which they used to analyse student participation. In line with the Victorian and Queensland trends outlined above, they concluded that over the previous decade there had been a fall in
participation in advanced and intermediate mathematics (equivalent to Teese and Polesel’s (2003) advanced and preparatory categories) and a rise in participation in lower level mathematics (i.e. terminal subjects which do not provide a suitable mathematical foundation for tertiary study).

Queensland’s senior mathematics curriculum offerings are described next to illustrate how one Australian state responded to the more diverse group of students remaining at school until the completion of Year 12. The discussion emphasises some of the distinctive features of Prevocational Mathematics—the focus of this study—by briefly comparing it with Queensland’s other senior mathematics syllabuses.

**Translating policy into curriculum: the example of Prevocational Mathematics in Queensland**

The syllabus documents for the Authority-registered subject Prevocational Mathematics (QSA, 2004a), and the Authority subjects, Mathematics A, B and C (QSA, 2008a, 20008b, 2008c), provide a map of the mathematics curriculum in senior schooling in Queensland. The documents have a common structure that facilitates comparisons between them. Each syllabus document includes elements such as a rationale and a statement of aims; statements about what students are expected to learn, written in terms of categories of objectives and topics for study; lists of suggested experiences that will enable students to reach these objectives; and approaches to assessment that will evaluate student achievement and related standards to describe it. (See Appendix 1 for a summary of the comparison of the four syllabus documents.) While there are expected differences in subject content and organisation, a significant addition to the *Study Area Specification [SAS] for Prevocational Mathematics* (QSA, 2004a) is the discussion of appropriate learning experiences for students and the inclusion of detailed examples of appropriate tasks and courses of study. Another significant difference for Prevocational Mathematics is that it alone recognises a distinctive type of learner, with particular needs, who is likely to be taking the subject.

In brief, the document states that teaching and learning in the study area are seen to be different from teaching and learning in Authority mathematics subjects (p.
25). For example, the subject incorporates “concrete, realistic hands-on experiences” (p. 6) and assessment tasks that should be “genuinely contextualised [so that they are] real and meaningful to the student” (p. 41). The emphasis on contextualisation is a key difference in terms of organisation between the Prevocational Mathematics syllabus and the Authority subjects’ syllabuses. Although all four syllabuses acknowledge the importance of applying mathematical skills and knowledge in “real-world situations” (QSA, 2008a, p. 43; 2008b, p. 42; 2008c, p. 50), only the Prevocational Mathematics syllabus proposes that contexts rather than mathematical topics (e.g. probability, geometry) are a viable approach to course organisation (see Appendix 1). The rationale for such an approach is premised on a view of students many of whom come to the classroom with negative attitudes and beliefs that prevent them from engaging in mathematical tasks in meaningful ways and from trusting their own mathematical intuitions. For many, negative attitudes towards mathematics initially develop in response to early school experiences of failing to understand, followed by a lack of further explanations or assistance from the teacher, leading to a loss of confidence and panic over the loss of control of his or her own learning.

As these experiences are repeated, the student feels frustrated and assumes it is futile to expect to understand mathematics. Finally, the student ‘switches off’ to distance him/herself from the situation. (QSA, 2004a, p. 28)

Based on these expectations of students, the subject is designed to build [students’] confidence and success in using mathematics in everyday contexts by reducing or removing anxiety when doing mathematical activities; by countering deep-seated negative beliefs and attitudes towards mathematics learning (through providing a supportive environment and scaffolded activities in which students can succeed); and by increasing students’ repertoire of skills with practical time-saving strategies. (QSA, 2004a, p. 25)

The Prevocational Mathematics guidelines suggest that there will be little variation in the type of students who will take the subject. This particular view of students was likely predicated on the fact that students enrolling in Prevocational Mathematics were only expected to have reached the equivalent of level 3/4 outcomes of the *Year 1-10 Queensland mathematics syllabus (2004)* (QSA, 2004b), levels which many other students may have reached during their early secondary school years. In comparison, students commencing studies in Mathematics A, B or C
should have consistently demonstrated outcomes at (or beyond) Level 6 of the *Years 1 to 10 Mathematics Syllabus* (QSA, 2008a, 2008b, 2008c).

The Prevocational Mathematics guidelines though are adamant that earlier lack of success in mathematics learning should not be seen in terms of cognitive deficits. Rather, gaps in students’ mathematical knowledge should be seen as a way of better understanding how students construct meaning (p. 29). The syllabus constructs the problem of poor performance in previous mathematics testing in terms of students’ lack of confidence and negative attitudes rather than in terms of lack of ability. Thus, the solution is couched in terms of supporting learning through a range of strategies that enable students to see mathematics as useful and meaningful.

The distinctive focus in Prevocational Mathematics on useful and meaningful mathematics is also evident in comparing the rationales of the four mathematics syllabuses (see Appendix 1). The rationale for Prevocational Mathematics is expressed in different terms from the rationales of the other three syllabuses. Prevocational Mathematics is explicitly “designed to help students improve their numeracy” with numeracy defined as the “effective use of mathematics to meet the general demands of life at home, in paid work, and for participation in community and civic life” (p. 1). In contrast, the Mathematics A, B and C syllabuses all justify the studying of mathematics as being an integral part of a general education which enhances students’ understanding of their world and the quality of their participation in society. Like Prevocational Mathematics, Mathematics A also acknowledges the functional or utilitarian role of mathematics. However, Mathematics A remains aligned with Mathematics B and C in its justification of the study of mathematics in terms of “understanding” rather than “use” and the absence of any mention of numeracy. Significant in this respect is that Prevocational Mathematics students are regarded as young adults, a designation not made in the other syllabuses. In line with this labelling, many of the resources and strategies proposed for them are drawn from adult numeracy research and practice.

While the descriptions of the stereotypical Prevocational Mathematics student and the sorts of meaningful learning experiences that will engage them and build their confidence in using mathematics may be appealing in a commonsense way, the
research evidence to support this view is rather more tenuous. The initial review of literature (discussed next) indicated that there had been little research undertaken in terminal mathematics classes, let alone research that examines the focus of this study—how students and teachers make sense of the alternative approaches, grounded in contextualised tasks, advocated by the Prevocational Mathematics syllabus.

**Research on terminal mathematics subjects**

A broad understanding of young people’s participation in terminal mathematics subjects can be obtained from research on overall participation in senior schooling in Australia. For example, a large, nationally representative, longitudinal study linked data about students’ Year 12 subject participation (in 2001) with information about their prior educational and social background (Fullarton, Walker, Ainley & Hillman, 2003). Using a similar three-tier categorisation to Ainley et al. (2008), Fullarton et al. undertook a multivariate analysis to show that gender, earlier achievement, aspirations to higher education and language background, all appeared to influence the type of senior mathematics in which students enrolled. In another study, the hierarchical curriculum structure of senior mathematics was used by Teese and Polesel (2003) to illustrate how diversification of the curriculum can result in greater social access to senior secondary schooling for particular groups—girls and working class students in the case of mathematics. Nevertheless, they suggested that the “quality of the learning experience”, particularly for those enrolled in terminal mathematics subjects remained problematic.

The hierarchy of mathematics options seeks to accommodate the range of attitudes and the range of achievements on which these are based. It acts as a structure for promoting young people whose success already supports positive attitudes and for conferring honour on them for making the scholastic shift that further progress in mathematics requires. But at the same time it casts weaker learners down into inferior streams where the quality of their learning experience shows no improvement. (Teese & Polesel, 2003, p. 104)

More recently, Helme and Teese (2012) confirmed that a differentiated mathematics curriculum in senior secondary schooling is no guarantee of an equitable experience of mathematics or more equitable outcomes. Drawing on student survey data from a diverse set of Victorian secondary schools, they observed
that girls and students from lower socio-economic backgrounds are more likely to be enrolled in the less demanding subjects. Students’ perceptions of mathematics classrooms and mathematics teachers also varied according to the level of subject, gender and social background. Student responses suggested that reforms to both curriculum and pedagogy were required, and that there was a need “to provide enough trained teachers to ensure that all students have the opportunity to engage deeply with mathematics” (Helme & Teese, 2012, Conclusion).

Survey research can describe in broad brushstrokes the characteristics and opinions of students who participate in the different senior mathematics subjects, but it provides little detail of their engagement with mathematics in the classroom. A survey of the last three reviews of research in mathematics education in Australasia (Forgasz et al., 2008; Perry, Anthony, & Diezmann, 2003; Perry, Lowrie, Logan, MacDonald, & Greenlees, 2012) revealed that little of this sort of empirical classroom research in the senior years of schooling had been published. The lack of empirical research was particularly evident for students in terminal mathematics subjects. A scan of the reviews revealed that where research did focus on the final years of school it was more likely to relate to preparatory and advanced subjects’ concerns than those of terminal subjects.

Studies involving classroom teachers shadowing workers in a range of industries (Hogan & Morony, 2000) and studies investigating the numeracy practices of young apprentices across a range of industries (Zevenbergen & Zevenbergen, 2003, 2004, 2009) were perhaps the sole examples of research which treated the subject matter and teaching approaches of terminal mathematics classes as problematic. That both studies investigated the use of mathematics in workplaces suggests a common underlying concern with a lack of continuity between the mathematics taught in school and that used in work. However, Zevenbergen and Zevenbergen (2009) considered that there was a key difference between the two research programs. They argued that Hogan and Morony’s study sought “to uncover school mathematics in the workplace [so that it] enabled teachers to justify the approaches being taken in the school context” (p. 203). In contrast, their research questioned the whole notion of transferability of mathematical content knowledge between the two contexts. Rather, “process-oriented skills and dispositions —
problem solving, estimation, and holistic thinking” (p. 204) figured much more prominently than basic calculations in workplace tasks. Thus, they argued, schools might serve their students better by focusing on the development of these dispositions instead of basic skills. Significantly for this study, neither research program sought to shed much light directly on the way that students undertaking terminal mathematics subjects in the senior years (or their teachers) engaged with mathematics in the classroom.

Wider searches of international literature also failed to uncover much in the way of classroom-based research with senior secondary school students who have had limited success in earlier school mathematics. This may have been partly due to the different ways of categorising school mathematics offerings in the later years of secondary school and/or the transitional status of a student age group who in other locations may be enrolled in institutions not designated as secondary schools. Nevertheless, a comparison of Australian and international mathematics syllabuses at this level (Coupland, 2006) suggested that few countries offered four officially authorised levels of mathematics for this age group as Queensland, other Australian states and, more recently, the Australian Senior Secondary Curriculum (Australian Curriculum Assessment and Reporting Authority [ACARA], 2012) do.

Coupland reviewed five national curricula: Singapore, Hong Kong SAR, Finland, United Kingdom, and the United States. Her study indicated that there were no subjects that could be described as equivalent to Prevocational Mathematics in these systems. Where a hierarchy of senior secondary mathematics subjects existed, the least demanding subjects had more in common with Queensland’s Mathematics A syllabus than with Prevocational Mathematics. Since Coupland’s 2006 review, there have been moves to reform mathematics curriculum at the senior secondary level in the United Kingdom (Noyes, Wake, & Drake, 2013) and in Singapore (Ministry of Education, Singapore, 2012). However to date, there seems to have been little research that looks exclusively at the work of teachers and students in senior secondary terminal mathematics classes in these education systems.

During this examination of the international literature, the closest equivalent to Prevocational Mathematics that had attracted concerted research attention was
Mathematical Literacy, a subject offered in the later years of secondary school in South Africa since 2006. Mathematical Literacy, like Prevocational Mathematics, has a primarily utilitarian purpose (Graven & Venkat, 2009). Of particular relevance to this study was that some of the research on Mathematical Literacy had explored the problematic nature of contextualised tasks. For example, Graven & Venkat (2007, 2009) identified a tension that exists in mathematical tasks, which seek to be both contextually authentic and to ensure that students are able to progress mathematically. In a similar vein, Hechter (2011) concluded that Mathematical Literacy teachers needed training to make “a coherent connection between contexts and the mathematical content required for solving problems rooted in real-life contexts” (p. 402). Like the ‘lower’ level subjects reviewed by Coupland (2006) though, the South African subject appeared to be more closely aligned with Mathematics A than Prevocational Mathematics.

The preliminary comparison between syllabuses and the scoping of the terminal mathematics literature outlined above both provided direction for the development of the conceptual framework for the study. The latter highlighted the dearth of research on senior secondary terminal mathematics subjects. The former pointed to research on contextualisation in earlier school mathematics and in adult numeracy as making a relevant contribution to the development of the framework. Such research is detailed in the more comprehensive review of literature discussed in Chapter 2.

**The research focus**

The study’s research focus is not on the effectiveness of contextualised tasks—however effectiveness may be defined—but rather on how students and teachers make sense of the significant role that such tasks play in Prevocational Mathematics. More precisely, the study is concerned with the extent to which students’ and teachers’ sense-making drew on the discourses of senior school reform that had recently been enacted in Queensland schools. Ontological and epistemological concerns have been of interest to mathematics education researchers for decades, though the key theoretical and conceptual frameworks for exploring teachers’ and students’ beliefs about the nature of mathematical knowledge and its acquisition
have varied over time. They have been conceptualised as relatively stable psychological constructs, as qualities whose formation is strongly influenced by socio-cultural contexts, and as integral to the development a student’s or teacher’s mathematical identity (e.g. Ernest, 1988; Goldin, Epstein, Schorr & Warner, 2011; Grootenboer & Jorgensen, 2009; Pajares, 1992; Roeskin, Pepin, & Toerner, 2011).

This study builds on the already extensive body of literature in two key ways that are underpinned by a notion of mathematics education as a network of social practices, to be elaborated below. First, while teachers’ mathematical epistemologies have been seen as crucial in the application of their professional knowledge in classroom situations (Leder, Pehkonen, & Toerner, 2002), and students’ epistemologies have been seen as playing a major role in explaining their difficulties in learning and using mathematics (Muis, 2004; Schoenfeld, 1992) and their in-the-moment engagement with mathematical tasks (Goldin et al, 2011), few empirical studies have attempted to investigate explicit connections between students’ and teachers’ mathematical epistemologies. The critical discursive approach that informs this study conceptualises students’ and teachers’ epistemologies in relational terms, and in doing so can foreground and enable an examination of their interconnectedness.

Second, while a research interest in teachers’ and students’ understandings about the nature of mathematics is often amplified at times of reform, the reforms themselves may be treated as inevitabilities rather than as phenomena that can themselves be interrogated (Battista, 1994, Handal & Herrington, 2003; though see Marz, Kelchtermans, Vanhoof, & Onghena, 2013). In contrast, a critical discursive perspective that theorises links between discourses at the micro-level (in individual written and spoken texts), at the meso-level (in social practices) and at the macro-level (in broader social, political and cultural formations), can problematise reform.

The use of the terms ‘discourse’ and ‘discourses’ throughout this thesis draws predominantly on Fairclough’s (2003) conceptualisations. He uses ‘discourse’ to communicate a view of language as “an element of social life which is dialectically related to other elements”, such that different ‘discourses’ are “different ways of representing aspects of the world” (pp. 214-215). Furthermore, at the middle level of
social practices, the critical discursive concepts of recontextualisation and genre chains (to be discussed in greater detail below and in Chapter 3) enable the tracing of discourses between nodes in a network of social practices. A conceptualisation of mathematics education as a network of social practices is a key framing device for the study.

**Mathematics education as a network of social practices**

Valero (2010) proposed the notion of a network of mathematics education practices as “a complex, multi-layered space of social practice where the meanings of teaching and learning of mathematics are constituted” (p. LIV). She argued that mathematics education researchers needed to think more expansively and saw this proposition as a way of envisioning possible new research paths in the field. In particular, in the light of growing reflexivity within the field, she suggested that there was a need for researchers to analyse the discourses of the field itself since

> [r]esearchers in academic fields construct particular discourses about their objects of study and their overall activity. Such discourses constitute systems of reason that regulate what is possible to think and do in a given field (Popkewitz, 2004). Thus, discourses generate both a space of possibilities as well as of limitations of what we can imagine as alternatives to existing orders. (Valero, 2010, p. LVI)

Drawing on elements of Faircloughian critical discourse analysis, Valero claimed that most mathematics education research focused on problems that dealt with the didactic triad “constituted by the relationship between mathematics, the teacher and the student” (p. LX). That is, despite mathematics education research undergoing a strong ‘social turn’ (Lerman, 2000; 2006) in adopting a variety of sociological and cultural-anthropological theories that attend to external social and cultural contexts, the focus of attention remains on the mathematics-teacher-learner triad located in the classroom. One of the ways in which mathematics education practices can expand beyond the didactic triad is to explore policy-making practices in mathematics “which structure and regulate the forms of valid knowledge, competences and achievement levels to be attained by students and teachers” (Valero, 2010, p. LXIX). Of particular relevance to this study is Valero’s belief that by conceptualising mathematics education practices as a network, it is feasible—and a way of expanding the scope of the field—to move back and forth between micro-
social units, such as classrooms, and macro-social units such as developments of policy. Such an approach can make explicit power relationships between researchers, policy makers, and teachers and students that may remain hidden in research perspectives that focus exclusively on classroom practice.

Morgan (2009) also used a critical discourse analysis framework to undertake the type of study proposed by Valero. She sought to examine “the concepts, values, and positions available to teachers and students in official school mathematics curriculum discourse” (p. 98). The study compared textbooks intended for two groups of students in the final years of compulsory schooling—one group who were expected to attain a Higher level of achievement in their final national examinations, the other expected to achieve at an Intermediate level. While Morgan’s study focused on the examination of textbooks, she noted that her approach offered possibilities of exploring how different official curriculum discourses might impact on classroom practices and student identity. In a subsequent, more reflective account, Morgan (2014) traced her developing research interests and the range of theoretical resources that had influenced her work. Here again, she noted that there are different “nodes within the educational enterprise” (p. 141)—classrooms, assessment practices, curriculum policies—that provide starting points for understanding the complexity of mathematics education practices. Morgan argued that, whatever the starting point, the complexity can be better addressed by working across the nodes.

Drawing on Valero’s and Morgan’s networked representations of mathematics education practices, this study works across policy-making (both within mathematics education and also at the broader level of senior schooling policy) and classroom practice nodes. That is, while it remains firmly focused on investigating what goes on in mathematics classrooms, it presupposes that working across the nodes can add to the understanding of classroom events, in particular how Prevocational Mathematics teachers and students make sense of contextualised tasks. Literature from curriculum and policy studies that contributed to this aspect of the conceptual framework is reviewed in more depth in Chapter 2. The next section briefly describes the study that was designed to undertake the research.
The design of the study

The concepts of recontextualisation and genre chains are used to theorise the research ‘across the nodes’ that was undertaken in the study. This theoretical framework, drawing largely on a version of Critical Discourse Analysis (CDA) developed by Fairclough, is detailed in Chapter 3, but a general understanding of the concepts is helpful in outlining the study’s design. Recontextualisation focuses on the relationship between social practices; that is, on how elements of one social practice, including discourses and genres, are appropriated by and relocated in the context of another. The process of recontextualisation is operationalised in genre chains: a sequence of genres that are linked together in relatively stable and institutionalised ways (Fairclough, 2003). In this study, the curriculum reform, subject-specific syllabus, and classroom assessment documents have been conceptualised as belonging to a genre chain.

The study therefore included policy analysis and fieldwork components. It necessarily involved several stages as it investigated three interlinked phenomena: (1) the emergence of new discourses of senior schooling in the reform document (2) how such system-wide reform discourses were interpreted and translated into a subject-specific syllabus document, and (3) how these were taken up by teachers and students in daily classroom practice. The analytical process involved the identification of authoritative senior schooling discourses through fine-grained analysis of policy texts, namely the ETRF White Paper (Queensland Government, 2002), the SAS for Prevocational Mathematics (QSA, 2004a), and a set of texts collected from Prevocational Mathematics classes in a Queensland secondary school. The texts collected during the fieldwork phase included teacher-produced task specifications and students’ responses to these tasks, and were supplemented by interviews with teachers and students and classroom observations.

Based on this theoretical and analytical framework, the overarching question that the research sought to answer was:

How, and how much, do Prevocational Mathematics students and teachers draw on the discourses of senior schooling promoted by policy
reforms and syllabus specifications to make sense of their engagement with contextualised tasks?

The use of the phrase ‘how much’ here is not meant to imply a quantitative approach to the issue. Rather, it assumes that, given the perceived problematic nature of the disjuncture between policy advice and classroom practice, the analysis will reveal that both new reform discourses and older established discourses, at both the more general level of senior schooling and the more specific level of mathematics education, will play a role in shaping students’ and teachers’ interpretations of contextualised tasks. That is, the analysis will need to be sensitive to the existence of both reform and traditional senior schooling discourses.

The structure of the thesis

Chapter 1 has introduced the study. It described the development of the research focus for the study—how Prevocational Mathematics students and teachers make sense of contextualised tasks—from initial concerns about the disconnect between the syllabus’s advocacy of such tasks and observations of classroom practice. The policy reform context from which the issue emerged has been outlined, as has the range of literature that was drawn upon to construct a conceptual and theoretical framework for the study. The critical discursive approach to the issue and the research design needed to adopt this approach have also been previewed.

Chapters 2 and 3 provide more detailed reviews of the literature that has informed the study. Chapter 2 examines two discrete bodies of literature—the influence of global trends on curriculum reforms such as those which occurred in Queensland senior schooling and the role of contextualisation in mathematics education research—that find some common ground in recent debates about distinctions between numeracy and school mathematics. Chapter 3 elaborates the theoretical foundation for the study’s critical discursive approach. It includes a rationale for selecting the particular approach adopted in the study and a discussion of the theoretical assumptions that underpin that approach. The research design that was outlined above is presented in more detail in Chapter 4. The selections of data from policy texts, and the selection and generation of different types of data in the
classroom context are elaborated and justified, as is the overall analytical approach, involving a combination of discourse analytic and ethnographic strategies and tools.

The next three chapters detail the results of these analyses. Chapters 5 and 6 examine the policy texts, focusing on how senior schooling practices are represented in the ETRF document (Queensland Government, 2002) and the Prevocational Mathematics syllabus document (QSA, 2004a) respectively. The tracing of senior schooling discourses culminates in Chapter 7 with the analysis of classroom data, including classroom texts and interview data to determine the ways in which policy discourses have been taken up in Prevocational Mathematics classroom practices. Chapter 7 concludes by drawing on the analyses of policy and classroom texts to address the study’s central question: the extent to which students and teachers draw on policy discourses to make sense of their engagement with contextualised tasks. Chapter 8 reviews the overall findings of the research and considers their significance in relation to policies for and practices of numeracy education in the senior phase of schooling. It also reflects on the theoretical and methodological contributions that the study makes to mathematics education and proposes directions for further research that these considerations imply.
Chapter 2

Developing the conceptual framework

As noted in Chapter 1, the current study was motivated by an apparent tension between Prevocational Mathematics policy and practice. On the one hand, the subject’s syllabus advised that contextualised tasks should play a central role in developing students’ mathematical learning. On the other, there seemed to be a range of views held by teachers and students about the significance of such tasks. The existence of different, sometimes contradictory ways of making sense of contextualised tasks was seen as an epistemological concern. Bodies of research that had examined students’ and teachers’ beliefs about the nature and acquisition of mathematical knowledge were mentioned, though the lack of research relating to the particular student cohort of interest in this study was also noted.

The decision to situate the study in research that conceptualises mathematics education as a network of social practices (Valero, 2010) meant that the existing literature about attitudes and beliefs did not figure prominently in the development of the study’s conceptual framework. Rather, the study was conceived as one that would draw on literature from across different nodes of the network. Figure 2.1, drawing on Valero’s visualisation of research moves in this networked conceptualisation of mathematics education, identifies the broad research fronts in mathematics education and policy (both in mathematics education and in schooling more generally) that have contributed to the study’s conceptual framework.

In Figure 2.1, contextualisation is subsumed under the mathematics education research node rather than identified as a separate network element. This configuration is meant to convey the idea that any resolution to a debate over the effectiveness of contextualised tasks through an evaluation of the various claims is not of immediate concern to the current study. Rather, it is the very existence of incommensurable theories, and the decision by the developers of the Prevocational Mathematics syllabus to adopt a particular position, that is worthy of exploration. That is, the reflexive stance towards mathematics education research advocated by Valero (2010), where research itself is one of the nodes of the network, requires
some discussion of the different research perspectives. This discussion is the first of
the ‘moves’ that seeks to uncover the interrelationships between the insights that
emerge from research, their take-up in policy, and the daily practices and events of
mathematics classrooms.

![Diagram showing connections between policy making, school, nation/state, international arena, classroom practice, and mathematics education research.]

**Figure 2.1** Defining research moves in the network of mathematics education practices for a study of students’ and teachers’ understandings of contextualised tasks (based on Valero, 2010, p. LXXXII)

The chapter therefore begins by expanding on the problematic nature of
contextualised tasks that was noted in Chapter 1. This exploration proceeds first
through an overview of three distinct theoretical perspectives on the significance of
context for students’ learning in mathematics and then through a consideration of the
purposes that contextualisation is claimed to serve in mathematics education. The
range of purposes are conceptualised as reflecting differences in curricular
orientations that relate to but also extend beyond mathematics education. Insights
from curriculum theory at this broader level are used to further develop the study’s
framework. In particular, they are used to examine the distinction between numeracy
and mathematics—an important consideration given the explicit numeracy focus of
Prevocational Mathematics. The final section of the literature review moves back to
a consideration of classroom practice. It discusses the implications of context in
issues of task design.
The significance of context

Contextualisation as it pertains to school mathematics is understood in this study as a process by which mathematical concepts and processes are deliberately embedded in non-mathematical contexts. In particular, given the centrality in the Prevocational Mathematics syllabus (QSA, 2004a) of contextualised learning experiences and assessment tasks that are associated with “meaningful, realistic contexts… reflect[ing] situations students know about or are likely to encounter after leaving school” (p. 35), the ‘non-mathematical’ contexts of interest are those that reference some aspect of students’ assumed ‘real life’ experiences. Context has been foregrounded in a variety of guises in mathematics education research. Studies that problematise context have ranged across examinations of simple exercises requiring nothing more than the application of an arithmetic operation (e.g. Cooper and Dunne, 2000) to more investigative tasks (e.g. Dowling, 1998), to extended tasks that explore themes of social justice in critical mathematics approaches (e.g. Brantlinger, 2011) and thematic teaching approaches whereby mathematics learning is embedded in a single context or theme over several consecutive lessons (e.g. Handal & Bobbis, 2004). The sorts of contextualised tasks that were observed in the current study have most in common with thematic approaches: over several weeks, students participated in a range of contextually and mathematically focused activities in a single context (e.g. planning a holiday). Of particular relevance to the study is that despite decades of study, contradictory positions that garner support from different theoretical perspectives remain evident in the research literature on the significance of context for student learning in school mathematics.

Research on context and contextualised mathematics tasks

Support for the inclusion of contextualised tasks in mathematics curricula can be found in learning theories grounded in constructivist beliefs. Such theories are based on notions of an active learner drawing on prior knowledge to negotiate meaning and construct new knowledge (Cobb, Yackel, & Wood, 1992; Jonassen & Land, 2000). Learning theories that conceptualise knowledge construction as (i) situated (i.e. a product of the learner’s activity and the context and culture in which it occurs) (Brown, Collins & Duguid, 1989) or (ii) the development of identity through
participation in a community of practice (Lave & Wenger, 1991) also fit under the broad constructivist umbrella (Tobias & Duffy, 2009). In ‘student-centred learning environments’ influenced by these constructivist theories of learning, “contextualized, authentic, [and] experiential” activities and tasks are seen as an important means of providing learners with affordances to construct personally meaningful knowledge (Jonassen & Land, 2000, p. viii). Contextualised tasks it is argued can be used to motivate, can illustrate potential applications, can be a source of opportunities for mathematical reasoning and thinking, and can anchor student understanding (Meyer, Dekker & Querelle (2001) cited in Sullivan, 2011).

However the inclusion of contextualised tasks in school mathematics has been problematised by those concerned with the reproduction of social class differences through schooling. Cooper and Dunne’s (2000) study of students’ performance on contextualised assessment items was one such study. They argued that much of the psychologically framed research on students’ understanding of mathematics ignored the differential effect of social and cultural background. They found that, while there were no significant differences between the performances of children from different social backgrounds on ‘esoteric’ (i.e. decontextualised) assessment items, children from low-socio economic backgrounds were less likely to respond correctly to ‘realistic’ items (i.e. items embedded in realistic contexts). In other words, embedding mathematical questions in real life, everyday situations did not necessarily make them easier to solve for students from low socio-economic backgrounds. These students were less likely to have learnt the implicit rules about what aspects of everyday knowledge were appropriate for consideration in a task.

A comparison of mathematics textbooks designed for higher achieving students with those designed for lower achieving students (Dowling, 1998) highlighted another problematic aspect of contextualised tasks in school mathematics. Textbooks for the ‘lower ability’ group of students were characterised by examples that referenced ‘everyday’ practices. In contrast, textbooks for the ‘higher ability’ group were characterised by the specialised language and form of ‘esoteric’ mathematical discourse. Dowling’s research showed that, while simplifying or avoiding specialist mathematical discourse by contextualising problems in everyday situations might be framed as a way of enabling students to access mathematical knowledge, the first
group were effectively denied this access while the second group were inducted directly into a highly valued form of knowledge (Morgan, 2007).

As well as contributing to a differential access to knowledge, Dowling (1998) argued that the incorporation of the everyday into school mathematics constructed a ‘mythical’ relationship between mathematics and the ‘real’ world. He described two myths that centred on the recontextualisation of non-mathematical practices in the teaching of mathematics. The myth of reference is evident in the use of non-mathematical activities to illustrate that mathematical knowledge is about something other than itself, for example in contextualised textbook exercises in which mathematical principles are ‘applied’. By calling up a diversity of non-mathematical settings in quick succession, he argued, such exercises confer a degree of power to mathematics over the non-mathematical practices to which the mathematical concept can be referenced. In contrast, the myth of participation blurs the distinctiveness of mathematical practice. This myth is evident in claims that mathematics is a necessary component of non-mathematical practices. That is, to participate optimally in everyday practices such as shopping, it is necessary to possess and use mathematical knowledge.

Dowling’s understanding of the ‘mythical’ relationship between mathematics and the world presents a challenge to those working within the constructivist paradigm where familiar contexts can provide the catalyst for the development of abstract mathematical knowledge. However, it also contradicts assumptions that underpin other perspectives not necessarily aligned with constructivist learning theories. Atweh (2012) described Dowling’s position as one that privileged disciplinary knowledge. He proposed an alternative construction of mathematics as “an activity of a reading of the world…. a process rather than a body of knowledge” (p.106, original emphasis). The task of mathematics education then can be seen as “a development of a capacity to read the world and, perhaps now or in the future, of writing the world” (p.106).

Atweh’s challenge to the privileging of disciplinary knowledge in mathematics education typifies an extensive body of research that does not look at contextualised mathematics tasks specifically, but foregrounds context in that it shares a concern
with “knowing mathematics in the world” (Wedege, 2010). This research includes studies undertaken from an ethnomathematics perspective (e.g. D’Ambrosio, 1985) that emphasise the significance of the cultural context in which mathematics is embedded. It also includes critical mathematics research (e.g. Brantlinger, 2011; Frankenstien, 1983; Gutstein, 2006) that starts from the position that empowering students does not only involve developing students’ mastery of abstract (i.e. decontextualised) mathematical knowledge. Rather, to contribute to students’ development as informed citizens, mathematics needs to engage with the physical and social world in authentic contextualised ways (Atweh & Brady, 2009).

The sample of studies discussed above is far from an exhaustive review of research on contextualisation in mathematics education. It is however, sufficient for the development of the conceptual framework for the present study. It confirms that within mathematics education research there is a range of competing discourses employed to make sense of the role of contextualisation. It differentiates between studies where contextualisation was foregrounded in order to justify or critique the incorporation of contextualised tasks in mathematics learning and others that presupposed that non-mathematical contexts make a valuable, perhaps even necessary, contribution to the study of mathematics. In summary, it suggests that research evidence for the effectiveness of the alternative approach built around contextualised tasks and advocated by the Prevocational Mathematics syllabus is far from settled. On the one hand, research grounded in constructivist learning theories points to the importance of meaningful, realistic contexts as a necessary precursor to the development of mathematical understanding. Studies premised on the value of mathematics to make sense of the world similarly see context as integral to mathematics learning. On the other hand, research grounded in sociological theory suggests that contextualised learning results in differential achievement in and access to disciplinary knowledge, disadvantaging students from low socio-economic backgrounds.

The discussion also implies that within mathematics education, differing pedagogical purposes are claimed for contextualisation, and that these are implicated in decisions about what should be included in curriculum. In the next section, three
frameworks that have been devised to make sense of the disparate approaches to contextualisation in mathematics education are examined.

**Purposes of contextualisation in mathematics education**

Two of the frameworks were produced in the context of South African mathematics education reforms, particularly in the final years of secondary schooling as mentioned in Chapter 1. One unpacked ‘a spectrum of pedagogical agendas’ for the subject *Mathematical Literacy* specifically (Graven & Venkat, 2007) and another highlighted the interplay of ‘positions and purposes’ with respect to contextualisation in school mathematics more generally (Venkat, Bowie and Graven, 2009). A third, less location-specific exploration of the purposes underpinning the use of contextualised tasks in school mathematics (Beswick, 2011) is also considered. Table 2.1 summarises the categories of purpose developed in each of the frameworks.

This tabulation of the three frameworks can highlight their common features (categories of utilitarian and mathematical purposes) and idiosyncrasies (cultural affirmation in post-apartheid South Africa) but downplays the essential fuzziness of the categorisations that all the frameworks’ developers acknowledged. Graven & Venkat (2007) noted that the nature of the link between non-mathematical contexts and mathematical knowledge was ambiguous in that different emphases were evident across different parts of the *Mathematical Literacy* curriculum. Furthermore, at times the curriculum seemed to suggest that mathematical skills and concepts should be learnt first and then applied in life-related contexts. At other times, it implied that contexts “should be engaged with in a way which enables and drives mathematical learning” (p. 70). While the four categories (context driven, context and content driven, mainly content driven, and content driven) were underpinned by different pedagogic purposes, Graven and Venkat proposed the categories should be described as a ‘spectrum’ of agendas to emphasise that the boundaries between them were not distinct. Teachers were required to move back and forth foregrounding different agendas at different times to meet curricular demands.

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3 Two mathematics subjects were available in the reformed Further Education and Training (FET) band: a more traditionally academic subject *Mathematics* and a newly introduced, more utilitarian subject *Mathematics Literacy* (Graven & Venkat, 2007). All FET learners were required to take one of these options.
<table>
<thead>
<tr>
<th>Table 2.1 Purposes for contextualisation in school mathematics</th>
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<tr>
<td><strong>Graven &amp; Venkat (2007, p. 74): ‘a spectrum of agendas’ in</strong></td>
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<td><strong>Mathematical Literacy</strong></td>
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<td>Context driven (by learner needs): To explore contexts that</td>
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<td>learners need to interact and engage with in their lives (current everyday, future work &amp; everyday, and for critical citizenship) and to use maths to achieve this.</td>
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<td>Content &amp; context driven: To explore a context so as to deepen maths understanding and to learn maths (new or from earlier years) and to deepen understanding of that context.</td>
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<td>Mainly content driven: To learn maths and then to apply it to various contexts.</td>
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<tr>
<td>Content driven: To give learners a 2nd chance to learn the basics of maths. [Not part of the FET curriculum but included in framework “due to its prevalence among teachers and the public”].</td>
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<tr>
<td><strong>Venkat, Bowie &amp; Graven (2009): purposes for contextualisation in mathematics education</strong></td>
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<tr>
<td>Utilitarian—current and future needs of learners in everyday and work-related contexts</td>
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<td>Critical democratic citizenship + Cultural affirmation</td>
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<td>Mathematical — developing understanding</td>
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<tr>
<td><strong>Beswick (2011): purposes for context problems</strong></td>
</tr>
<tr>
<td>Utilitarian – personal, vocational and social goals</td>
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<tr>
<td>For understanding important issues</td>
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<tr>
<td>Understanding maths concepts + Enhancing students’ appreciation of the nature of maths + Improving student affect in relation to mathematics</td>
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<tr>
<td><strong>Reasons for studying mathematics</strong></td>
</tr>
<tr>
<td>Mathematics is useful</td>
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<td>Mathematics is meaningful</td>
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<tr>
<td>Mathematics is studied primarily to develop disciplinary knowledge</td>
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</table>
The framework developed by Venkat and her colleagues (2009) incorporated a second dimension, ‘position’, to add complexity to their review of research about contextualisation. They identified three positions researchers adopted with respect to the inclusion of non-mathematical contexts in developing students’ mathematical understanding: full support; limited support; and complete rejection of the process. A fourth position was identified but not included in the framework. This position—an assumption that contextualisation was necessary, thus obviating the need to advocate or reject it—was associated with the more applied orientation of the subject Mathematical Literacy. In making decisions about how to incorporate non-mathematical contexts, Venkat et al. highlighted the fact that teachers needed to contend with a complex interplay of contradictory positions promoted by research undertaken from different theoretical standpoints and the purpose/s that motivated a particular teaching sequence.

Beswick’s (2011) framework included five “broad and not entirely discrete categories” (p. 369) of reasons that have been given for the inclusion of contextualised tasks in mathematics curricula. Like the other frameworks, there were purposes that were directed beyond the immediate classroom context and others that focused on students’ development in classroom mathematics. In her review of research, Beswick concentrated on the latter purposes. In examining evidence of the effectiveness of contextualised tasks in improving understanding of mathematics concepts, and appreciation and affect towards mathematics, Beswick drew attention to the claims that ‘authentic’/‘relevant’/‘real world’ tasks have “potential to motivate and engage students” (p. 367). She concluded that the contextualised nature of tasks might not necessarily be their most salient aspect when it came to enhancing participation, engagement and achievement. Rather, a problem’s ability to “facilitate meaningful engagement with the relevant mathematics” (p. 382), whether or not it was contextualised was more important. This affective dimension was not identified as a significant category in the other two frameworks but is clearly relevant to the present study owing to the emphasis given to developing students’ confidence in the Prevocational Mathematics syllabus.

In summary, the review of these three meta-studies contributed to the present study’s conceptual framework in the following ways. In the first instance, it made
clear that categorising the purposes of contextualised tasks is not a straightforward undertaking. Furthermore, it suggested that calls for mathematics curricula to become more relevant through the incorporation of contextualised tasks (exemplified in the Prevocational Mathematics curriculum), had their basis in a range of curricular priorities. Where embedding mathematics in realistic contexts was seen to contribute to the development of mathematical understanding for its own sake, contexts might be contrived to meet the purposes of enhancing access to, and/or motivation for, the mathematical learning. An alternative purpose for contextualisation was to prepare students to apply their mathematical learning in various life-related contexts now and in the future. In such cases, the choice of relevant contexts became a central concern. However, the reviews also suggested that the complexity of bringing together mathematics with relevant contexts might not be always fully appreciated. They highlighted assumptions that remain unchallenged in the Prevocational Mathematics syllabus such as the transfer of mathematics learnt in the classroom to contexts outside the classroom and the need for authenticity of contexts.

In all three meta-studies, the need to develop a framework was premised on the importance for curriculum developers, including teachers, to better understand the intentions behind embedding mathematics in non-mathematical contexts so that they might make more informed curricular decisions. Purposes for contextualisation are of course grounded in broader purposes of mathematics education, which are in turn based in broader purposes of schooling. The final row of Table 2.1 highlights the first of these links. The reasons for contextualisation identified in the meta-studies are categorised into two broad orientations that drive school mathematics curriculum. On the right, the acquisition of mathematical knowledge is seen to have intrinsic value, while on the left, the things that can be done with mathematics are more important. This distinction in the mathematics education domain is one that has also circulated in debates between knowledge-based approaches and generic, skill-based approaches to curriculum more generally. The next move in developing the conceptual framework for the current study then was to turn to studies of curriculum in order to understand the broader context in which the Prevocational Mathematics syllabus had been developed.
Curricular priorities

At the schooling level: process versus content

New curricular models have emerged as “a response by education systems to pressures associated with globalization, particularly in respect of economic competitiveness and citizenship” (Priestley & Biesta, 2013, p. 3). Apple (1998) associated the orientation of these curricula with a neoliberal position that is underpinned by a future-oriented vision of students as human capital:

the world is intensely competitive economically, and students—as future workers—must be given the requisite skills and dispositions to compete efficiently and effectively (p. 342).

The framing of new curricula around the development of learners’ generic (though in the long-term work-related) competencies or capacities has resulted in “assessment-driven teaching” with curriculum goals expressed in terms of skills, dispositions and capabilities—“what students are able to experience in their learning and/or do as a result of such learning” (Priestley & Biesta, 2013, p. 4) rather than in terms of what they know.

Recent policy analysis work (Williams, Gannon, & Sawyer, 2013) tracing the notion of the ‘21st century learner’ across a network of Australian education policies, other national curricula and other international projects and organisations confirmed this trend. The authors identified the global circulation of the concept of the 21st century learner, and its “steady ‘economisation’… and a concomitant corporatisation of educational innovation” (p. 792). While the authors concurred with the suggestion that “industry-led agendas” emphasised that schools should produce people who are “adaptable and flexible”, have “negotiating and team skills” and are capable of “personal management and planning” (Yates & Collins, 2010, cited in Williams et al., 2013, p. 799), they also noted that the notion of the 21st century learner often contained elements from “the social democratic traditions of schooling which emphas[ise] equity, social justice and collective responsibility” (p. 799).

Reeves (2013) also examined the evolution of the concept of ‘the learner’ in policy. She argued that while constructivist notions were originally adopted in schools in the form of student-centred learning approaches in the 1960s and 1970s,
recent invocations in school education owe more to the uptake of the theories in the fields of adult education and organizational development. The trajectory from these adaptations back to school settings occurred via an extension of the discourse of lifelong learning from adult settings to “its application to ‘all learning endeavours over the lifespan’ (Organisation for Economic Cooperation and Development [OECD], 2004)” (p. 60). Thus, contemporary characterisations of ‘the successful learner’ are of someone “with an agentive and autonomous orientation to the world” who is “committed to self improvement” and “has mastered the skills of personal learning so that they can respond flexibly to a changing environment” (p. 51). However, she noted, the extension of adult education practices and their underpinning notions of learner autonomy back to school settings failed to take into account the “far more uniform curricular structure based on a different set of relationships between learners, teachers, and the curriculum” (p. 68) that exists in schools. This observation is of relevance to the present study since the Prevocational Mathematics syllabus draws heavily on adult numeracy approaches to teaching.

Another critique levelled at current curricular trends is that, in emphasising the development of generic skills or capabilities, they diminish the importance of specific knowledge outcomes. Young (2008) drew on Bernstein’s (2000) theorisation of the structure of knowledge to argue that skills-based curricula that focus on performance outcomes or vocational competencies do so at the expense of access to ‘powerful knowledge’—knowledge that enables those who acquire it to gain a deeper level of understanding, to see beyond their everyday experience. Bernstein’s (2000) distinction between mundane (everyday, commonsense) and esoteric (conceptual, abstract) forms of knowledge has provided a valuable theoretical framework for many researchers concerned with the differential access to valued forms of knowledge, including the exemplary studies in mathematics education discussed earlier in the chapter (Cooper & Dunne, 2000; Dowling, 1998). Of significance to the discussion of context here is that everyday knowledge is seen to be acquired tacitly and tied to specific contexts and events so that its meanings are only understandable within that specific materially-based context. In contrast, knowledge that is typically associated with sites of knowledge production and institutional pedagogy (such as school mathematics) involves an abstraction from
everyday concepts (Lerman, 2006, 2014). Thus, while everyday knowledge is acquired in the specific context in which it is meaningful, the acquisition of abstract knowledge is not necessarily “consumed at the point of its contextual delivery” but is rather “an on-going process in extended time” (Bernstein, 2000, p. 160).

According to their critics, curricula that focus on the development of skills and capabilities are necessarily tied to specific contexts and thus deny students the opportunity to acquire abstract, context-independent specialist knowledge. The power of such knowledge lies in the fact that it is “the means societies use to think ‘the unthinkable’ and ‘the not-yet thought’” (Wheelahan, 2007, p. 637). So while skills-based curricula might widen participation in formal education, they do so at the expense of the development of this more powerful knowledge for all students.

Ecclestone (2013) also critiqued process-based curricula that sought to be more inclusive through their “enthusiasm for skills or ‘capabilities’ rooted in life-related and personalized knowledge rather than traditional disciplines” (p. 76) She focused on the emphasis these curricula often placed on dispositions and ‘skills’ such as confidence and collaboration. She argued that in making confidence an end in itself, such curricular orientations deny certain ‘difficult to teach’ students intellectual capital. Furthermore, they shift attention away from structural disadvantages such as material conditions, or class, race and gender.

In contrast to criticism of process-based curricula that assume “a fundamental incompatibility between acquiring skills and demonstrating competence on one hand and acquiring knowledge on the other” (Young, 2008, p. 7), other researchers have taken a more conciliatory position on competing curriculum priorities. Priestley and Sinnema (2014) proposed a number of caveats to the incompatibility argument. They suggested that the distinctions between everyday and disciplinary knowledge and between knowledge and skills might not be as clear-cut as critics have claimed. However, they conceded that in displacing knowledge from its central role, new curricular approaches ran the risk “that knowledge will be downgraded in practice, through inconsistent approaches to specifying content that is then potentially not fit for curricular purpose” (p. 71). Lingard and McGregor (2014) observed similar tensions and potential problems in the development of the Australian Curriculum in
its attempts to reconcile the acquisition of disciplinary knowledge with the development of skills and dispositions needed to become a “global millennium citizen and worker” (p. 90). They discussed this in terms of educators needing to understand and work with curriculum priorities of ‘knowing’ and ‘doing’. They suggested that without considerable professional development many teachers may face difficulties in dealing with the complexities of ‘cross-curriculum priorities’ and ‘general capabilities’ embedded within discipline-area curricula that attempt to meld these distinct concerns.

At the subject level: numeracy versus mathematics

The emphasis on the development of skills, dispositions and capabilities in process-based curriculum models has been reflected in mathematics education in Australia in the emergence of ‘numeracy’ as a curricular concern. The following discussion, which examines the significance of context as a dimension of numeracy, moves from the broader curriculum focus of the previous section to the subject level. The discussion highlights the penetration of the numeracy discourse across school and adult education settings.

From its likely origins in a report to government about the education of 15 to 18 year olds (Crowther, 1959), the notion of numeracy has, in a sense, always been an invention of policy. Current conceptualisations of numeracy have moved far from its initial meaning as the “mirror image of literacy” (para. 398). Then, numeracy referred to scientific literacy in a broad sense complementing an understanding of literacy that meant well-read, rather than simply being able to read (Coben, 2006). Numeracy was seen as

an understanding of the scientific approach to the study of phenomena - observation, hypothesis, experiment, verification. … [responding to] the need in the modern world to think quantitatively, to realise how far our problems are problems of degree even when they appear as problems of kind. (Crowther, 1959, para. 401)

Understandings of numeracy, and its differentiation from mathematics, now owe much more to the global trends in curriculum outlined in the previous section. Coben, Colwell, Macrae, Boaler, Brown, and Rhodes (2003) and Stanley (2008) have documented a range of definitions for numeracy in reviews of numeracy
research and practice in adult and school contexts respectively. In adult numeracy contexts, Coben and her colleagues concluded that numeracy was “a deeply contested and notoriously slippery concept” (p. 9). Stanley’s observations on the range of understandings about numeracy were made in a review focusing on numeracy education in Australian schools. He also noted a degree of uncertainty as to what counted as mathematics and what counted as numeracy in his call for “clarification of the numeracy/mathematics distinction” (p. vii).

Nevertheless, across both reviews, and in common with the view of numeracy advanced by the Prevocational Mathematics syllabus, definitions of numeracy commonly foreground the inclusion of context—numeracy is seen as mathematics in use in particular contexts—and the importance of the development of students’ skills and dispositions. Coben et al. suggested the following definition encapsulated these key dimensions:

To be numerate means to be competent, confident, and comfortable with one’s judgements on whether to use mathematics in a particular situation and if so, what mathematics to use, how to do it, what degree of accuracy is appropriate, and what the answer means in relation to the context. (Coben, 2000, in Coben et al., 2003, p. 10; emphasis in the original).

Numeracy defined in such terms is seen to be important not just for personal educational, employment and citizenship goals but for broader national economic goals as well. This view of numeracy resonates with process-based orientations to curriculum and is evident not only in Australian state and national policy directions (Education Queensland, 2007; Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA], 2008; Standing Council for Tertiary Education Skills and Employment [SCOTESE], 2012) but is also reflected at the transnational level (OECD, 2009).

The rationale for ensuring that Queensland students complete their secondary schooling having attained minimum standards of numeracy, and hence the need for a subject like Prevocational Mathematics, draws on these broad economic-based understandings. It is premised on a view of numeracy as a set of essential skills required for productive participation in the community. Similar sentiments provided a foundation for Australian Curriculum concerns with developing essential numeracy (i.e. skills “that provide the critical foundation for [student] learning, and for their
productive and rewarding participation in the community” (ACARA, 2013)). In the adult education sector, the development of a national ‘foundation skills’ strategy for adults (SCOTESE, 2012) was based on similar conceptualisations of numeracy as a largely individual capability involving the acquisition of a range of stratified cognitive skills that are unproblematically transferable from one context to another. Coben et al. (2003) noted that there is a “remarkably persistent” view that adult numeracy is largely concerned with “equipping the workforce with the minimum skills required for industry and commerce” (p.9). It is perhaps unsurprising then that the notion of numeracy as ‘basic mathematics’ appears to have become the dominant public perception (Stanley, 2008).

Working from an adult numeracy education perspective, but within the context of global policy trends discussed earlier, Tsatsaroni and Evans (2014) challenged the use of such human capital approaches. They drew on the distinction between disciplinary and everyday forms of knowledge (Bernstein, 2000) to suggest that conceptions of numerate behaviour and skills in terms of ‘everyday’ or ‘work’ practices reduced “potentially powerful knowledge like numeracy” to a “narrow competency” (p. 167). They cited a range of studies in the adult numeracy field, including research on ‘techno-mathematical literacies’ informed by the affordances, flexibilities and demands of information technologies (Hoyles, Noss, Kent & Bakker, 2010), as examples of potentially richer ways of thinking about numeracy. Such research suggested that numerate behaviour involves complex abilities rather than a set of basic skills and that more nuanced notions of context may be more valid starting points for understanding numeracy than generic references to work or everyday life.

**At the task level: whose context?**

Mathematics is traditionally a task-driven pedagogy (Walls, 2005). Teachers select or design learning tasks for students for a variety of purposes including to introduce new mathematical ideas, to practice previously learned skills, and to assess students’ understanding. Some of these decisions have already been considered in the broader discussion of the purposes of contextualisation earlier in the chapter. However, one aspect that was not discussed there but that emerged from the literature was the
extent to which students might be involved in the process of choosing the contexts in which tasks are embedded.

Studies that have examined aspects of students’ engagement in mathematics suggest that students prefer to work with peers on novel tasks and activities that (i) have personal meaning (Helme & Clarke, 2002); (ii) require active learning and include elements of choice (Attard, 2010), and (iii) emphasise negotiation and explanation (Nardi & Steward, 2003). Two contrasting perspectives on approaches to ensure that the contextualised tasks with which students engage are purposeful and meaningful are outlined next. The first emphasises the active role of teachers in designing, assigning and monitoring learning tasks; the second proposes a more participatory role for students in generating tasks.

Ainley (2012) examined the purpose of contextualised tasks at three levels: (i) the intended curriculum (the purpose of teaching mathematics); (ii) teachers’ intentions (the purpose for which a contextualised task is intended to be used in the classroom); and (iii) learners’ experiences (the purpose to be served in completing the task). She described the relationship between school mathematics and the ‘real’ world as an uneasy one, arguing that while mathematics curricula often foreground the importance of mathematics for understanding the real world, contextualised tasks rarely provide answers to genuine student questions. Earlier work with colleagues (e.g. Ainley, Pratt & Hansen, 2006) involved the development of a framework for designing pedagogic tasks that had a clear purpose for learners, but also required the use of particular mathematical ideas. Such purposeful tasks were proposed as a way to improve the ‘uneasy’ relationship since they allowed learners to recognise the utility of mathematics (i.e. how and why mathematics is useful to get things done).

A point of contrast to Ainley’s emphasis on the need for teachers to design purposeful, meaningful tasks for their students can be found in research that proposes that contextualised tasks may be more meaningful if students generate their own problems. For example, Clarke (2006) commented on the abstract versus contextualised task debate in the context of a broader discussion of dichotomies in mathematics education. He drew on international comparisons to discuss the divergent positions around contextualised tasks and proposed that different societies
have different priorities for mathematics education. His synthesis of research from a number of countries noted that while many Western classrooms perceived the need to make mathematics relevant to students’ lives, this was not the case in Japan, Hong Kong or China. Clarke distinguished between the ‘figurative context’ invoked by a task and the ‘social context’ in which the task was undertaken (Clarke and Helme, 1998, cited in Clarke, 2006). He used this distinction to assess the recent South African commitment to contextualise the curriculum around social justice themes. He concluded:

> attempts to increase the ‘relevance’ of these tasks through a figurative contextualisation may be counter-productive if these efforts are perceived by students to be artificial and are interpreted as reifying the very distinctions they seek to dissolve. Resolution of this dilemma may come from instructional approaches that require students to generate their own connections rather than to impose these through pre-fabricated contexts determined by the teacher or the text. (Clarke, 2006, pp. 380-381)

The literature reviewed in this chapter points to ‘context’ as a significant factor in curriculum decision-making at macro-, meso-, and micro-levels. A model designed to capture this multi-level consideration of context is shown in Figure 2.2. The model attempts to show that the sorts of contextualised tasks that are set in Prevocational Mathematics classrooms are not simply the result of decisions made by individual teachers or school mathematics departments. Rather decisions made by teachers about what counts as legitimate mathematical knowledge and practice for senior school students are nested within policy decisions made on state, national, and transnational scales. These choices are presented as clear-cut dichotomies in the diagram, though the research reviewed in this chapter would suggest that this is a simplification. In practice different agendas co-exist with one another requiring curriculum developers at all levels to make choices that take into account a range of curriculum priorities.
Schooling

Knowledge-based curriculum
acquisition of context-free disciplinary knowledge

Process-based curriculum
devolution of context-tied skills, capabilities & dispositions

Subject

Mathematics
acquisition of context-free, mathematical knowledge & understanding

Numeracy
development of context-tied skills, capabilities & dispositions to effectively & confidently use mathematics

Task

Contextualised tasks to enable access to disciplinary knowledge
Contextualised tasks so that mathematics can be used to do things

Contextualised tasks to enable application of disciplinary knowledge
Contextualised tasks so that to understand things with confidence

Figure 2.2 The significance of context in decision-making at the different levels of curriculum relevant to the study

Framing the study

The study is premised on the belief that students and teachers of Prevocational Mathematics make sense of contextualised tasks in multiple ways, that these different interpretations might not necessarily align with the role of such tasks espoused in the subject’s syllabus, and that such differences—between and within student and teacher groups and in official curriculum—have implications for students’ access to and participation in mathematics learning. Chapter 1 relied on personal observations to support these claims, arguing that there was little research evidence that had explored the issue in a systematic way. The purpose of this chapter then has been to draw on a range of literature to develop a framework that can underpin such a study.

Valero’s (2010) conceptualisation of mathematics education as a network of culturally and historically situated social practices, extending beyond teacher-student interactions around mathematical content, established an initial overarching
framework. Among the many sites of practice that Valero identified, mathematics education research practices and policy-making practices that promote particular meanings of what counts as mathematics education were two of particular relevance. The review acknowledged the tensions that are evident in different theoretical positions that researchers draw on to explain the role of context in *how* people learn. But, these well-rehearsed debates were peripheral to the focus of this study. Rather, research that investigated the purposes of contextualisation—the reasons *why* people should learn particular mathematical content was of more importance. The review of meta-studies focusing on the purposes of contextualisation in mathematics education in turn led to both a broader examination of the overall purposes associated with different orientations to curriculum and a narrower examination of how context is made relevant in mathematics task design.

The review of literature suggests that it is unsurprising that there is a variation in the ways that Prevocational Mathematics students and teachers make sense of contextualised tasks; that even though the support for contextualised tasks goes unchallenged in the Prevocational Mathematics syllabus, research paints a less certain picture. The time and space limitations of the current study mean that it does not investigate in any greater depth why the curriculum developers embraced a particular view about contextualised tasks in preference to others. Instead, it is the (dis)connections between the policy and practice nodes of Valero’s model that are central to the study. While the literature reviewed in this chapter has highlighted the significance of contextualisation at micro-, meso-, and macro-levels of relevance, the discussion has remained somewhat disjointed. The explicit conceptual commitment to notions of discourses and power that underpins Valero’s model has not yet been fully explored. In order to theorise the relations between the policy and practice nodes, the next chapter develops a critical discursive perspective as the theoretical foundation for the study.
Chapter 3
Developing the critical discursive perspective

The previous chapter used Valero’s (2010) model of mathematics education as a network of social practices to propose that a problem, initially conceived as one located within classroom practice, could also be examined in terms of relations between research, policy and practice. That is, the alternative and possibly contradictory views on contextualised tasks held by groups of teachers and students could be reconceptualised as resulting from differences in the way that new discourses about senior school mathematics had been incorporated into students’ and teachers’ existing frames of reference. While the emergence of the new discourses of senior school mathematics as a selective recontextualisation of research discourses might be gainfully explored further, the primary concern of this study is the interface between policy and practice. The purpose of this chapter then is to elaborate the theoretical assumptions that underpin a critical discursive perspective and to foreshadow how this perspective can contribute fresh insights into how students and teachers make sense of the contextualised tasks that are a central facet of Prevocational Mathematics classroom practice.

The chapter begins with a brief discussion of the commonalities and variations in approaches to Critical Discourse Analysis (CDA) and examines some examples of its application in educational research. This overview serves as an introduction to the particular versions of CDA that have contributed to the theoretical and analytical framework for this study, namely Fairclough’s dialectical-relational approach (e.g. Fairclough, 2003, 2005a, 2009) and van Leeuwen’s approach that conceptualises discourses as the recontextualisation of social practices (e.g. van Leeuwen, 2008, 2009a, 2009b). Next the key theoretical concepts and objects of research for the study are explicated. The development of the theoretical framework culminates in the formulation of a set of sub-questions that conclude the chapter.
Critical approaches to discourse analysis

Conceptualising discourse

In reviewing literature that looks broadly at the notion of discourse, it is evident that discourse has taken on various meanings that reflect different ontological and epistemological perspectives and theoretical concerns (Jaworski & Coupland, 2006; Stephanie Taylor, 2001; Wodak & Meyer, 2009). Nevertheless, according to Jaworski and Coupland across the range of definitions of discourse there is a recurring emphasis on ‘language in use’: “Discourse is language use relative to social, political and cultural formations — it is language reflecting social order but also language shaping social order, and shaping individuals’ interaction with society” (p. 3).

While this broad, abstract conceptualisation of discourse as an element of the social process is a common one, this thesis follows Fairclough’s more recent work in replacing the use of discourse in this general sense with the term ‘semiosis’. Semiosis is defined by Fairclough, Jessop, and Sayer (2004) as “the inter-subjective making of meaning” (p. 40). The use of ‘semiosis’ reinforces the notion that CDA’s focus is on shared meanings and is not just concerned with language but with other semiotic modalities such as visual images and body language. The use of the term ‘discourses’, in the plural, is reserved as a category for designating different ways of representing aspects of the world (Fairclough, 2003).

In general, critical approaches to discourse analysis have come to be identified with an explicit commitment to uncovering how power and social and political inequalities are evident in and reproduced through discourse (Stephanie Taylor, 2001). The centrality of the notion that power relations are discursive owes much to Foucault’s theoretical insights into discourse and language (Fairclough, 2003; van Leeuwen, 2008). Foucault (1972) defined discourses as “practices that systematically form the objects of which they speak” and said of them “[d]iscourses are not about objects; they do not identify objects, they constitute them and in the practice of doing so conceal their own invention” (p.49). For Foucault, discourses were not just about what can be said and thought but also about who can speak authoritatively in particular circumstances (Ball, 1993). But, although discourse analysts working in a
critical tradition may orient to language and discourse in these similar ways, so marked is the variety in critical approaches to discourse analysis that Wodak and Meyer (2009) have proposed that CDA might be better thought of as a ‘school’ or ‘programme’ that encompasses a “heterogeneity of methodological and theoretical approaches” (p.5) rather than as a single method. An overview of the use of CDA in education research demonstrates this variety.

**CDA in educational research**

In an early review of how critical approaches to discourse analysis can inform educational processes, Luke (1995) clarified the distinction between these approaches, which focus on the relationship between discourse and larger social formations, and “more programmatically ‘scientific’ and disciplinary approaches … [which have] a principal focus on the study of language development and use per se” (p. 8). As Luke elaborated, these non-critical models tend to analyze language as a way of explaining the psychological intents, motivations, skills, and competencies of individuals rather than explaining how discourse systematically constructs versions of the social and natural worlds and positions subjects in relations of power. (p. 8)

In contrast, critical approaches that attempt to theorize the links between discourse at the micro-level (in individual written and spoken texts) and at the macro-level (in broader social, political and cultural formations) have a potential

[to] tell us a great deal about how schools and classrooms build “success” and “failure” and about how teachers’ and students’ spoken and written texts shape and construct policies and rules, knowledge, and, indeed, “versions” of successful and failing students. (Luke, 1995, p. 11)

A decade later, Rogers, Malancharuvil-Berkes, Mosley, Hui, and Joseph (2005) looked back at how CDA had been taken up by educational researchers since the time of Luke’s review. Their review illustrated the range of ways that critical approaches to discourse analysis, especially Fairclough’s approach, had been developed by educational researchers over that time. The studies they reviewed included ones which only analysed written texts (e.g. textbooks, policy documents, newspaper articles relating to educational concerns), ones which only analysed spoken texts (e.g. speeches, teacher meetings, class discussions), and many which analysed both types. The latter were often classroom-based studies where some
combination of written artefacts (student and/or teacher produced texts), and transcripts of interviews with classroom participants and classroom interactions were analysed using CDA. Studies which focused on interactional data (i.e. teacher-student talk) often used ethnographic methods such as observational field notes and debriefing with participants to provide contextual information to support the analysts’ interpretations.

The range of studies included in the review reflected a wide variation in what it meant to conduct CDA in educational contexts. Rogers et al. (2005) concluded that CDA was defined in multiple ways, but generally brought together macro and micro analysis and offered description, interpretation, and explanation of social events. They also noted that educational researchers were more likely than CDA researchers working in other fields to include interactional data in their analyses. The inclusion of such data was seen by the reviewers as a significant methodological development as CDA had to that point largely neglected interaction and dialogism.

**Theoretical frameworks**

Two particular versions of CDA, developed by Fairclough and van Leeuwin, have contributed to the study’s methodological and analytical framework. While both approaches claim explicit connections with Foucault’s conceptualisation of discourse, they vary in their emphases on the interactions between social relations and structures. These presuppositions have implications for how the two approaches conceptualise the relationship between discourse and practice that is central to this study. Such conceptualisations in turn influence their objects and levels of analysis, how linguistic and non-linguistic elements are treated, and whether they emphasise explanatory or critical purposes (Glynos, Howarth, Norval, & Speed, 2009).

**Focusing on change**

Fairclough’s approach to CDA has always been concerned with examining how discursive change is a part of wider processes of social and cultural change, and how these changes are evident in changing social practices and in specific events and texts that make up these practices (e.g. Chouliaraki & Fairclough, 1999; Fairclough 1992b, 2007). This focus is especially pertinent to the present study, which is premised on senior schooling reforms that were instigated in response to wider social
and economic imperatives, and that have been subsequently translated in subject-specific ways by syllabus developers and classrooms teachers. The Prevocational Mathematics syllabus guidelines make explicit statements emphasising the new subject’s difference from traditional school mathematics. At a classroom level then, teachers and students whose previous school mathematics experiences are likely to have been with traditional modes will have to reconcile the new ways with the old, more familiar ways of teaching and learning mathematics.

Sandra Taylor (2004) argued that its focus on change made Fairclough’s approach to CDA particularly valuable “in documenting multiple and competing discourses in policy texts, in highlighting marginalized and hybrid discourses, and in documenting discursive shifts in policy implementation processes” (p. 434). Thus, with respect to this study, CDA can be employed in tracking discursive similarities and differences across the stages of the policy implementation process, beginning with the senior schooling reforms advanced by the state in response to “a world of rapid and constant change” (Queensland Government, 2002, p. 4), their specific recontextualisation and operationalisation in Prevocational Mathematics syllabus documents (QSA, 2004a), and the enactment of these guidelines in classroom discourses.

As an integral part of this process, within the classroom itself, a focus on discourse may reveal variation in the understanding of new classroom practices. In other words, a critical discourse analysis of policy and classroom discourses can reveal the extent to which students and teachers draw on policy discourses to make sense of what it means to ‘do Prevoc Maths’. Contextualised tasks have been selected as a more specific focus for the investigation of classroom practices in this study because of their central role, according to syllabus guidelines, in realising the intent of the subject. In the remainder of this section, the key theoretical assumptions about language, discourse and semiosis that underpin Fairclough’s critical discursive approach will be elaborated.

Fairclough’s approach draws on a realist ontology that conceives discourses as having causal powers to affect things in the world; that is, they have real effects on social practices and institutions (Chouliaraki & Fairclough, 1999; Fairclough et al.,
On this basis, social practices—“[the] habitualised ways, tied to particular times and places, in which people apply resources (material or symbolic) to act together in the world” (Chouliaraki and Fairclough, 1999, p. 21)—are a central facet of social life, mediating between more abstract and durable social structures and social events, the “individual, immediate happenings and occasions of social life” (p. 22). There is an inherent ambiguity in the word ‘practice’ as defined in this way—“as a social action, what is done in a particular time and place, and as what has hardened into relative permanency—a practice in the sense of a habitual way of acting” (pp. 21-22). Chouliaraki and Fairclough described this ambiguity as ‘helpful’ in that it sets up a dialectical relationship between structure and agency. That is, the actions of social agents are constrained, but not determined by existing social structures and practices. Therefore structures and practices cannot only be reproduced through the actions of agents; they can also be transformed by them (Fairclough, 2007).

At each of these levels, semiosis (not only language, but also other meaning-making modalities such as visual images or body language) is an element of the social process. Languages, in this inclusive sense, are the semiotic dimension of social structures. They define a set of semiotic possibilities. Texts, as the semiotic dimension of social events, can also be understood in an inclusive sense: written texts, but also spoken texts such as lectures, conversations and interviews, or multimodal texts in digital media that combine still or moving images with words and sounds. Orders of discourse are the semiotic dimension of networks of social practices. They mediate between the semiotic potential that is an irreducible element of social structures and the actual meaning-making of texts: “orders of discourse in general terms [are] … the social structuring of linguistic variation or difference—there are always many different possibilities in language, but choice amongst them is socially structured” (Fairclough, 2003, p. 220). At all three levels, semiosis is dialectically related to other social elements.

Fairclough’s understanding of the dialectical relation between semiosis and other elements can be traced to Harvey’s (1996) theorisation of the relations between discourse and non-discursive aspects of social life.
Discourses internalize in some sense everything that occurs at other moments…. Discourses express human thought, fantasy, and desire. They are also institutionally based, materially constrained, experientially grounded manifestations of social and power relations. By the same token, discursive effects suffuse and saturate all other moments within the social process. (Harvey, 1996, p. 80)

Semiosis is dialectically related to social relations, power, institutions, beliefs and cultural values in that each element is in part semiotic: “they ‘internalize’ semiosis’ without being reducible to it” (Fairclough, 2009, p.163). Thus, in Fairclough’s approach to CDA, there are two dialectical relations that are of interest: the first between social structure, in particular at the intermediate level of structuring (social practices), and social events; and the second, within each level, between semiotic and other social elements (Fairclough, 2009). Moreover, in social practices and social events, semiosis operates in three main ways: (i) as a way of acting or interacting, (ii) as a way of representing (or construing) aspects of the world, and (iii) as a way of being (i.e. of establishing a particular identity).

Semiosis operates in social practices and social events to shape representations of the world, social relations, and individual identities. At a time of educational reform, ‘new’ discourses may be

enacted in new ways of acting and interacting (including new genres),
inculcated in ways of being or identities (including new styles), materialized in new technologies, physical environments etc. (Fairclough, 2005a, p.67)

This way of incorporating semiosis/discourse into theorising the social distinguishes a dialectical-relational version of CDA from other versions that have worked with the concept of discourse and “ended up seeing the social as nothing but discourse” (Chouliaraki & Fairclough, 1999, p.28). Such a comment reiterated Fairclough’s (1992b) long-held rejection of Foucault’s claim that discourse is constitutive. In opposition to this “heavily structuralist” perspective which “excludes active social agency in any meaningful sense”, a dialectical position “sees social subjects as shaped by discursive practices, yet also capable of reshaping and restructuring those practices” (p. 45).

The key concepts, categories and relations comprising the dialectical-relational view of social life that informs the Faircloughian approach to CDA are encapsulated in Figure 3.1 and are elaborated in the discussion that follows.
Figure 3.1 A dialectical-relational view of language and discourse in social life (Fairclough, 2003)

First, discourses are the semiotic category associated with ways of representing certain aspects of the world. Such representations are always a part of social practice – either representations of the material world, of other social practices, or reflexive representations of the practice itself. A discourse may be identified with the perspective of a particular group of social actors. Different educational discourses (e.g. a discourse of student-centred learning, a discourse of direct instruction) are different ways of representing/construing pedagogic practice. Proponents of teacher-directed practices in school mathematics are likely to construe pedagogic practice differently to those who promote group activities centred around contextualised tasks. Educational reforms at a broader level are likely to involve changes in the way that aspects of educational practice are represented.

Second, genres are the semiotic category associated with ways of acting (or interacting) socially. In some forms of social action, semiosis may be a relatively small element of the social action while in others the social action consists almost
entirely of it. For example, in a school context, semiosis may be a less significant element of practical classes (where the main activity is the production of something material) than in a mathematics class where much of the activity involves making meaning with written and spoken language. Part of being a student or a teacher in a mathematics class involves acting and interacting semiotically in particular ways that reflect power/knowledge relations. For example, the ways that teachers orient students to tasks, organise whole-class instruction, pose questions, and so on may be evident in fairly stable configurations across many different classrooms—discourses become enacted as genres (Fairclough, 2001a). At times of educational reform, changes in the way that aspects of educational practice are represented may result in changes in the way that teachers and students act and interact with one another in the classroom, i.e. the overarching lesson genre may change.

Third, styles are the semiotic category that relate to ways of being, i.e. ways of constituting a particular identity. As with genres, the constitution of identities may be more or less semiotic—it may be apparent in new ways of speaking, of interacting with others, or new ways of dressing. For example, a change in classroom practice from teacher-directed instruction to group work based on contextualised tasks could involve the inculcation of new ways of being a teacher or a student if they embrace these new practices. On the other hand, teachers and/or students may feel that new ways of working are being imposed on them and resist any change to the way they see themselves and the way they act and interact with one another. To summarise, discourses, genres and styles are dialectically related to one another. On the one hand, discourses are enacted as genres and inculcated in styles. On the other, actions (genres) and identities (styles) are represented in discourses.

Since social change is a result of change in the networking of social practices (Fairclough, 2003), CDA in particular theorises the mediation between the social and the linguistic at the intermediate level of social practice (Chouliaraki & Fairclough, 1999). The analytic focus of CDA is the order of discourse, the semiotic aspect of the network of practices that create a social order, conceptualised as “a particular social ordering of relationships between different ways of meaning-making— different genres, discourse and styles” (Fairclough, 2009, p. 164). This focus can be illustrated in the context of the present study by a consideration of how social events (and texts
as their semiotic element) are shaped, on the one hand by social practices and structures, and on the other by social agents as follows.

Many of the events which are the focus of the investigation in the classroom component of the study involve an adult and a group of ten or so 16 year olds working together on particular activities centred on contextualised tasks. The events would most likely be recognisable to anyone who has some cultural knowledge of the education system in Australia or similar countries because they can identify the patterns of activities, and the spaces in which they occur, as those belonging to secondary school mathematics education. This recognition is likely to be the case even though some of the activities (e.g. researching how to obtain a passport in a extended task contextualised around planning an overseas holiday) may not conform to traditional notions of mathematics education. Any one of these events can be identified as an activity belonging to a school mathematics lesson. Some of their particularities identify them more specifically with Prevocational Mathematics—it is likely that similar actions and participants could be found in other Prevocational Mathematics classroom settings.

These sets of related events belong to the social practice of secondary school mathematics, specifically the subset of practices associated with labels such as ‘terminal’ mathematics or ‘numeracy’ and the participants can be identified as teachers and students. Classroom observations suggest that both students and teachers are active agents in the events of which they are a part—in shaping classroom practice. But at the same time, their actions are both enabled and constrained by policies that seek to establish the norms of senior secondary school practice in general (Queensland Government, 2002) and in Prevocational Mathematics specifically (QSA, 2004a).

While Fairclough’s approach to CDA provided an overarching framework for the study, it has been seen as more focused on macro-level investigations of social

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4 While Prevocational Mathematics has been categorised as a ‘terminal’ mathematics subject in Chapter 1, an alternative description, as a senior ‘numeracy’ subject is adopted for the remainder of the thesis. This description is preferred as it draws attention to the difference between Prevocational Mathematics which was ‘designed to improve students’ numeracy’ and the other Queensland senior mathematic subjects.
structures than on micro-level investigations of individuals’ agency (Wodak & Meyer, 2009). So, even while the earlier chapters have sought to establish that wider social structures are implicated in the issue of differing interpretations of contextualised tasks, the formulation of the overall research question makes it clear that the study also requires investigation at the level of the social agent. To incorporate this perspective within the parameters of the study, an approach to CDA developed by van Leeuwen, which has been identified as emphasising social agency rather than social structure (Wodak & Meyer, 2009), was used to augment the Faircloughian framework. This approach is discussed next.

**Focusing on practice**

Like Fairclough, van Leeuwen acknowledged the influence of Foucault in his definition of discourses as “socially constructed ways of knowing some aspect of reality which can be drawn upon when that aspect of reality has to he represented, or, to put it another way, context-specific frameworks for making sense of things” (van Leeuwen, 2009b, p. 144, original emphasis). His approach fits within the CDA research program because it too is interested in “the critique of dominant discourses and genres that effect inequalities, injustices and oppression in contemporary society” (van Leeuwen, 2009a, p. 278). As Wodak and Meyer (2009) suggested above, van Leeuwen’s concern with power relations is at the micro- and meso-levels, rather than at a macro level.

The theoretical premise of van Leeuwen’s work – referred to as the ‘Social Actors Approach’ by Wodak and Meyer (2009) is the “primacy of practice”: “all texts, all representations of the world and what is going on in it, however abstract should be reinterpreted as representations of social practices” (van Leeuwen, 2008, p. 5). Van Leeuwen conceived discourses as the ‘recontextualisation’ of social practice. He borrowed the term from Bernstein’s (1990) work on knowledge production and pedagogic discourse, but broadened the concept, to claim that all discourses recontextualise social practices (van Leeuwen, 2008, p. vii). That is, whenever social practices are discussed, reported or described, they are being recontextualised. Social practices are defined as “socially regulated ways of doing things” (van Leeuwen, 2008, p. 6). They can be analysed in terms of their key elements including the social
actors involved; the social actions that make up the practice, and the various conditions (e.g. timings, settings, purposes) that structure social practice.

Van Leeuwen’s approach to CDA makes contributions to the study in terms of the development of the analytical and theoretical framework. The main contribution to the analytical framework is his development of socio-semantic categories to analyse the discursive construction of social actors and social action in a text. Social actors can be represented as active participants in events and processes or passive recipients depending on how they are discursively constructed. They may also be excluded from texts to suit particular interest and purposes. Selected elements of van Leeuwen’s socio-semantic inventory of the ways in which social actors and actions can be represented and their linguistic realisations in text are included in the discussion of analytic methods in Chapter 4.

More substantively, van Leeuwen’s approach intersects with the primary concerns of the study in its conceptualisation of the relationship between discourses and social practices. His notion that, while discourses ‘make sense of things’, different discourses make sense of the same aspect of reality in different ways and serve different interests is important in this study. That is, his focus on sense-making is particularly relevant to the concern of this study with understanding how different discourses about senior schooling may influence students’ and teachers’ ways of making sense of contextualised tasks. Furthermore, van Leeuwen’s (2008, p. 6) emphasis on the distinction between social practices—“doing it” and the representation of social practices—“talking about it” is also of relevance to the study. The texts that are the focus of the discursive analysis in the study can be conceptualised as one that primarily talks about senior schooling practice (the ETRF White Paper), a second that simultaneously does senior schooling practice, in interpreting the curriculum reforms in subject-specific ways, and talks about senior school numeracy practices (the Prevocational Mathematics syllabus), and a third set of texts that do senior school numeracy practice (the contextualised task specifications).

While van Leeuwen’s distinction between ‘doing it’ and ‘talking about it’ contributed to the study’s conceptualisation of the connections between discourse
and practice, the overall approach adopted to generate and analyse data adopted in the study drew predominantly on Fairclough’s (2003) methodology. In the next section, the key concepts that emerged from Fairclough’s theorisation of language, discourse and semiosis are discussed further to explain their role in the current study.

**Examining policy-practice connections**

**Power relations in the policy arena**

The notion that power relations are discursive is a central tenet of CDA. In this study, both the Queensland education policy arena and the Prevocational Mathematics classroom are conceptualised as discursive sites. The study follows the example of other policy analyses that use CDA in conceptualising policy as discourse (Sandra Taylor, 2004; Thomas, 2002, 2009). That is, policies are seen as social practices that represent social realities in particular ways, and in doing so position people in particular ways as social subjects (Thomas, 2009). The policy process involves negotiations over meaning, conceptualised as discursive ‘struggles’ (Sandra Taylor, 2004; Thomas, 2009) that are temporarily settled as emergent discourses achieve hegemonic status (i.e. are taken to represent a commonsense view of the world) (Fairclough, 2005a). The resulting policy documents can be seen as “terrains of compromise” that are “especially prone to reflect multiple discourses” (Kennedy-Lewis, 2013, p. 167).

It is not only researchers working within CDA who see value in conceptualising policy as discourse. As Bacchi (2000) noted “policy-as-discourse theorists define ‘discourse’ in ways that accomplish goals they/we deem worthwhile” (p. 46). In the main,

> [their] primary purpose in invoking discourse is to draw attention to the meaning making which goes on in legal and policy debates. The goal is to illustrate that change is difficult, not only because reform efforts are opposed, but because the ways in which issues get represented have a number of effects that limit the impact of reform gestures. (Bacchi, 2000, p.46)

She argued that issues may be represented in policy in ways that “mystify power relations” (p. 46) in that they shift the blame for failure away from social structures on to individuals. Thus, a focus on language and discourse provides a conceptual framework for examining social processes.
Education research undertaken within this paradigm conceptualises policy as being ‘enacted’. Braun, Maguire and Ball (2010) explained enactment as “an understanding that policies are interpreted and ‘translated’ by diverse policy actors in the school environment, rather than simply implemented” (p.547). While this explanation seemingly restricts policy enactment to the school setting, the current study draws on Singh, Thomas, and Harris’s (2013) examination of the role that ‘mid-level policy actors’ play in policy translation and interpretation to conceptualise the development of the Prevocational Mathematics syllabus as a mid-level policy action. Singh et al. employed Bernstein’s notion of recontextualisation to show how mid-level policy actors mediate the processes of policy enactment by selecting and organising knowledge from policy texts to “an imagined logic of teachers’ practical work” (p. 465). Their work was characterised as involving negotiation and attempts to “make meaning relevant to specific contexts from diverse, incoherent, contradictory and unclear texts” (p. 478).

At this point, it is worth clarifying the different meanings of the term ‘recontextualisation’ that have occurred so far. Both van Leeuwen and Fairclough appropriated the term from Bernstein’s theorisation of pedagogic discourse. Bernstein was specifically interested in the principles by which knowledge is reshaped in an educational context. He made a distinction between the ‘field of production of a discourse’ (2000, p. 34), and the recontextualization of that discourse in pedagogic discourse. Singh (2002) described the process as follows: “Through recontextualisation, a discourse is moved from its original site of production to another site, where it is altered as it is related to other discourses” (p.573). It is in this sense that Singh et al. (2013) used the term.

As discussed in the previous section, Van Leeuwen’s (1993) redefined recontextualisation to differentiate between doing and representing social practice.

The practical knowledge of a social practice, the knowledge of how to perform as a participant of the practice, is knowledge in an ‘unrepresented’ state. As soon as the practice is represented (taught, described, discussed) it is recontextualised (van Leeuwen, 1993, p. 204). Recontextualisation in a Faircloughian sense—the sense that is taken up in this study—presupposes van Leeuwen’s distinction between actual practice and the representation of practice, but applies it to a focus on discursive change as an
element of social change (Chouliaraki & Fairclough, 1999). That is, the concept of recontextualisation is used as a resource for tracing the “movement of meaning” (Fairclough, 2003, p. 30) within and between fields of practice: in this study, the social practices of policy development in education departments and policy enactment in classrooms. The textually oriented analytical approach frequently adopted in CDA to establish discursive links between fields of practice is outlined next.

**Texts and genre chains**

The objects of research in CDA are not texts themselves but the relations between semiotic and non-semiotic moments of social practice. In particular, Fairclough proposed that discourses could be investigated in terms of the following broad issues:

- How and where did they emerge and develop?
- How and where did they achieve hegemonic status?
- How and where and how extensively have they been recontextualized?
- How and to what extent have they been operationalized?

(Fairclough, 2007, p.32)

He theorised that new discourses emerged as elements of existing discourses were articulated together; that the achievement of hegemonic status involved processes of contestation between alternative discourses through which one discourse becomes dominant over others; and that the recontextualisation of dominant discourses involved the movement of meaning across different scales (e.g., at local, national, and global levels) and between fields (e.g., the uptake of economic discourses in education), and through their re-articulation with other discourses in these new contexts. He argued that while some emerging discourses gain sufficient dominance to be implemented as policy, for real social change to occur—for reform policies to be enacted—discourses need to be operationalised. Operationalisation involves the transformation of a policy ‘imaginary’ so that new ways for people to act and interact are enacted, new ways of being are inculcated, and new ways of organizing time and space (apparent in changes to physical systems and structures) are materialised. He saw operationalisation as the critical moment of change in that it focused on “how complex processes and changes in discourse impact upon social life” (p. 32).
These processes operate across networks of social practices (and their semiotic aspect, orders of discourse). Such networks were established as a primary focus for understanding social change earlier in the chapter. Texts are a fundamental component of these networks and so a “textually-oriented” approach to examining the relationships between social and discursive change is often adopted in CDA (Fairclough, 1992b; 2003). Thus, while Foucault’s theorisation of discourse influenced the development of critical approaches to discourse analysis more generally, Fairclough argued that Foucault’s more abstract approach, which focused on ‘the conditions of possibility’ of discourse, failed to include analysis of specific written or spoken texts.

In contrast to Foucauldian approaches to discourse analysis, CDA generally combines critical social theorising with some form of textual analysis. A text, as a specific realisation of a discourse, can be the starting point for a critical discourse analyst. In the analysis of individual written or spoken texts, CDA often involves the use of concepts derived from systemic functional linguistics (SFL) (Halliday, 2004). In SFL, language is seen as a meaning-making system with three simultaneous metafunctions: the ideational function which represents meanings about the world and experience; the interpersonal function which relates to how the identities of and social relationships between text participants are established; and the textual function which determines the meaning conveyed through lexical choices, combinations and organisation. In putting SFL concepts to work in CDA, Fairclough (2003) preferred to distinguish between “types of text meaning” — action, representation and identification (p. 27), which correspond with the semiotic categories of genre, discourse and style.

In CDA, the analysis of specific texts (as the semiotic manifestations of social strategies in specific social events) is undertaken (i) to see how action, representation and identification are realised through lexical and grammatical choices; and (ii) to connect the concrete social event with more abstract social practices by examining how different genres, discourses and styles are drawn upon and articulated together in a text (Fairclough, 2003). Rather than being concerned primarily with the linguistic analysis of specific texts then, CDA can be better conceived as an oscillation between a focus on structures (principally at the level of social practices)
and a focus on discursive strategies. That is CDA focuses primarily on the interdiscursive analysis of orders of discourse.

To elaborate, interdiscursive analysis entails the investigation of how different genres, discourses and styles are ‘articulated’ or ‘textured’ together. It allows one to incorporate elements of ‘context’ into the analysis of texts, to show the relationship between concrete occasional events and more durable social practices, to show innovation and change in texts, and it has a mediating role in allowing one to connect detailed linguistic and semiotic features of texts with processes of social change on a broader scale (Fairclough, 2005b, p. 5).

Such analysis can illuminate the policy process, understood as it is in this study as involving negotiation over meaning. First, since policy reform documents are characterised by the texturing together of multiple discourses as the basis for the emergence of new discourses, an examination of a text’s interdiscursive strategies can reveal how differences between discourses are minimised to create new meanings (Adie, 2008; Sandra Taylor, 2004). Furthermore, interdiscursive analysis can trace the movement of discourses across documents that are linked together in a genre chain.

Genres have been conceptualised by Fairclough (2005a) as “institutionalised way[s] of regulating interaction” (p. 64). Genre chains involve “different genres which are regularly linked together, involving systematic transformations from genre to genre” (Fairclough, 2003, p. 31). They “operate as ‘filtering devices’ with respect to discourses… selectively including or excluding discourses in the shift from one genre to another in intra-organisational or cross-organisational processes” (Fairclough, 2005a, p. 65). Within the policy arena, Fairclough (2009) envisaged discourses as generating imaginary representations of how the world will be or should be within strategies for change that, if they achieve hegemony, can be operationalized to transform these imaginaries into realities. (p. 321)

Thus policy discourses create “imaginary spaces” which in turn give rise to “frameworks for action”, procedures which network social practices (activities) in particular ways” (Fairclough, 2005a, p. 59). In the context of this study, ‘big picture’ policy texts such as the Education and Training Reforms for the Future (Queensland Government, 2002) can be conceptualised as creating an imaginary space in which
particular discourses about senior secondary school mathematics can be articulated, while syllabus documents such as the SAS for Prevocational Mathematics (QSA, 2004a) provide the frameworks for action to establish the social practices which can now be seen as appropriate.

In the current study, processes of recontextualisation and operationalisation are of particular interest. In order to understand the impact of policy reform discourses of senior schooling on teachers’ and students’ understandings of a particular aspect of classroom practice, namely contextualised tasks, the research aims to trace the construction of authoritative discourses of senior schooling promulgated in the policy reform document, their recontextualisation and operationalisation by mid-level policy actors in the development of a syllabus for the subject Prevocational Mathematics, and their further recontextualisation and operationalisation in classroom discourses. That is, at each stage of the genre chain, the analysis will identify what is discursively constructed as legitimate practice in senior schooling.

**Questions to trace discourses from policy to practice**

This chapter has focused on the development of a theoretical framework for exploring how students and teachers make sense of contextualised tasks. The overarching question that the study seeks to answer

How, and how much, do Prevocational Mathematics students and teachers draw on the discourses of senior schooling promoted by policy reforms and syllabus specifications to make sense of their engagement with contextualised tasks?

can be unpacked into a set of sub-questions for more focused interrogation using the genre chain of policy reform, subject-specific syllabus, and assessment task specifications documents as a framing device. New discourses of senior schooling, that is new ways of representing legitimate senior schooling practices, are conceptualised as emerging from policy reform processes that are local recontextualisations of global policy trends. These new discourses are further recontextualised (i.e. legitimate practices are represented in new ways) and operationalised (i.e. new sorts of practices are enacted) in subject-specific ways first.
at the system level by syllabus developers, and then at the school and classroom level by teachers.

The initial identification of the key discourses of senior schooling in the policy texts is addressed by the following two sub-questions:

1. What discourses of senior schooling are promoted in the ETRF White Paper? That is, how are preferred senior schooling practices represented?

2. What discourses of senior numeracy education are promoted in the SAS for Prevocational Mathematics? That is, how are preferred senior numeracy education practices represented?

The questions have been formulated to emphasise the partly promotional intent of contemporary policy genres (Fairclough, 2000a, 2000b; Sandra Taylor, 2004). Thus the analysis seeks, not just to trace the dominant discourses evident in the documents, but also to examine the linguistic and interdiscursive strategies that policy workers have employed to construct authoritative discourses. The form of the questions also highlights the study’s focus on the dialectical relationship between discourses and practices.

However, the development of the theoretical framework in this chapter points to the study’s focus not just on the representation of practices, but on the synergies and tensions between these representations, and their subsequent take-up in the classroom as the primary concern of the analysis. Two further sub-questions were formulated to seek evidence of (i) the recontextualisation and operationalisation of the more general discourses of senior schooling promoted in the White Paper in the SAS for Prevocational Mathematics, and then finally (ii) the recontextualisation and operationalisation of these two policy discourses in the classroom through the analysis of classroom texts and accounts of classroom practice.

3. Which discourses of senior schooling promoted in the ETRF White Paper are evident in the SAS for Prevocational Mathematics? That is, which of the White Paper’s preferred senior schooling practices are (a) represented and/or (b) enacted in subject-specific ways in the syllabus document?

4. Which of these policy discourses of senior schooling and senior numeracy education are evident in the Prevocational Mathematics classrooms? That is, which of the preferred senior schooling/senior numeracy education practices
are (a) represented in interview accounts and/or (b) enacted in task specifications and classroom activities?

Fairclough (1992a) argued that intertextual analysis shows “how texts selectively draw upon orders of discourse—the particular configurations of conventionalized practices (genres, discourses, narrative, etc.) which are available to text producers and interpreters in particular social circumstances” (p. 194). The notion of genre chains as ‘filtering devices’ for the movement of discourses within the order of discourse associated with senior schooling in Queensland suggests that some discourses may remain intact, others may change, and others may disappear as they move from one text to the next. The next chapter describes the broad methodological approach and specific analytic methods used to trace discourses across the genre chain in the current study. It details how such an approach can build on the foundational sub-questions posed above to address the study’s overall focus on the impact of policy discourses on teachers’ and students’ understanding of contextualised tasks.
Chapter 4

Research design and methods

This chapter describes the study’s overall research design based on the conceptual and theoretical frameworks presented in the earlier chapters and elaborates the specific methods adopted to realise this design. There are four main sections. Reflexivity and the role of the researcher have been identified as important considerations in research agendas involving CDA more generally and particularly in education research (Rogers et al., 2005). Accordingly, the first section focuses on these issues. The next two sections describe the data gathering process. Section two provides an overview of the policy and curriculum documents that are central to the study. A rationale for the selection of specific extracts for detailed textual analysis is included. Next, the parameters of the school-based component of the study are specified through a description of the school setting and the collection of data at the site. Here again, a rationale for the selection of texts for detailed analysis is given. The final section of the chapter describes the combination of analytic methods used to interrogate the selected policy, curriculum and classroom texts and additional school-based data in order to address the research questions.

Reflexivity and the role of the researcher

My role as a researcher in this study is necessarily permeated by my personal and professional history. I have been a student and a teacher of secondary school mathematics in Queensland schools and have been involved in writing numeracy policy and in undertaking research work in secondary school classrooms. I recognise that in both incidental and substantive ways each of these roles has had, at different times, an impact on my choice of topic, how I have situated this topic in the mathematics education research literature, and how I have approached the research methodologically. I have therefore been aware of how “the classic tension between distance and closeness in the research setting is often blurred in education research” (Rogers et al., 2005, p. 382). Nevertheless, I have attempted to acknowledge this influence in this chapter by emphasising the deliberative, constructive role I have played in the research process.
The collection of interview data is perhaps the most apparent part of the research process in which the power relations between the researcher and the researched need to be acknowledged (Stephanie Taylor, 2001). It is more difficult to pinpoint how power relations impact on the collection of classroom observational data, as there is likely to be variation over time and with different participants, though here too the mere presence of the researcher needs to be acknowledged. Even the collection and selection of policy data for analysis could be seen as idiosyncratic. The details provided in the remainder of this chapter about the systematic selection of data for the study attempt to address these issues.

The analytic process involved the tracing of discourses and strategies through the systematic coding of the texts’ linguistic features. The description of this process later in the chapter seeks to satisfy the overarching principles for educational research of warrant and transparency (American Educational Research Association [AERA], 2006) at the same time as acknowledging the purposeful role of the researcher in the analysis. That is, the description of the systematic iterative coding of text, oscillating between examining the whole texts for macro-level features and functions and more fine-grained line-by-line analysis of micro-level features and functions in document extracts attempts to make explicit the logic of inquiry that was pursued and justify the interpretations that were reached. Finally, I also recognise that these interpretations and the conclusions that I draw have been socially, culturally and historically shaped by my experiences. They cannot help but be a partial and contingent explanation of how Prevocational Mathematics students and teachers make sense of contextualised mathematics tasks.

**Data gathering 1: selection of policy data**

As has been established in earlier chapters, a primary motivation for the current study was a desire to investigate some of the apparent contradictions between the syllabus advice about contextualised tasks contained in the *Prevocational Mathematics Study Area Specification* (QSA, 2004a) and classroom experience. The link between the SAS and the earlier ETRF policy reforms (Queensland Government, 2002) has also been documented and theorised as the recontextualisation of broad government policy directions for senior schooling in
Queensland into subject-specific curriculum, pedagogy and evaluation. The ETRF policy document, which preceded the publication of the Prevocational Mathematics SAS, obviously cannot refer specifically to the sorts of pedagogic practice that will come to be seen as legitimate for the subject. However, it can pre-empt such understandings as it discursively creates an imaginary space such that alternative discourses about senior secondary school mathematics, different ways of ‘doing’ mathematics, can now be expressed.

**Selection of extracts from the policy texts for detailed textual analysis**

The research questions, with their focus on discourses as representations of practices, and particularly on the promotion of preferred practices, provided criteria to identify extracts from within the two documents for closer textual analysis. While the selection of extracts is being discussed here as a preliminary step in a linear data analysis process, in reality the final selection of extracts was a more iterative process refining initial broad-brush examinations of whole texts with subsequent fine-grained analysis.

The ETRF proposed changes in the early, middle and senior phases of schooling. Despite this fact, there was a clear focus in the document’s Foreword on the senior years of schooling. On closer examination, it was evident that while the foreword gave little detail of the form of senior school practices proposed in the reforms, it discursively constructed the legitimation for new senior schooling practices. For this reason it was selected as the first extract. The initial examination of the document also revealed that the Executive Summary provided a succinct overview of the proposed reforms across the three phases of schooling. The second extract selected for more detailed analysis therefore includes parts of the executive summary that focused on aspects of senior schooling; sections that referred specifically to the other phases of schooling were omitted from the analysis.

A complementary set of extracts was selected from the Prevocational Mathematics syllabus. Its introductory Rationale discursively constructed the legitimation of pedagogic practices though provided little detail of the practices themselves. The intentions of the subject were stated succinctly in the Aims while the details were provided in later sections entitled Learning experiences, Assessment.
strategies and Developing tasks. Sections that are typical of syllabus documents such as the objectives of the course and its overall organisation, including detailed lists of topics were found to be less informative about preferred pedagogic practices and were not analysed more closely. The details of the extracts from the policy documents are summarised in Table 4.1. The extracts are provided in Appendix 2.

Table 4.1 Extracts from policy documents selected for detailed textual analysis

<table>
<thead>
<tr>
<th>Document</th>
<th>Extracts analysed</th>
<th>Why choose the extracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETRF. A White Paper (Queensland Government, 2002)</td>
<td>1. Foreword (p. 4)</td>
<td>Encapsulates the argument for reform</td>
</tr>
<tr>
<td></td>
<td>2. Executive summary (pp. 6-9)</td>
<td>An overview of the reforms</td>
</tr>
<tr>
<td>SAS for Prevocational Mathematics (QSA, 2002)</td>
<td>1. Rationale &amp; Aims (pp. 1-3)</td>
<td>Encapsulates the purpose of the course</td>
</tr>
<tr>
<td></td>
<td>2. Learning experiences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overview (p. 25)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expectations of the learner (pp. 25-26)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Teaching strategies (p. 27)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Approach 11: Plan for practical and</td>
<td>A focus on what students/teachers should do – pedagogic practices rather than content</td>
</tr>
<tr>
<td></td>
<td>contextualised learning (pp. 34-35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Assessment strategies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Developing tasks (pp. 40-43)</td>
<td></td>
</tr>
</tbody>
</table>

Data gathering 2: collection and selection of classroom data

This section outlines aspects of the research design related to collecting classroom data including: the rationale for and processes of selecting a school site and participants; ethical considerations in the conduct of the research; and the generation of data through the collection of written classroom texts, audiotaping of classroom talk and teacher and student interviews. The timing of the fieldwork in relation to the development of policy is summarised in Table 4.2. As this timing suggests, the discursive struggles that are temporarily settled in the creation of policy, are conceptualised in this study as ones that may, in practice, persist over time.
Table 4.2 Timeframe of reforms in Queensland senior schooling in relation to classroom component of research

<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Education and Training Reforms for the Future</em> White Paper published</td>
<td>2002</td>
</tr>
<tr>
<td><em>Study area specifications for Prevocational Mathematics</em> published</td>
<td>2004</td>
</tr>
<tr>
<td>PVM syllabus implemented in schools</td>
<td>2005</td>
</tr>
<tr>
<td>First group of students subject to ETRF reforms in Year 10</td>
<td>2006</td>
</tr>
<tr>
<td>First group of students subject to ETRF reforms graduate with QCE</td>
<td>2008</td>
</tr>
<tr>
<td>Classroom research with Year 11 &amp; 12 students at BGC</td>
<td>2010</td>
</tr>
</tbody>
</table>

**Negotiating school access: practical and ethical considerations**

Negotiating access to school sites in order to undertake research with young people requires multiple levels of ethical approval. After university approval to proceed with the study had been obtained (Griffith University Ref No: EBL/25/08/HREC), government and Catholic education sector offices responsible for approving research in Queensland schools and a number of Catholic and independent schools who operated independently from these two systems, were invited to be involved in the study. The two criteria for approaching schools were:

a) a location that would enable multiple visits to the school site to collect data, and
b) the provision of a choice in senior secondary mathematics subjects including Prevocational Mathematics.

The collection of school data was undertaken at a Catholic girls’ college, pseudonymously named Bankside Girls College that met these criteria and was the first to respond positively to the invitation to undertake the research.

**The school and its Prevocational Mathematics classes**

The following description of the school draws on information from the school’s annual report for 2010 and the school’s profile on the *My School* website (ACARA, 2010). In 2010, when the major portion of the school-based data for the study was collected, the school had approximately 750 students enrolled in Years 8 to 12. The NAPLAN results for Year 9 students in 2010 indicated that the school’s averages
were close to or above the average of all Australian schools’ averages on each of the literacy and numeracy domain scores with over 95% of students scoring above the benchmark on all of the measures.

The school aimed to be an inclusive community catering for students from diverse social, cultural and economic backgrounds and of different academic abilities. One of the ways of doing this was to provide broad and flexible teaching and learning experiences that provided opportunities for all students to excel. To this end, vocational education and training (VET) subjects were offered alongside more traditional academic subjects in the senior school curriculum. Thus, many Year 11 and 12 students were enrolled in some form of VET, such as a structured work placement or a school-based apprenticeship/traineeship. Other students combined their senior school studies with a Certificate5 course either at the school or at a nearby Technical and Further Education (TAFE) college. In total, about 40% of the students completing Year 12 in 2010 obtained one or more VET qualifications with over half of these at the Certificate II level.

In terms of mathematics, during Year 10 (described by the school as a year for transition into the senior school), students could take one of three levels of mathematics. These alternatives influenced which of the three senior mathematics subjects—Prevocational Mathematics, Mathematics A, or Mathematics B they would take in Year 11 and 12. (Some students taking Mathematics B took the advanced course, Mathematics C as well.) Across the other subject areas, there were similar ranges of academic and vocationally-oriented alternatives. In Year 11 & 12, students who elected to study a course that would make them eligible to apply to university typically studied six academic (Authority) subjects. Those who elected a more vocationally-oriented course typically studied the equivalent of five subjects which could include a mix of Authority and Authority-Registered subjects and VET Certificate courses. Many of these students also undertook either work experience, or a traineeship or apprenticeship one or two days a week.

5 The inclusion of VET Certificate courses leading to Certificates I, II (basic vocational skills and knowledge) and III and IV (more advanced skills and knowledge in particular industries) as part of senior schooling in many Queensland schools was one of the consequences of the ETRF policies described in Chapter 1.
Students who participated in the VET component in Years 11 and 12 were more likely to take Prevocational Mathematics than one of the other senior mathematics subjects. This involvement had consequences for the day-to-day composition of the two Prevocational Mathematics classes in which the study was undertaken. While both classes had approximately 15 students enrolled, on any given day there were likely to be fewer students present. This variation was because students who were undertaking work placements or school-based apprenticeships or traineeships were absent one day each week so they could attend their workplace or TAFE college course.

**Negotiating classroom access: practical and ethical considerations**

After obtaining formal permission from the college’s principal to conduct the research, both Prevocational Mathematics teachers were informed about the project and invited to participate. Once they had agreed that their classes could be involved in the study, information about the research was presented orally to students in class. As well, an information sheet was given to them to take home so that both they and their parents could exercise informed consent. Both teacher and student participants were advised of the provisions that had been made to ensure confidentiality and anonymity, and were assured that their participation was voluntary and that they could withdraw from the study at any time without consequence.

Since not all students in either of the classes gave their consent to participate in the study, the collection of classroom data in 2010 was limited to self-selected ‘focus’ students. Additionally, a final set of interviews with the Year 11 class was organised during 2011 when these students were in the final weeks of Year 12. An extra four students agreed to be interviewed on this occasion, while some of the original Year 11 participants declined to be interviewed.

The fact that not all students agreed to participate had consequences for the data collection, particularly for classroom talk data. Audio-recordings of classroom events were made on several classroom visits (7 of the 16 lessons overall). Typically, the recordings began as the lessons started with teacher instructions about what would be happening for the rest of the lesson. The teacher-led instruction sometimes extended into a larger segment of the lesson, while at other times students quickly
moved on to independent or group activities. In the latter case, a pair or small group of focus students were selected and their talk was recorded for approximately ten minutes before moving on to record another pair or group. This was enough time to record students’ discussion around one aspect of a task, and over the whole lesson to record two or three segments of talk from different groups of students. However, because the focus students were not isolated from the remainder of the class, it was impossible to make recordings without including non-focus students. On reviewing the recordings, once these students’ contributions to the discussion were removed from the dataset there was often a lack of continuity in what remained.

There was also a lack of continuity on a broader scale (i.e. over the four-month period in which the classes were visited), which had an impact on the composition of the final set of classroom-based data. A range of factors contributed here. At the end of each lesson, the teacher was given the opportunity to propose when the next data collection should occur. It was important to give teachers this degree of control over classroom data collection, though it did result in gaps in the data that might have been avoided by a pre-determined schedule of visits. When combined with absences due to the participation of focus students on off-campus work placement or VET courses⁶, and a number of public holidays and school events such as swimming carnivals, the end result was that the classroom data for the study were collected over nine 50-minute lessons with Year 12 students and seven 50-minute lessons with Year 11 students between March and June 2010.

The teachers, the students and the tasks

Of the two teachers participating in the study, one had been involved in the negotiations to undertake the research from the outset. She was an experienced specialist mathematics teacher who had taught Prevocational Mathematics previously as well as other mathematics subjects in both the senior and middle years. The second teacher had taught Prevocational Mathematics in the previous year, though

⁶ Students were expected to make up for the classes they missed on days when they were at school and had ‘spare’ lessons. They could consult their teacher or continue their work independently to keep in step with the rest of the class. However, I had no research access to students at these times.
this was her only mathematics class. She had not undertaken any formal preparation to teach mathematics.

In the Year 12 class, only four students chose to participate in the study. Of those who did, one student was absent on several days including on the two occasions that assessment data were collected. Consequently, while an initial interview and some talk in the classroom to which she contributed remained in the dataset, none of her written work was collected. In the Year 11 class, only three students did not wish to participate. However, in each week two of the days on which Year 11 Prevocational Mathematics classes were scheduled coincided with days when some students were off-campus. On these days, the students were either at the local TAFE College or at a workplace as part of their school-based traineeship. To include a comparable amount of data to that provided by the Year 12 students, four Year 11 students who were present on most of the days on which data had been collected, contributed written work to the dataset, as well as interview and classroom talk data. Another eight students contributed to the group interview and classroom talk data, though sometimes only briefly.

The school’s Prevocational Mathematics work program was based around two to three self-contained units in each semester of study. Each of the units that were observed comprised a mixture of more traditional mathematics segments (i.e. teacher-led whole-class instruction of content followed by the completion of graded exercises) together with the completion of contextualised tasks. For example, the unit based around a theme of “A place to live” included lessons where students worked in groups to design and build a model of a doll’s house and more traditional lessons where they learnt how to calculate interest on loans and completed a workbook with problems related to borrowing money to buy a house. Table 4.3 provides an overview of the units that the two classes were working on during the data collection period.
### Table 4.3 Semester 1 units of work in Prevocational Mathematics included in the research

<table>
<thead>
<tr>
<th>Year level/topic or theme (content)</th>
<th>Research coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 12</strong></td>
<td></td>
</tr>
<tr>
<td>1. Navigation (one lesson observed – compass bearings)</td>
<td>1 lesson</td>
</tr>
<tr>
<td>2. Buying a car (criteria for selection, financing a car, insurance)</td>
<td>4 lessons</td>
</tr>
<tr>
<td>3. Planning an overseas holiday (travel costs – flights, accommodation, insurance; currency conversion, time differences)</td>
<td>4 lessons</td>
</tr>
<tr>
<td><strong>Year 11</strong></td>
<td></td>
</tr>
<tr>
<td>1. Super size me (conducting a survey, designing food packaging and labels)</td>
<td>3 lessons</td>
</tr>
<tr>
<td>2. A place to live (designing and constructing a doll’s house, renting &amp; buying real estate)</td>
<td>4 lessons</td>
</tr>
</tbody>
</table>

### Selecting classroom texts for detailed textual analysis

Both written and spoken classroom texts were seen as potential data sources in the study. That is, the written assignment specifications (the topics and tasks selected by teachers), the students’ (usually written) responses to these and the classroom talk that accompanied the completion of these tasks could all contribute to an understanding of whether the policy discourses about legitimate senior schooling practices were influential in shaping how teachers and students made sense of contextualised tasks. However, only the teacher-produced task specifications were considered for detailed textual analysis.

There were both conceptual and pragmatic reasons for restricting this dataset, first to the task specifications, and then to two of the four tasks observed. The written tasks specifications were conceived as the ‘next step’ in the genre chain that provides the framing for the study. While lesson plans, classroom instructions, student talk, and so on were all arguably semiotic elements of the network of Prevocational Mathematics practices (and thus equally valid candidates for analysis), the task specifications were considered more comparable to the policy documents in that they were official texts that communicated to students and to wider audiences about what is valued in the subject. Table 4.4 provides an overview of this data and highlights
the two contextualised task specifications (bolded in the table) that were selected for more fine-grained analysis. These documents can be found in Appendix 3.

<table>
<thead>
<tr>
<th>Year 11</th>
<th>Year 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Super Size Me” Task specifications</td>
<td>“Buying a car” Task specifications</td>
</tr>
<tr>
<td>Task sheet 1: Volume (exercises)</td>
<td></td>
</tr>
<tr>
<td>Task sheet 2: Survey &amp; package design</td>
<td></td>
</tr>
<tr>
<td>“A Place to Live” Task specifications</td>
<td>“Planning a holiday” Task specifications</td>
</tr>
<tr>
<td>Task sheet 1: Design brief for doll’s house</td>
<td></td>
</tr>
<tr>
<td>Task sheet 2: Renting / housing loans (Web searching activity; interest calculations)</td>
<td></td>
</tr>
</tbody>
</table>

Since the Prevocational Mathematics syllabus advocates that teachers include a variety of approaches in a work program, there are no claims made about the representativeness of the two tasks selected, either at the local level (i.e. that these were typical tasks at the school) or more generally, that these are typical of what occurs in other schools. However, while the final selection of the two tasks for detailed analysis was necessary to remain within the parameters of the study, the selection was also considered in that (i) the tasks represented two distinct approaches to task design taken by the two teachers, and (ii) the tasks were variations on exemplars provided in the Prevocational Mathematics syllabus.

**Additional data: classroom talk, observations and interviews**

Despite the difficulties that were faced in collecting audio data in the classroom, and the resulting patchy coverage across the research time frame, the data that were collected did make a contribution to the study in that they were used to inform the discussion of classroom practices. That is, classroom talk was grouped with observation and interview data and students’ written responses and differentiated from the core genre chain of policy and classroom texts to be analysed. This distinction was made on the basis that the genre chain texts all had a permanency and independence from the research process, and could be considered naturally occurring data (Silverman, 2006). In contrast, the interviews, the field notes and the recordings of classroom talk had a different status. They were artefacts of the research process.
and owed their existence to deliberate and avowedly selective researcher involvement.

Chouliaraki and Fairclough’s (1999) advice to combine discourse analytical research with other social scientific methods, particularly ethnography, for the benefit of both, provided the model to deal with these different categories of data. Extended fieldwork incorporating data collection methods such as audio recordings, field notes and interviews is the hallmark of ethnography and can contribute the sort of knowledge that CDA often extrapolates from text, that is knowledge about the different moments of social practice: its material aspects (for example its locational arrangements in space), its social relationships and processes, as well as the beliefs, values and desires of its participants. (p. 62)

In turn, CDA brings to ethnography a degree of reflexivity:

data material should not be regarded as faithful descriptions of the external world but as themselves discursive formations that are assembled together to construct a particular perspective on the social world; neither do participants’ accounts transparently reflect the social processes in which they are embedded. (p.62)

Krzyżanowski (2011) also argued that a combination of ethnographic and critical discursive perspectives can strengthen problem-oriented research, particularly studies that examine “the circulation of meanings across different institutional spaces, scales and genres” (p. 232), such as the present study does. An example of this type of study is the educational tracking of a student over a 10-year span that combined longitudinal ethnography (observations in the home and classrooms, interviews with family and community members) with the analysis of official and unofficial records (Rogers, 2011). This approach enabled Rogers to connect micro and macro discourses that impacted on educational decision-making and their consequences for educational equity.

Similarly, Johnson (2011) drew on ethnography and CDA to examine language policy processes “within and across the multiple layers of policy creation, interpretation, and appropriation” (p. 267). His study involved observations in schools and meetings, formal and informal interviews with teachers, administrators and policy-makers in combination with CDA of policy texts and discourses. He argued that
While CDA is effective in establishing intertextual and interdiscursive links between policy texts and discourses, ethnography is essential in contextualizing the data and understanding why language policies are recontextualized in particular ways in particular contexts. Ethnography reveals why the intertextual and interdiscursive connections exist and what they mean for local participants (in this case, bilingual education students). (p. 277, emphasis in original)

In this study, field notes captured the material aspects of Prevocational Mathematics classroom practices and the social relationships and processes of participants: such things as classroom spatial arrangements, and the main student and teacher activities of the lesson. Additional data were obtained from individual and/or group interviews with students before and after the collection of classroom data. The two teachers were also interviewed after the classroom data collection had been completed. The interviews were semi-structured. Student interviews focused on (a) reasons for taking Prevocational Mathematics; (b) their experience of Prevocational Mathematics; and (c) other school mathematics experiences. Teacher interviews focused on (a) students’ reasons for taking Prevocational Mathematics; (b) task design issues—content and process; and (c) perceived task demands. There were also informal de-briefings with teachers after each lesson. The inclusion of interviews in the study ensured that the views of producers and consumers of the texts under investigation were also included in the analysis and therefore helped to address the criticism that CDA often relies too heavily on the researchers’ interpretation of texts (Breeze, 2011). Table 4.5 is an overview of the interview data that were collected for the study.

**Table 4.5 Interview data**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Teacher interviews</td>
<td>Interview (after classroom data collection)</td>
<td>Interview (after classroom data collection)</td>
</tr>
<tr>
<td>B. Student interviews</td>
<td>Interviews with 3 pairs of students (before classroom data collection)</td>
<td>Interviews with 4 students (before classroom data collection)</td>
</tr>
<tr>
<td></td>
<td>Interviews with 4 pairs of students (after - Oct 2011)</td>
<td>Group interview with 3 students (after classroom data collection)</td>
</tr>
</tbody>
</table>
Developing the analytical approach

In this section, the methods used to undertake the linguistic and interdiscursive analysis of texts are elaborated. The iterative approach to analysis adopted in the study is simplified here into stages corresponding to

1. an examination of whole text organisation through identification of the texts’ semantic structure, generic structures, and the classification schemes drawn upon;

2. an examination of selected extracts focusing on linguistic features that contribute to the representation of legitimate or ‘preferred’ senior schooling practices, and what students and teachers do as part of this practice, including:
   a. concrete representations of practice (the participants that are present in the texts and what processes are they associated with)
   b. abstract representations of practice (i.e. where participants are not present in the text and/or social agency is obfuscated)
   c. evaluations (value statements about the desirability/importance/usefulness of practices) and semantic relations between clauses (in particular whether or not explanations are given for practices)
   d. modality (the authors’ degree of commitment to (i) the truth or likelihood of their statements about practices, or (ii) the desirability of, obligation to or permission to commit to practices);

3. further examination of the extracts focusing on interdiscursivity (the texturing together of different discourses, genres and styles to create new discourses);

and

4. a final tracing of discourses across the policy and classroom texts

Stage 1

Whole text organisation

In both policy and classroom documents, headings and sub-headings and spatial arrangements of text and image are used to alert readers to salient and important information and to provide overall coherence to the text (van Dijk, 2001). In the
policy documents, these were used as an initial filter to identify relevant extracts for further analysis and to identify the texts’ key topics or themes (i.e. the texts’ particular representation of reality). Some critics of CDA have suggested that an analytic move that does little more than what any reader might be expected to do lacks rigour and is itself susceptible to the analyst’s predetermined frames of reference (Breeze, 2011). The next step, the generation of classification schemes for each document, was therefore important in that it provided confirmation that the headings had identified the key themes/topics that would be used as the basis for the identification of key discourses.

**Classification schemes**

A classification scheme is “a particular way of dividing up some aspect of reality which is built upon a particular ideological representation of that reality” (Fairclough, 2001a, p.96). Classification schemes are evident in the collocation of words (i.e. the patterns of co-occurrence of words in texts). Concordance software (Imao, 2014) was used to generate lists of the most frequent lexical items in a document and to then examine the concordance and collocation patterns for these items, i.e. the surrounding context for each instance of a given word. Lexical items are the content words—the nouns, adjectives, verbs and adverbs—in a text. Generating the collocations and concordances of frequent content words can reveal patterns in the way that particular aspects of reality are represented in a text. For example, Table 4.6 shows a few lines from the concordance file for ‘young people’ in the ETRF. This brief extract highlights the repetition of particular phrases in the text that foreground a representation of young people as the receivers of government largesse and the linking of ‘our’ young people with the future of the state.

Classification schemes developed from the exploration of concordance files for frequently occurring content words in the two policy documents can be found in Appendix 4.
We will introduce a range of measures to give **young people** more options and more flexibility so they are better equipped.

Research shows that completing Year 12 or its equivalent gives **young people** greater opportunities in further education and employment.

Education and training systems in Australia to ensure that our **young people** are equipped to lead the way into the future.

Our **young people** are the future of our state. The Queensland Government is dedicated.

In small documents such as the task specifications examined in Chapter 7, the use of concordance software adds little of value to the close, repeated readings of the text. That is, while the identification of classification schemes for the policy documents helped in (i) the selection of pertinent extracts and (ii) the direction to take in subsequent analytic stages, for the task specifications it did little more than confirm initial impressions about the topics of the tasks.

**Stage 2**

**Representation of practices**

(1) **Participants and processes**

Transitivity is a grammatical feature that contributes to a text’s ability to specify different types of processes (Janks, 2005). Halliday (2004) identifies six types of processes: material (related to types of doing); mental (sensing); relational (types of being, relations to one another); behavioural (types of behaving); verbal (types of saying); and existential (recognition of existence). An analysis of transitivity can show how teachers and students are represented in texts by identifying the way in which they are presented as agents in different types of processes. Patterns in the association of groups of participants with particular processes and circumstances can legitimate particular types of pedagogic practice that they participate in.

An example of the application of transitivity analysis in this study is in the Prevocational Mathematics SAS where the extracts were examined to see when
students were represented as thinkers, participating in mental processes such as explaining or solving, or as doers, participating in material/behavioural processes such as using and demonstrating.

(2) Abstract representation of participants and practices

Transitivity analysis can be useful when social practices are represented in specific concrete ways. However, the key elements of social practices—the participants and their actions may be excluded when the actual details of a social practice are less important than the legitimation or critique of that practice (van Leeuwen, 2008).

Some of van Leeuwen’s socio-semantic categories for social actors are particularly useful for this analysis. He made a distinction between social actors that are included and those that are excluded, and noted that it is important to question why some social actors in the activity being discussed are backgrounderd or excluded entirely from the text. At other times, social actors may be included in a text but their role as social agents is obfuscated. This can be done through such linguistic strategies as using a passive construction to either background or remove the social agent involved in an activity (passivation) or rewording processes (verbs) and properties (adjectives) into nouns (nominalization). A statement in the ETRF White Paper about one of the government’s intended actions: “we will introduce a range of measures to give young people more options and more flexibility” illustrates two of these strategies. ‘We’ (the government) is constructed as having agency, ‘young people’ as passive beneficiaries of the government’s actions, meaning that it is unclear what students actually do. Furthermore, abstract nouns such as ‘options’ and ‘flexibility’ allow what the government is proposing to give to remain equally vague.

Evaluations and explanations of practices

By making evaluative statements, authors either explicitly or implicitly commit themselves to particular values (Fairclough, 2003). Evaluative statements are statements about what is desirable and what is undesirable. They can be realised explicitly through adjectives, adverbs, verbs and nouns. Implicit evaluations depend on the assumption that the author and reader share a familiarity with an implicit value system. When the writers of the ETRF White Paper described their proposed
reforms as creating “an innovative and vibrant education and training system”, they attached positive evaluations to the reforms to legitimize them.

Examining texts for causal relations between clauses or sentences can establish whether the text’s author is making claims based on assumptions that remain implicit or is justifying them through causal relations. For example, the Prevocational Mathematics syllabus provides an explicit reason for assessment during class time in the sentence “So that students can be fully supported and scaffolding provided, assessment should be conducted mostly in class time”.

**Modality**

Fairclough (2003) defined two main types of modality. Epistemic modality is related to the exchange of knowledge and refers to the degree to which authors commit themselves to the truth of statements. Deontic modality is related to activity exchange and refers to the degree to which actions are constructed as an obligation or necessity. Modality is realised explicitly through modal markers: verbs such as ‘can’, ‘will’, ‘must’; and adjectives and adverbs such as ‘certain’/‘certainly’ and ‘possible’/‘possibly’; though unmodalised categorical statements can also be construed as authoritative commitments to its truth.

Modality provides evidence of the relationship between speakers or writers and their representations of the world and can point to whether statements are acceptable or unacceptable within a particular discourse. For example, the ‘instructions to students’ section of a classroom text illustrated high and moderate modality in the statements: “All working *must* be shown…” and “Calculators *may* be used…”. A student’s interview comment about a task—“That was *so* not maths”—expressed her strong commitment to the truth of the statement.

**Stages 3 and 4**

The preliminary linguistic analyses undertaken in the previous two stages form the basis of the tracing of discourses within and between texts that are central to the investigation of the recontextualisation and operationalisation of discourses across the genre chain. The third stage is conceptualised as an analysis of interdiscursivity—an examination of how texts articulate different discourse, genres,
and styles together in innovative ways within a text, as outlined in the previous chapter.

The final stage is conceptualised as an analysis of intertextuality—an examination of how texts draw upon and incorporate other texts (Fairclough, 2003). Intertextuality does not necessarily involve a direct reference to other texts. In this study, it is rather a matter of whether the ‘voices’ that are present in earlier texts are called up or rejected in succeeding texts in the genre chain. That is, the purpose of the intertextual analysis is to determine the extent to which policy reform discourses are drawn on in the development of the syllabus and then in the enactment of classroom practices, either directly or via syllabus discourses.

The next three chapters present the results of the linguistic and interdiscursive analyses of the reform (Chapter 5), syllabus (Chapter 6) and classroom (Chapter 7) texts. In addition, intertextual analyses trace discursive (dis)connections, initially between the reform and syllabus texts (Chapter 6), and then between these and the classroom texts (Chapter 7). Van Leeuwen’s (1993, 2008) distinction between actual social practices and the representation of social practices is an important element of the theorisation that underpins these analyses. That is, while the ETRF White Paper, the SAS for Prevocational Mathematics, and the interview accounts may all be conceptualised as constructing representations of senior schooling practice—particular versions of what is seen to count as legitimate ways to do senior schooling, the syllabus and classroom texts may also be conceptualised as ways of operationalising senior schooling discourses. In other words, in translating and interpreting senior schooling reforms in subject-specific ways, the syllabus developers are likely to do more than recontextualise ETRF; they (in part) transform the reform discourse’s imaginaries into a system of organising learning within the subject that includes new genres and styles. Similarly, the set of classroom texts analysed in Chapter 7 are conceptualised as an operationalisation of senior schooling and senior numeracy discourses, involving new ways of acting and interacting, new ways of being a mathematics teacher or student, in new time-space arrangements influenced by both the ETRF and the syllabus. The tracing of discourses across the policy and classroom texts establishes the groundwork for the final discussion in
Chapter 8 of the extent to which students and teachers draw on the policy discourses to make sense of contextualised tasks.
Chapter 5
Discourses of senior schooling reform

Chapter 5 focuses on the first text associated with the genre chain that frames the study’s investigation. It examines how an authoritative discourse on senior secondary schooling is constructed in the ETRF White Paper (QSA, 2002). The chapter begins with an initial broad-brush analysis of the document. It examines the overall semantic organisation and identifies the classification scheme and generic structures upon which the document draws. The two extracts that were selected for further fine-grained analysis are discussed next. The discussion highlights the linguistic and interdiscursive strategies used by the document’s authors to legitimise the need for reforms, outline the actions needed to undertake the reforms and describe the preferred senior schooling practices that will eventuate.

An overview of the ETRF White Paper

The White Paper is organised into five distinct sections. A Foreword, an Executive Summary and a visual representation or ‘snapshot’ of the reforms precede the main body of the document. The main body elaborates the substance of the reforms, listing actions that the government will perform, and providing illustrations and case studies to convey the government’s vision for education in Queensland. Two summaries of consultations that informed the reform process follow the main section.

The overall theme of the White Paper is summed up in two phrases that are used as labels in the graphic snapshot of the reforms, and as the highest level of section headings in both the executive summary and the main section: ‘All young people in education and training’ and ‘The Government’s commitment’. The repetition of these phrases provides the global coherence of discourse for the White Paper. They convey the government’s intent to create an inclusive education system in which all young people will be able to participate. Second-level headings that identify key reforms proposed by the government: ‘Reshaping Senior’, ‘More Options and Flexibility for Young People’, ‘More Support for Young People’, and ‘Working Together—Building New Community’ are similarly repeated, first in the
Executive Summary, then in the graphic snapshot and the main section of the document. Summarizing the gist of the reforms in the headings is a way of “working up the discourse” (Fairclough, 2000a, p.185). The headings anticipate the characteristics of the preferred new senior schooling practices that are elaborated in the substance of the document—that they are ‘shaped’ differently, and that they should be flexible, supportive, and involve the wider community. The lexical classification scheme (see Appendix 4, Table 1)—the frequently occurring participants, their attributes and the processes they are associated with, which carry the meaning of the text—corroborates the significance of these headings to the semantic information of the text as a whole. ‘Options’, ‘support’, ‘community’ and ‘flexibility’ are among the most common content words in the document and their appearance in section headings can be seen as a key discursive strategy in conveying the government’s preferences for a new set of senior school practices.

The classification scheme identifies the main participants in the text as (i) ‘young people’/’students’, (ii) ‘education’ (represented through an extensive list of near-synonyms ‘learning’, ‘training’, ‘schooling’, ‘studies’ and the hyponyms ‘schools’, ‘TAFEs’, and ‘providers’), and (iii) ‘Queensland’/the ‘state’/the ‘government’. Significantly, the category of ‘teachers’ does not appear in the frequent words list and is largely absent from the text as a whole. Collocation patterns for some of the most frequent verbs across the text (‘provide’, ‘achieve’, ‘ensure’) indicate that these are processes frequently associated with the government, or sometimes with the education system as a whole. The prominence of government actions and the absence of teacher action suggest that the ETRF is not highly prescriptive about what happens in classroom practice but is more concerned with regulating senior schooling at the system level. The representation of senior schooling practices therefore remains at a more general level.

The generic distinction between the informational and promotional intent often evident in contemporary policy documents (Fairclough 2000a, 2000b; Sandra Taylor
2004) was confirmed by the initial scan of the document. The foreword\(^7\) of the document (p. 4) served a primarily promotional purpose in that it set out a rationale for the government’s commitment to ensuring that all young people participated in senior schooling without providing any details of the reform. In comparison, the executive summary (pp. 6-9), while it also detailed the rationale for reform, clearly had a more informational intent as it sketched out what the government envisaged for senior schooling and how they proposed to achieve this.

**The need for reform**

The foreword, by its very nature and location, is an initial frame that provides directions to readers on how they should understand the substance of the reforms that follows. While the whole document can be assumed to be a work of collective authorship by policy workers, the foreword is presented as the views of the Queensland Premier and two Cabinet Ministers. The presence of their names suggests that the reforms are a Government priority. It also suggests that the audience for the document is more extensive than the immediate education community, with the politicians’ message more likely to be aimed at the broader Queensland public.

Fairclough (2003) drew on van Leeuwen’s work on legitimation to identify a number of strategies that may be used to legitimate actions, procedures or structures, and several of these are evident in the Foreword. Authorisation is legitimation by reference to the authority of people in whom institutional authority of some kind is vested, or of law, tradition, and custom. An appeal to expert authority to justify the proposed ETRF reforms is exemplified in the statement

> National and international research shows that completing Year 12 or its equivalent gives young people greater opportunities in further education and employment. (lines 22-23)

Another justification for the reforms could be seen in terms of a collective personal authorisation by Queenslanders:

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\(^7\) See Appendix 2 for the Foreword (Extract 1) and Executive Summary (Extract 2) of the ETRF White Paper. Line numbers for longer quotes (in parentheses) refer to the numbering shown in these extracts.
Thousands of Queenslanders have taken part in consultations about proposed reforms to our education and training system and we want to thank those who participated for their valuable contributions. (lines 11-12)

A more pervasive, though less overt form of legitimation occurs in the Foreword in the way that educational change is represented as inevitable, a response to larger, inescapable changes. In developing this case in the foreword, widespread societal change is represented as the problem, education reform as the solution. That is, the overall semantic pattern of the foreword is one of problem-solution (Fairclough, 2000a). The opening paragraph of the foreword cues the reader to the problem of the changing world before providing the solution — that ‘we too must change’.

If we look forward we see a world that is rapidly changing, and we know that if we are to keep up with the pace of change we too must change. (lines 1-3)

The sentence constructs a complex conditional relationship. It presupposes the broader public’s tacit approval for reform, through the use of the pronoun ‘we’, effectively dismissing any alternative viewpoints. This discourse of consensus is reinforced in the remainder of the Foreword. The text consists of a loosely connected set of declarative assertions, that slip “between description and prediction” (Fairclough, 2003, p. 99), and repeat the use of ‘we’ and ‘our’ to imply that the government’s beliefs are shared with the text’s readers, the people of Queensland.

The next few sentences in the Foreword demonstrate this pattern.

It is important that we all work together to achieve this change. The Queensland Government will work with industry and the community to ensure that future generations gain the benefits of a rewarding and fulfilling education that sets the foundations for future success.

Our vision for the Smart State is to create a state of prosperity and social justice with a commitment to equality of opportunity.

Education and training are at the heart of the Smart State vision and that means providing the very best learning opportunities possible for every young Queenslander regardless of their economic and social circumstances. (lines 4-10)

The statements are loosely connected in that key ideas of change, at a global level and in a Queensland context, are repeated multiple times. However, rather than developing an “explanatory logic” which makes causal connections to support the proposed reforms, the set of statements can be seen as providing a “logic of
appearances” (Fairclough, 2003, p. 95)—an unordered list of facts “without temporal or spatial specification or limit” (Fairclough, 2005a, p. 9). This “building up of a picture of the ‘new age’” (Fairclough, 2003, p. 99) in the texturing of relations between description and prediction, between change as a fact and change as an imperative, is typical of many contemporary policy documents. It is a form of legitimation conveyed through narrative (Fairclough, 2003). Furthermore, as Fairclough (2003) argued, such texts seek to establish an authoritative voice by closing down dialogue, by persuading the reader that they present the only possible policy solution to the envisaged future.

In the second half of the Foreword, the authors move from these assertions about change to imperatives of what must be done to counter its effects. The use of the modal verbs of obligation ‘should’, ‘must’ and ‘have to’ underpin the urgency to act:

Learning should prepare students for the world. Our education and training system must teach them about the world as it is now and prepare them for a future that we — today — can only imagine. (lines 16-17)

… we must reform the system from time to time in response to the changes that are reshaping our world and our communities. (lines 20-21)

Today, 10 000 Queenslanders aged 15 to 17 years are not in school, not in work and not in training. This is simply not good enough and we have to try harder. (lines 26-27)

The final sentence of the Foreword:

We are demonstrating that commitment by changing the education and training system to ensure that young Queenslanders lead the way and are not left behind, in a world of rapid and constant change. (lines 32-34)

reiterates the opening presentation of problem and solution, though this time the solution (changing the system) precedes the problem (the changing world). This grammatical construction suggests that the solution is no longer treated as ‘new’ information but can now be considered as ‘given’ (Halliday, 2004). The presentation of the proposed reforms in the remainder of the document is thus framed as elaborating the solution to an undeniable problem.

Fairclough (2003) defined value assumptions as statements about what is desirable or undesirable. They depend upon a familiarity with an implicit value
system that is shared between author and reader. He argued that all legitimation strategies to some extent implicitly assume that authors and readers have a shared value systems. They aim to create a sense of positive, beneficial, understandable, necessary or otherwise acceptable action in particular circumstances (Vaara, Tienari, & Laurila, 2006). Throughout the foreword, value-laden adjectives are used to establish the worth of the proposed reforms. Time at school is presupposed to be ‘amongst the best and most important years of our lives’, while the reforms are predicted to lead to ‘a rewarding and fulfilling education’, ‘the very best learning opportunities’, and ‘an innovative and vibrant education and training system’. That is, the legitimation of the practices proposed in the reforms is invoked by the positive values assumed to be associated with them even before they have been described in any detail.

Social investment strategies linking imperatives of economic prosperity and social inclusion have been seen as part of a “neo-liberal globalized education policy discourse that emphasises the role of education in supporting economic productivity growth through the development of human capital formation” (Thomas & Hay, 2012, p. 157). The statement of the Queensland’s government’s vision to ‘create a state of prosperity and social justice with a commitment to equality of opportunity’ draws attention to the policy’s position within this value system. The use of the labels ‘future generations’, ‘young people’ and ‘young Queenslanders’ as alternatives to ‘student’ contributes to the future orientation of this discourse. They imply a longer time frame and broader reach. The reforms will have had a wider impact than that of immediate benefit. Students will accrue longer-term benefit from the reforms, which will also enable them to make a contribution to the future well-being of the state.

While the notion of social justice is not taken up again in the foreword, three sentences develop a connection between education, future economic prosperity—for both individuals and the state—and better social outcomes:

A well-educated and skilled population has become a defining characteristic of a modern society with high living standards. (lines 13-14)

Gone forever is the job for life with on-the-job training that delivered a comfortable lifestyle. High-level qualifications are the currency of today’s global economy and rapidly changing job market. (lines 24-25)
It is noteworthy that all three sentences contain relational processes (‘has become’, ‘is’, ‘are’) that solidify meanings in categorical assertions. Such assertions leave little room for alternative interpretations and help to frame what follows in the executive summary as a necessary course of action to address these inevitabilities.

The opening paragraphs of the executive summary reiterate the need for reform and use similar linguistic strategies to the foreword. The narrative of inevitable social change requiring responsive government action is developed through a series of categorical statements about the present and predictions about the future. Of greater significance in the executive summary is that way the document frames the response to the need for reform, and the multiple discourses that are called upon to describe the preferred senior schooling practices that will eventuate from the government’s actions.

**The government’s response**

Throughout the executive summary (Extract 2), the government is constructed as the predominant social actor in the reform process. That is, while students, (predominantly represented as ‘young people’) are the main social actors across the text, they are largely constructed in a passive role that is realised grammatically as the beneficiary of government activities. The nature of this relationship between young people and ‘the government’ (also represented by its near synonyms ‘the state’/'Queensland’ and the pronoun ‘we’) and its allied ‘education and training system’ is captured by two of the most frequently occurring verbs in the document—‘provide’ and ‘ensure’. The government, and the education and training system that it proposes to create, are constructed as facilitators providing for, delivering to, giving, preparing, helping, assisting and supporting students/young people in various ways. Though the verb ‘ensure’ suggests a more forceful role for the government, it does similar work in statements such as

> we are responding to these challenges by creating one of the most flexible education and training systems in Australia to ensure that our young people are equipped to lead the way into the future. (p. 6, lines 5-8)
Mulderrig (2011) categorised words such as ‘provide’ and ‘ensure’ as “Managing Actions” and suggested that they are characteristic of a “soft power” associated with a managerial discourse. This discourse allows a government “to specify the outcomes it desires while simultaneously ‘taking a step back’ in agency (both grammatically and socially), recasting it as an enabling, rather than coercive, force” (p. 50). Since such verbs enable the government to manage at a distance, they deliberately texture an abstract and vague policy imaginary. The collocates of managing verbs therefore only suggest the general form that senior schooling practices will take rather than any specific details.

Much of the executive summary’s recommendations are written in the form of a stem statement followed by a list of bullet points. Following the chain of verbs in one example (a stem statement followed by three bullet points, the third of which has seven sub-points) can illustrate how the nebulous quality to both the processes and outcomes of senior schooling is conveyed through Managing Actions:

The Queensland Government will provide funding to help young people improve participation in learning and achieve qualifications by:

- establishing a grants program to trial initiatives that improve participation, retention and attainment for 15- to 17-year-olds in learning, including:
  - supporting schools to provide a range of education programs in new learning environments for those students not suited to traditional schooling. (p. 8, lines 75-77, 82-84, emphasis added)

This example shows how the “complex ‘layering’ of management” (Mulderrig, 2011, p. 51) is textually constructed with the government instigating a sequence of activities performed by intermediary actors and processes with the final goal of student retention.

Table 5.1 provides some further illustrations of the ways in which the government’s Managing Actions articulate their policy vision for senior schooling, i.e. the preferred set of senior schooling practices. The list draws on Mulderrig’s (2011) “cline of coercion” (p. 53) in that it moves from what can be interpreted as more coercive (‘ensure’) to less coercive (‘enhance’) government actions. As in the foreword, ‘we’ is used in several of these statements of intent to suggest that the goals of government are a shared concern with the people of Queensland. Thus, the
government is represented as the provider of the reforms, to which all Queenslanders can agree. The recurrent use of the modal verb ‘will’, a linguistic pointer to a high degree of certainty, in the statements conveys the strength of the government’s intentions, a strength that has already been foreshadowed in the notion of commitment in the semantically important heading ‘The government’s commitment’. Thus, the sequence of ‘we will’ statements in the executive summary reinforces the sense of an authoritative government in control, with the assumption that these actions are based on shared values and understandings.

Table 5.1 The managing role of the Queensland government in the ETRF policy

<table>
<thead>
<tr>
<th>The Government/we will….</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ensure</strong> that more young people who undertake vocational education and training in schools achieve qualifications that are highly regarded by industry. (p.8, lines 42-44)</td>
</tr>
<tr>
<td><strong>require</strong> young people to participate in education and training after Year 10. (p. 6, lines 89-90)</td>
</tr>
<tr>
<td><strong>provide</strong> more school-based apprenticeships and traineeships (p. 8, lines 45-46)</td>
</tr>
<tr>
<td><strong>provide</strong> an employment program specifically designed to <strong>assist</strong> young people at risk of disengaging from learning. (p. 8, lines 51-52)</td>
</tr>
<tr>
<td><strong>provide</strong> funding to <strong>help</strong> young people improve participation in learning and achieve qualifications by … creating local models to <strong>support</strong> young people (p.8, lines 65-67, 85-87)</td>
</tr>
<tr>
<td><strong>give</strong> them a range of options to <strong>help</strong> them achieve the academic or vocational education qualifications they need to compete in the world of work (p. 6, lines 58-61)</td>
</tr>
<tr>
<td><strong>give</strong> them greater flexibility to achieve qualifications beyond Year 10. (p. 7, lines 1-2)</td>
</tr>
<tr>
<td><strong>give</strong> young people equitable, affordable access to vocational education and training in schools and TAFE (p. 8, lines 49-50)</td>
</tr>
<tr>
<td><strong>encourage</strong> them to return to learning and … recognise previous achievements (p., lines 9-10)</td>
</tr>
<tr>
<td><strong>enhance</strong> distance, online, and virtual education provision (p. 8, line 41)</td>
</tr>
<tr>
<td><strong>enhance</strong> options and flexibility in schools, TAFE institutes and other settings … by reviewing existing courses and offering a wider range of tailored courses (p. 8, lines 34-37)</td>
</tr>
</tbody>
</table>

Teachers are largely absent in the White Paper’s account of what needs to be done to reform senior schooling. In the sole explicit reference to teachers in the executive summary—a call ‘on the dedication and professionalism of teachers’—they are allocated a passive social role. That is, teachers’ consent with government actions, rather than what teachers know, either in terms of specific disciplinary or pedagogical knowledge, is constructed as the teachers’ major contribution to the reform process. Instead, it is the system rather than teachers that is allocated an active teaching role in statements such as:
Our education and training system must teach them about the world as it is now and prepare them for a future… (Foreword, lines 16-17)

and

this system [that] provides students with an excellent foundation for future success (Foreword, lines 18-19)

Such statements could be interpreted as a representational choice of impersonalization (van Leeuwen, 2008) in that a human actor (the teacher) is replaced with a non-human noun (the system) that possesses the human qualities of educating and training. However, this is not a clear-cut interpretation. Rather than including teachers, but choosing to impersonalize them—to represent them as (part of) the system—the policy writers may have chosen to suppress the category of teachers in the document for other reasons. The absence of teachers emphasises that the reforms should be seen as systemic rather than piecemeal and perhaps open to an individual teacher’s interpretation. Van Leeuwen (2008) argued that it is often difficult to know whether suppressed social actors are supposed to be retrievable. In the above examples, and indeed in other parts of the document, it may be that readers are assumed to know what teachers do and therefore more detailed references would be seen as condescending. It could also be argued that since the ETRF focuses on the structural framework rather than the details of pedagogic practice, constructing an abstract rather than a concrete representation of senior schooling practices, a more detailed portrayal of teachers’ roles in senior schooling is not appropriate. Nevertheless, teachers remain an indistinct presence in the ETRF White Paper and thus the part they might play in the operationalisation of the reform process remains ambiguous and unexamined.

The preferred practices of senior schooling

While the statements in Table 5.1 may be vague and abstract, several point to diversification of the senior school curriculum as the key solution to student retention and thus a more inclusive form of senior schooling. A discourse of diversification is constructed in several ways. The repetition of the phrase ‘range of’ implies that diversity is an unquestioned element of the new senior schooling: ‘a range of different options’; ‘a broader range of learning’; ‘a wider range of tailored courses’; ‘a range of education programs’ are all proposed as part of the reforms.
Relations of equivalence (Fairclough, 2003, 2004) between different forms of education and their outcomes also contribute to the representation of new senior schooling practices as diverse. Establishing relations of equivalence is part of the textual process of classification. It involves combining, often in lists, elements that may have previously been considered distinct from one another. In the ETRF document, references to the different forms of reformed senior schooling involve a collocation of existing and new locations where senior schooling may be undertaken. In this way, they are presented as essentially equivalent to one another. For example, the government will: ‘enhance options and flexibility in schools, TAFE institutes and other settings’ and ‘make schools, TAFE institutes and other participating vocational education and training providers’ responsible for monitoring student progress.

Similarly, in the discussion of outcomes, ‘academic and vocational education qualifications’ are collocated, as are ‘skills and qualifications’, and ‘knowledge, skills, and confidence’. These examples illustrate that the texturing of equivalences can occur within and between discourses. The pairing of vocational with academic ‘qualifications’ stems from the different forms outlined in the previous paragraph but remains within an educational discourse associated with the need for schooling to be publicly accountable for student outcomes. However, the phrase ‘knowledge, skills and confidence’ combines (and constructs as equivalently important) concepts that come from discourses that are historically associated with different domains of social life (Fairclough, 2004): ‘knowledge’ from academic notions of education and learning, ‘skills’ from vocational forms of education, but originally from crafts and trades, and ‘confidence’ from personal psychology.

It is through texturing together discourses from these disparate areas—the “subversion of the differences between prior discourses” (Fairclough, 2004, p. 10)—that a new discourse of senior schooling, one that expands the narrower conception of senior schooling as being solely concerned with academic studies, is constructed. The juxtaposition of skills and knowledge is particularly noteworthy in this regard. There are two instances in the whole document where skills and knowledge are given equivalent weighting:
The Government also wants young people to have exciting and relevant opportunities in the Senior Phase of Learning so they go into the world with knowledge, skills and confidence. (p. 8, lines 2-4)

Most importantly, they must be ready for lifelong learning so they can pick up new skills and knowledge and adapt as the nature of work continues to change. (p.12)

However there is only one other reference to ‘knowledge’ as an outcome of senior schooling in the remainder of the document. In contrast, there are 26 references to students’ acquisition of skills. Such an imbalance between the ‘new’ skills discourse and the ‘traditional’ knowledge discourse of senior schooling may suggest that the reforms will result in significant change. However, additional texturing of old and new, performed through the metaphor of pathways, helps to moderate the extent of change.

For many of these students [already participating in senior schooling], the pathway through school and into university or further studies will not change. (p. 6, lines 20-24)

While the pathway through schooling will continue to be the main track to university or further study for most students, we want to ensure that the 27 per cent of students who currently do not finish Year 12 have the best possible chances to succeed. (p. 8, lines 5-8)

The reform of the senior school curriculum through diversification is thus constructed as an expansion of existing practices—an alternative pathway to a common destination, rather than as a radical overturning of current forms.

The second of these two passages draws an explicit comparison between two groups of students: ‘most [current] students’ and those young people ‘who do not currently finish Year 12’. The latter group are represented in largely negative terms at other points in the Executive Summary. They are young people who ‘do not complete school’ and who ‘enter into full-time work without obtaining qualifications’. A more specific sub-group who are ‘not suited to traditional schooling’, ‘at risk of disengaging from learning’, and ‘at risk of not achieving’ is also identified. These references stand in contrast to more generic references such as ‘all young people’ (realised by the mass noun ‘people’) or ‘students’ (realised by a plural noun without an article) that are also evident throughout the text. While the more generic references foreground the universal applicability of the reforms, the identification of this specific sub-group, constructs the reforms as simultaneously
targeted at young people who, through constructions that emphasise their negative qualities—‘not suited’, ‘not achieving’, ‘disengaging’—are of particular concern to the government.

The notion that senior schooling can legitimately be conceptualised as made up of diverse practices, that provide students with more “flexible opportunities” is of course one way in which these two slightly different intents can be reconciled. According to Fairclough (1999), a discourse of flexibility has become an irreducible element of contemporary economic and social life at a variety of levels, for example, the change from mass to small batch production, the need for an adaptable workforce. It has in turn become one of the key defining features of contemporary public policy framed by neoliberal values (Fairclough, 1999) including contemporary education policy (Davies & Bansel, 2007; Sandra Taylor, 2004; Thomas & Hay, 2012). The White Paper taps into this discourse of flexibility. That is, it presupposes the inherent value of flexibility, to promote a vision of senior schooling as one that will give students ‘exciting and flexible pathways’, ‘greater flexibility to achieve qualifications’, and ‘more flexible learning options’. As these examples attest, much of the discussion about the flexibility of senior schooling remains at the abstract level of ‘the system’, or ‘options’ and ‘opportunities’, though case studies in the body of the document do provide some examples of flexible practices which have led to successful outcomes for students.

There is no explicit acknowledgment in the White Paper that a diversified senior school curriculum, able to be engaged with flexibly, might run the risk of devaluing the quality of learning that students will experience. Nevertheless there are other discourses evident in the White Paper that might be seen as tempering these more expansionary discourses. Throughout the exposition of the broader range of education and training opportunities on offer to senior students, there is also an emphasis on the valuable outcomes to be gained from participation in senior schooling. The preferred practices may be diverse and flexible but they are also represented as being crafted and regulated in such a way that will ensure students achieve both longer-term social and economic benefits, and the more immediate qualifications that will be gained from school completion. The executive summary opens with a declarative statement that exemplifies how the long- and short-term
goals and linked together in an employment focused discourse:

Young Queenslanders can no longer expect to get good jobs, earn decent incomes and lead rewarding lives without obtaining Year 12 or some kind of substantial vocational or university qualification that gives them the skills for work and life. (p. 6, lines 1-4)

The desirability of ‘good’ jobs, ‘decent’ incomes, and ‘rewarding’ lives is assumed and is seen to be dependent on ‘substantial’ qualifications. References to the acquisition of specific qualifications such as ‘a Senior Certificate or a Certificate III vocational qualification’ or more generally ‘high-level qualifications’ occur elsewhere in the extract, contributing to a discourse of regulation through certification that textures together symbolic and embodied outcomes—credentials and skills.

The final two sub-headings, ‘More Support for Young People’ and ‘Working Together—Building New Community’, give prominence to the need for senior school practices to be supportive and to have a community focus. These two discourses also could be seen as a counter to the discourses of diversification and flexibility. ‘Support’ is constructed as being especially relevant to ‘re-engage young people who have disengaged from learning’ with a list of strategies proposed to assist them, but also as something that is applicable to all students through the development of Senior Education and Training (SET) plans. The fact that such plans will be agreed to, negotiated and monitored is another case of a proposed new senior schooling practice drawing on multiple discourses — the regulative discourse associated with notions of monitoring, but also a more conciliatory discourse that incorporates notions of agreement and negotiation.

Finally, while a discourse of community may be highlighted as a theme through its appearance in a heading, the nature of community is never really explicated in the text and many references to community in the executive summary are as adjectives: community leaders, community services, community organisations, community activities, and a Community Commitment. References to ‘local’ are semantically and grammatically similar, describing services, models, mentors and coordinators, and initiatives. As the final heading, the positive connotations of ‘Working together — building new community partnerships’ reaffirms earlier
suggestions of the universal benefit of the reforms, though focusing it at the
community level rather than right across the state. References to ‘community’ like
the use of ‘we’ throughout the document can be seen as a strategy to elide any
conflict of values or suggestion of competing interests at work in the reforms.
‘Community’ also intersects with the discourse of flexibility, as another site for
learning, and with the discourses of regulation and support, since the partnerships
envisaged by the reforms are involved in supporting students through locally
delivered, but also locally devised and administered initiatives and programs. The
discourse of community, while it remains vaguely defined, therefore realizes
multiple meanings in the representation of senior schooling practices.

This chapter has examined how a range of linguistic and interdiscursive
strategies have been used by the authors of the ETRF White Paper to promote an
authoritative discourse of senior schooling. A discourse of inclusion established an
underlying justification for the reforms to enable an expansion of the practices of
senior schooling. Inclusion had both present-process and future-outcomes
orientations. In the present, senior schooling needed to change so that all students
would participate; the result would be a better future for all students and the state as
a whole. Inclusion in this future sense was constructed with individual and collective,
and social and economic dimensions as the government intended to ‘create a state of
prosperity and social justice with a commitment to equality of opportunity’. These
goals intersected with an employment-focused discourse that wove through the text.
It was through learning relevant work skills that individuals would prosper socially
and economically, and contribute to the stability and prosperity of the state. Senior
schooling—even the existing academic pathway—was now conceptualised in
fundamentally vocational terms.

A more inclusive phase of senior schooling was discursively constructed in the
White Paper through legitimating a broader range of senior schooling practices than
had previously been the case, and in representing students as being able to exercise
choice in selecting a course of study. These discourses of diversification and
flexibility thus expanded the range of pedagogic practices that could be seen as
legitimate ways of doing senior schooling. However it was not a boundless
expansion. The discourse of vocationalism intersected with a regulatory discourse
that when combined offered assurances that senior school qualifications (including VET credentials) would be relevant and valuable ones. Finally, a discourse of support was constructed as relevant to all students, but particular emphasis was given to re-engaging those who might otherwise leave school.

Discourses order reality in particular ways that enable or constrain social practices. The discourses of senior schooling constructed in the ETRF White Paper thus established broad parameters for the practice of senior schooling that were to be translated and interpreted by the mid-level policy actors responsible for the development of the SAS for Prevocational Mathematics. The analysis of this document is taken up in the next chapter.
Chapter 6

Discourses of senior school numeracy education

The focus of analysis in Chapter 6 moves from the system level of senior secondary schooling, along the genre chain, to the syllabus level in a specific subject area. The chapter examines how an authoritative discourse on senior secondary numeracy education is constructed in the Study Area Specification for Prevocational Mathematics. It begins with an outline of Queensland’s school-based assessment system and mathematics teachers’ backgrounds to contextualise the analysis. The analysis of this syllabus document that follows adopts a similar approach to that used to examine the ETRF document in the previous chapter. A discussion of the overall generic structure of the document and the classification scheme upon which it draws contribute to the first broad stage of analysis. The second stage involves the more detailed linguistic and interdiscursive analysis of selected extracts. This analysis examines how the authors have constructed an authoritative discourse that legitimates (i) the need for Prevocational Mathematics and (ii) the sorts of teaching and assessment practices that will meet Prevocational Mathematics students’ needs. The final section of the chapter involves a comparison between this authoritative discourse of Prevocational Mathematics and the authoritative discourse of senior schooling previously identified in the ETRF White Paper. This intertextual analysis examines the ways in which the ETRF discourses have been deployed (or ignored) by the Prevocational Mathematics syllabus developers.

Contextualising the practices of Prevocational Mathematics

A system of moderated school-based assessment operates in Queensland’s senior years of schooling (Maxwell & Cumming, 2011). In this system, school-based assessment is a shared responsibility between a statutory body of the Queensland Government (the QSA at the time of the study) and schools (Allen, 2012). The assessment regime is based on a portfolio system in which evidence of student learning is collected continuously across the two years of the course. The Authority
has overall responsibility for the integrity and credibility of the results that it certifies through an external moderation process (for Authority subjects) or a quality assurance process (for Authority-registered subjects), while schools are responsible for a range of assessment-related tasks. For example, teachers/schools design assessment tasks and develop task-specific criteria and standards that reflect statutory guidelines and generic criteria and standards matrices set out in official syllabus documents. They are also required to judge students’ performance on the tasks based on these defined standards, and to submit samples of students’ work to moderation panels. Teachers participate in meetings within and between schools where they meet to discuss the scope of schools’ courses, the quality of assessment instruments and the judgments of standards. The intent of moderation and quality assurance processes is to ensure that all teachers judge and grade their students’ achievement using the same standards.

Assessment is an integral aspect of a course of study under this system (Queensland Curriculum & Assessment Authority [QCAA], 2014a). While Authority-registered subjects such as Prevocational Mathematics are subject to less rigorous procedures than those subjects that count towards selection for entrance to tertiary institutions, teachers are still involved in complex processes of formative and summative assessment as part of their normal duties (Allen, 2012). Many Prevocational Mathematics teachers who undertake these tasks do so without any specialist mathematics background. Although there is no hard data to give precise numbers of such teachers, other state and national studies (Harris & Jensz, 2006; Productivity Commission, 2012; Queensland Audit Office, 2013) have indicated a downward trend in the number of specialist mathematics staff employed in Australian secondary schools over the past two decades, leading to substantial teacher shortages. Confirmation that a significant number of Prevocational Mathematics teachers would not have a specialist mathematics background to bring to assessment processes is provided by the syllabus developers who explained that the syllabus was written for an audience that was likely to include both specialist mathematics teachers and teachers who were not teachers of mathematics (Cordiner & Trussler, 2005).
An overview of the SAS for Prevocational Mathematics

The comparison between the Prevocational Mathematics syllabus and the other Queensland senior mathematics syllabuses that contributed to the initial framing of the study showed that it conforms broadly to the typical pattern of Queensland senior school syllabuses. For Authority-registered subjects such as Prevocational Mathematics, whose origins lie in curriculum offerings developed by individual schools in response to local conditions and clientele (and not previously subject to centralised quality assurance processes), the very adoption of the standard format for Queensland senior syllabuses contributes to the authoritativeness of the document. It can be seen as a textual strategy for establishing a subject’s credentials as a bona fide subject, beginning with the need to satisfy QSA requirements. That is, the intertextual links that the Prevocational Mathematics syllabus makes with the other senior Mathematics syllabuses, and indeed with all other Authority and Authority-registered subjects is most evident in its overall structure and suggests that some expert consensus has been reached on what is legitimate course content and how it might be taught and assessed.

The first two sections of the syllabus are a Rationale and a statement of the subject’s Aims. Together they encapsulate the underlying reasons for the subject’s existence in senior schooling and what students who take the subject are expected to achieve. They are included as the first extract though only the running text of the rationale has been subject to more detailed analysis. The bullet pointed list of aims is a succinct statement of what students should do in the course that are discussed in greater detail in the following sections.

Subsequent sections of the document elaborate the objectives of the subject and the school’s/teacher’s responsibilities with respect to organising a course of study around particular topics, and assessing and reporting on student achievement. The other four extracts were selected for detailed analysis because of their emphasis on

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8 See Appendix 2 for the Rationale and Aims (Extract 1) and other extracts from the SAS for Prevocational Mathematics Line numbers for longer quotes (in parentheses) refer to the numbering shown in these extracts.
Prevocational Mathematics practices rather than content. They included sections that described the practices that learners were expected to engage in (Extract 2), an overview of recommended teaching strategies (Extract 3), an approach to contextualised learning (Extract 4), and an overview of assessment strategies, including advice on the development of tasks (Extract 5).

As with the reform document analysed in the previous chapter, the selection of extracts was guided by the documents’ section headings that scaffold readers’ engagement with the text and the classification scheme generated through the use of concordance software (Imao, 2014). The identification of the classification scheme for the syllabus document was complicated by the extensive use of bullet pointed lists to structure elements of the text. For example, in the syllabus’s statement of Aims, a stem statement was followed by list of seven points. In another section of the document, imperative statements such as

Plan for practical and contextualised learning (p. 34, line 1)

effectively hid significant concordance patterns associated with the participant category of teacher. Lists of ‘suggestions’ for teaching approaches were similarly written as imperative statements implicitly directed at teachers. Given the primary audience of syllabus documents are likely to be those who teach and administer the subject, neither textual strategy might be considered unusual. Their significance for the initial stage of analysis was the need to re-insert these missing participants back into the text to get a fuller picture of the concordance patterns associated with teacher and student participants to generate the text’s classification scheme (Appendix 4, Table 2).

A significant difference between this classification scheme and the White Paper’s (Appendix 4, Table 1) is that both ‘students’ and ‘teacher’ are identified as frequently occurring participants in the text, while the ‘government’ is no longer included. This difference is perhaps unsurprising and suggestive of a sharpening of the pedagogic focus. That is, the classroom relations between students and teachers that were largely absent from the abstract representation of senior school practices in the reform policy document are of more relevance in a syllabus document whose chief intent is to prescribe what is expected of teacher and student participants in the
subject. In the next section, the selected extracts are examined in order to explore how these key participants, their attributes and the processes they are associated with construct a preferred set of practices of senior numeracy education.

**The need for Prevocational Mathematics**

As might be expected by the heading ‘Rationale’, the need for a subject such as Prevocational Mathematics is addressed most explicitly in Extract 1. The rationale does not describe pedagogic practice in detail. Rather, it establishes that the content to be learnt, and the recommended approaches provided in the remainder of the document, fulfil an identified need.

The justification for the subject commences with a definition of numeracy:

> Numeracy is the ‘effective use of mathematics to meet the general demands of life at home, in paid work, and for participation in community and civic life’. (p.1, lines 1-2)

The placement of the definition of numeracy in the opening sentence of the rationale establishes that numeracy is an important framing device for the subject. Definitions are by their very nature categorical statements that cement meanings through the use of relational processes such as ‘is’. In this instance, the use of a citation from an external ‘expert’ source could be seen as a strategy to establish the authoritativeness of this version of numeracy, in a mathematics education environment where numeracy is acknowledged as a deeply contested concept (Coben et al., 2003; Stanley, 2008).

The importance of establishing a definitive meaning of numeracy to underpin the subject is reinforced later in the section in a categorical statement about what numeracy is not:

> Numeracy is more than being able to operate with numbers. It requires mathematical knowledge and understanding, mathematical problem-solving skills, literacy skills and positive beliefs and attitudes. (p. 1, lines 7-9)

The statement differentiates numeracy from a narrow, commonsense view of “being able to operate with numbers”, texturing together knowledge, skills, and beliefs and attitudes. The collocation of these three types of desired outcomes is repeated several times throughout the rationale, often in constructions that establish a causal relationship between positive attitudes, in particular ‘confidence’, and the
development of knowledge and skills.

Prevocational Mathematics is designed to help students improve their numeracy by building their confidence and success in making meaning of mathematics. It aims to assist students to overcome any past difficulties with, or negative attitudes towards, mathematics, so that they can use mathematics efficiently and critically to make informed decisions in their daily lives. (p. 1, lines 2-6)

As students become more confident in using mathematics, they willingly contribute to class and group discussions — they question, propose, argue, challenge, seek advice and clarification, and become aware of the benefits of working independently and in groups. (p. 1, lines 25-28)

[Prevocational Mathematics] develops not only students’ confidence and positive attitudes towards mathematics but also their mathematical knowledge and skills …, and their communication skills …. (p. 2, lines 6-9)

The importance of confidence-building as a prerequisite for developing understanding is evident in claims, employing causal relations between clauses, that students “improve their numeracy by building their confidence”, that they need “to overcome … negative attitudes … so that they can use mathematics efficiently…”, and that “as [they] become more confident, they willingly contribute…”. The rationale similarly constructs the conditions that are required to enable students to develop confidence through causal relations.

Students study five topics … integrated into teaching and learning contexts which have relevance to them. Because these contexts foster cooperation, and are supportive, enjoyable and non-competitive, students develop positive attitudes towards the use of mathematics.

Students’ confidence improves when they have sufficient time to discover how to solve problems, discuss, guess at answers, take chances, try things out, be wrong, and most importantly, experience success. (p.1, lines 15-23, emphasis added)

The opening definition of numeracy also establishes that the twin goals of social inclusion and economic prosperity—in terms that emphasise their universal and everyday relevance (home, work, community)—are fundamental to the syllabus. Prevocational Mathematics’ concern with the everyday is realised in expressions that emphasise the importance of numeracy for students in making informed decisions “in their daily lives” and in solving problems “in real contexts such as everyday life, work or further learning”; and in pursuing “vocational and personal goals”. The focus on work in particular is constructed as a point of differentiation between the new subject and existing mathematics subjects:
… workplace mathematics is often very different from school mathematics because of the particular requirements in different industries where mathematical skills are adapted to ensure efficiency (p. 1, lines, 23-25)

This declarative statement can be construed as a positive evaluation of the new subject. It is discursively constructed through the combination of (i) the contrast between workplace mathematics (and by implication Prevocational Mathematics) and existing subjects heightened by the modifiers ‘often’ and ‘very’ and (ii) the inference drawn from popular negative perceptions that school mathematics is irrelevant to real-world concerns such as efficiency. The positive evaluation presupposes that efficiency is a desirable quality in workplaces, but perhaps is not always taken into account in traditional school mathematics.

The rationale consists largely of declarative statements that position the teacher-reader as the receiver of authoritative information on the need for Prevocational Mathematics. While the most obvious function of the syllabus’s rationale is to provide a justification for the subject as a whole, such statements also construct initial impressions of students and teachers and the classroom practices in which they are expected to participate. Much of the rationale constructs a deficit discourse about a stereotypical Prevocational Mathematics student lacking in knowledge, skills and confidence, though this jars with the statement that the SAS “provides teachers with the flexibility to design courses of study that cater for the broad range of skills, attitudes and needs of students”. This statement, the sole reference to teachers in the rationale, introduces the notion of teachers as designers who are responsive to their students’ needs. The most explicit guidance to teachers in the role of designers can be found in the chapter of the syllabus entitled ‘Learning Experiences’.

**Preferred teaching and learning practices**

The following discussion combines the analysis of extracts 2 and 3, two excerpts from the *Learning experiences* chapter, to show how preferred ways of learning and teaching are discursively constructed in the syllabus. The preferred practices of senior school numeracy education are unpacked through a combination of transitivity analysis (i.e. looking for patterns in the text’s representations of teachers and students and the processes in which they are involved to show what kinds of
practices are represented in the text), logical-semantic relations between clauses (i.e. identifying the reasons given for particular practices) and an examination of the use of modality and evaluations to show how these practices are discursively constructed as the preferred ways of teaching and learning in the subject.

The classification scheme generated from the text shows that the social actor category of ‘students’ is collocated with a range of material/behavioural, verbal, and mental processes. By far the most frequent representation of students across the texts is as participants in a material process of ‘using’, an emphasis that was flagged in the opening paragraph of the document in the definition of numeracy. Students are represented as users of mathematics in a variety of ways, including many that may imply their participation in mental processes. For example, students are represented as using ‘a number of different pieces of mathematical information’ and ‘a blend of personal 'in-the-head' methods, pen-and-paper and calculator procedures’, but also as being expected ‘to use some of the symbolism and conventions of formal mathematics’, and ‘to use a variety of formal and informal strategies’. Such representations of students may involve mental activity but they suggest a utilitarian, in-the-moment focus for the activity rather than the acquisition of deeper conceptual understandings. This representation is a reminder of the finding from the initial content comparisons between senior Queensland mathematics syllabuses (Appendix 1). It shows how the focus on ‘use’ in the Prevocational Mathematics rationale, in contrast to the other syllabuses’ rationales where a notion of ‘understanding’ was established as a reason for studying the subject, is elaborated discursively through the remainder of the text.

The high frequency of clauses in which students are represented as users might suggest that the Prevocational Mathematics syllabus is one that emphasises “doing” rather than “knowing” (Lingard & McGregor, 2014), or that they are “scribblers” rather than “thinkers” (Morgan, 2009). However, as the list of verbs most frequently collocated with students shows, they are represented as capable of a broad range of social actions, including ones that involve knowing, interpreting, and explaining. They are represented as participants in both material/behavioural and mental processes.
The multi-dimensional representation of students can be seen to contribute to the syllabus developers’ need “to help teachers reconceptualise [in a more positive light] the students they were teaching” (Cordiner & Trussler, 2005, p.91). But it also increases the uncertainty about what counts as valuable skills and/or knowledge (Lingard & McGregor, 2014) as well as the “lack of coherence and mixed messages about the place of knowledge” (Priestley & Sinnema, 2014, p. 50) that has been observed in newer curricula. Priestley & Sinnema warned that curricula that were not clear about what knowledge students needed to acquire, nor what teachers needed to do to ensure that acquisition left them vulnerable to charges of having “inconsistent approaches to specifying content that is then potentially not fit for curricular purpose” (p. 71).

There are a number of ways that this ambiguity is evident in the extracts. First, much of the social action associated with student actors is in statements about what students could be expected to do, or what students could be helped to do. That is students are attributed little agency. They are represented as acting at the behest of or as a result of teacher’s (or the subject’s) actions rather than as the initiator of actions or events. Furthermore, when it comes to some of these expectations, it appears that in attempting to disrupt a deficit discourse about students, to encourage teachers to see students in a positive light, the syllabus developers have constructed an indeterminate version of learning that is always partial—on the way to something else; and has little intellectual heft. For example:

the student is expected to begin to adapt prior experience and examples…(p. 26, line 17)

Where students are discursively constructed as working with mathematical knowledge, through mental processes such as ‘explain’, ‘plan’, ‘clarify and organize their thinking’, ‘interpret and analyse’ and ‘solve’, the knowledge that they work with is consistently described in limited ways that distinguish it from the knowledge that is developed in other school mathematics subjects. For example, ‘solving problems’ is explicated in terms of “simple everyday problems”, “practical problems”, or “straightforward problems”.
In comparison with the other Queensland senior mathematics curricula, the Prevocational Mathematics syllabus provides much more information on how the content of the subject should be taught. The Learning experiences chapter that focuses on pedagogic practice rather than on content has no real equivalent in the other syllabuses, where an ideal reader might be assumed to already have subject-specific pedagogic knowledge. An examination of the sub-section entitled ‘Teaching strategies’ reveals how the authors approach the task of constructing an authoritative text, accessible to a non-specialist reader.

Bullet points and numbering are used extensively and, while these can make a text easier to understand, they can also present information as facts that are difficult to dispute or contradict (Fairclough, 2001a). Their occurrence therefore reflects the expected prescriptive nature of a syllabus document. In the Teaching strategies section, the authority of numbered and bullet-pointed statements is compounded by their imperative mood. For example, the first approach

Ascertain and evaluate attitudes and beliefs regarding both learning mathematics and using mathematics: getting to know your students (p. 28, line 1)

might be interpreted by the teacher-reader as an instruction to be complied with: the teacher should get to know their students’ attitudes and beliefs. However, the heading for the section “Approaches to consider when choosing teaching strategies” implies that these are not directives, merely suggestions that might be better interpreted with lower modality as ‘the teacher could…’ Further, under each main approach additional imperative statements are labelled as “suggestions”. There is therefore some ambiguity over the extent to which the authors have committed themselves to the necessity of these approaches for successful teaching. The sheer quantity of suggestions, together with the preliminary sections of the syllabus that have established the role of teachers as task and course designers and as creators of supportive social contexts, hints that these are approaches are to be read as possibilities rather than as requirements.

A further examination of the full list of teaching strategies highlights the procedural nature of the advice given to teachers. (See Appendix 2, Extracts 3 and 4 and the intermediate list for the complete set of approaches.) Of the 12 strategies,
four give general organisational advice: teachers are to *provide opportunities and time* to explore mathematical ideas with concrete or visual representations and hands-on activities’; *provide opportunities for group work*; *provide opportunities* for students to communicate about mathematical issues’ and *plan* for practical and contextualised learning’. A further three strategies emphasise the need to encourage students: *encourage* the development and practice of estimation skills’; *encourage* development of mental mathematics skill as an alternative computational strategy’; *encourage* the use of multiple solution strategies’. The need for teachers to encourage, and to ‘reassure’, ‘support’ and ‘help’ students is repeated throughout the elaborations of the strategies, though there is little more specific pedagogical advice given. Morgan (2010) observed a similar emphasis on “procedural” as opposed to “principled” aspects of practice in advice to mathematics teachers in a curriculum document for English schools. She suggested that in such advice there was an absence of “apprenticing strategies” and that this enabled “experienced teachers to maintain their existing positioning as expert professionals with no need to be apprenticed into new principles and their associated teaching practices, merely needing to adopt new procedures” (p. 115). In the case of the Prevocational Mathematics syllabus, where a non-specialist teacher-reader has been assumed, the emphasis on general procedural advice rather than principled strategies might suggest another sort of reassurance: that providing opportunities and time and encouragement does not require specialist knowledge. In other words, teachers without specialist qualifications can be effective in Prevocational Mathematics.

Lexical choices that emphasise students’ attitudes and beliefs are evident throughout the suggested teaching approaches. For example, in the elaboration of the first approach provided in Extract 2, students have “negative attitudes and beliefs” “a loss of confidence and panic over a loss of control”, are “frustrated”, and “switch off”. Such over-wording (the use of many words in the same area of meaning) suggests a preoccupation with presenting some aspect of reality as fixed and stable, indicating that it is itself a contentious issue (Fairclough, 2000b). This emphasis on students’ attitudes and beliefs is also apparent throughout the other suggested teaching approaches and in frequent references in the assessment section of the syllabus.
Preferred assessment practices

Over 10 per cent of the Prevocational Mathematics syllabus document details teachers’ assessment responsibilities to their students and to the system. Much of the advice in this section is common to all Authority and Authority-registered subjects’ syllabus documents and had been in place prior to the ETRF reforms. It makes up a significant component of the text and signals the importance of the assessment regime in regulating the conduct of the subject but will not be examined in depth here. However, one segment of the syllabus’s assessment section is specific to Prevocational Mathematics and particularly relevant to the study (Extract 5). The section recommends assessment strategies and provides suggestions for developing tasks in the subject.

The overview of this section introduces the argument for the proposed assessment strategies through causal and temporal relations: why and when particular sorts of assessment should be used.

*Because* students may be fearful of formal assessment, informal assessment can validly be used to provide additional evidence upon which to award a level of achievement. *Once* students’ confidence has been built up sufficiently with supportive teaching strategies, they may be able to demonstrate achievement of the general objectives in more formal assessment tasks. (p. 40, lines 4-8, emphasis added)

That is, legitimation for the proposed assessment is foregrounded by drawing attention to the rationality of the suggestions (Fairclough, 2003). Even so, there is a tentativeness to these rationalisations realised through the low modality auxiliaries ‘students *may* be fearful’, ‘they *may* be able to demonstrate’ that contrasts with the next paragraph that establishes the normative assessment practices for the subject through the higher modality auxiliary ‘should’

Regardless of whether assessment is informal or formal, it *should* extend well beyond examining students’ ability to find the right answer for a computational exercise. It *should assess* the many additional skills and knowledge areas that are part of being numerate … (p. 40, lines 9-11, emphasis added)

In several of the strategies that follow, there are further instances of causal relations between clauses being used to foreground the reasons for their use.

*So that* students can be fully supported and scaffolding provided, assessment should be conducted mostly in class time. (p. 40, lines 17-18, emphasis added)
In order to be able to communicate about issues involving mathematics, students should be encouraged to explain how they are working with given rules, operations, procedures and open-ended problems. (p.40, lines 27-29, emphasis added)

Because this study area specification emphasises contextualised assessment of a broad range of skills and reasoning processes and is not test-based, it is strongly recommended that examinations be kept to a minimum or not used at all. (p. 41, lines 29-31, italic emphasis added, original bold emphasis)

While each of these recommendations also use the auxiliary ‘should’ to indicate the authors’ commitment to the necessity of the strategies, the final one additionally uses the adverb ‘strongly’ to strengthen the claim and bolds the text. There is an emphasis in this section then on convincing the reader that these alternative approaches to assessing student learning have a rational justification, and that in the case of the final example might be considered more than a ‘recommendation’.

There are two references to students’ affective state at the beginning of the section: that they may be ‘fearful’ and need their ‘confidence… built up’ that foreshadow the need for assessment to be well supported. The importance of ‘supported teaching strategies’ to assessment is elaborated in the suggested strategies and guidance on developing tasks. Throughout the strategies, the discourse of support is interconnected with a discourse that emphasises the regulatory features of assessment. For example, while the initial reason given for assessment being conducted in class time is to provide support and scaffolding and adequate time for students to complete tasks, this approach also enables “close supervision” and “many opportunities for the teacher to record observations, assist them in completing tasks, and authenticate student work”. Similarly, the strategy of encouraging students to talk is proposed as both a supportive measure: to “assess understanding … diagnose difficulties and provide guidance” and as a means to “contribute to evidence of their achievements”.

The role of contextualised tasks

The development of contextualised assessment tasks is the third of the proposed assessment strategies.

Genuinely contextualised assessment is real and meaningful to the student because it is practical and realistically related to the world of work, personal organisation, and interpreting society. (p. 41, lines 1-4, emphasis added)
At first glance it seems, like the previous two strategies discussed above, that a causal connection between clauses has been used to construct a justification for the strategy. However, in contrast to the reasons given in the previous strategies (to support students, to communicate about mathematics issues), the reason given here is somewhat self-referential. Thus this statement might be better judged as an assertion than a justification. However, elsewhere in the document additional reasons are provided for contextualised learning.

One such example is extract 4, one of the “approaches to consider when choosing teaching strategies” from the Learning experiences chapter. It urges teachers to ‘plan for practical and contextualised learning’. The first sentence of this extract sets up a contrastive relationship between learning contextualised in future ‘life and work environments’ and the ‘context-free environments’ of workbook exercises.

Students can see clearly that what they are learning will be directly applicable to situations in their own lives if they are using their new skills in environments that are very similar to the life and work environments in which they will have to function, rather than just in context-free environments such as workbooks with extensive isolated arithmetic practice exercises. (p. 34, lines 2-6)

‘[E]xtensive isolated arithmetic practice exercises’ juxtaposes a set of implicitly negative descriptors that are part of the public discourse about school mathematics and therefore work as a metaphor for traditional schooling. By implication, the alternative approach is evaluated positively. Markers of high modality ‘clearly’ and ‘directly’ construct contextualised tasks as an essential component of Prevocational Mathematics. The next sentence provides an elaboration of the value of contextualised learning using more positive evaluations, weaving together the skills focus from the previous sentence, in the broader context of ‘lifskills’ with a discourse based in the psychological constructs of interest, motivation, success and enjoyment.

Contextualised learning is more likely to interest and motivate students, provide opportunities for success and show them that mathematics is a necessary lifeskill that can also be fun. (p. 34, lines 5-9)

‘Context’ and ‘contextualised tasks’ are pervasive concepts in the Prevocational Mathematics syllabus as the presence of ‘context/s’ and ‘task/s’ in the document’s classification scheme suggests. Their centrality has been confirmed by
the analysis of selected extracts from the syllabus. In particular, the analysis has revealed that the syllabus’s advocacy of contextualised tasks is based on an understanding that they offer an alternative to more traditional approaches to mathematics learning in schools. This explicit differentiation is proffered as a reason why they will be appropriate for students who have not experienced success in previous school mathematics. Although many examples of contextualised tasks are provided at different points in the document, the justification of their inclusion is overall couched in commonsense understandings rather with reference to a professional discourse related to principles of pedagogic practice. Significantly, the problematic features of contextualisation that have emerged from the extensive body of sociological research are absent from the discussion.

**Enacting senior schooling reforms**

The final phase of the analysis of the Prevocational Mathematics syllabus looked for evidence of the operationalisation of the discourses of senior schooling constructed by the ETRF’s White Paper. The discourses of diversification and flexibility, as described in the previous chapter, legitimated many new ways of acting and interacting in senior schooling, resulting in the possibility of new genres being materially enacted in new spaces (Fairclough, 2001b). It is in this context that the Prevocational Mathematics syllabus writers are able to develop the subject as an alternative to existing subjects catering for a distinctive, new category of learner. That is, the syllabus can be conceptualised as a specific operationalisation of the ETRF’s discourse of diversification. Similarly, the syllabus operationalises the discourse of flexibility, albeit in a somewhat different way to that constructed in the White Paper. There are many references within the syllabus to the importance of choosing from a range of options and the very format of the document encourages the teacher-reader to conceptualise the syllabus as one that can be enacted in multiple ways. However much of this flexibility is couched in terms of course design, as a feature to be exploited by teachers, rather than as a set of choices to be exercised by students as was conveyed in the previous document. Students are represented as the beneficiaries of teachers’ flexible practices rather than as playing an active role in decisions about curriculum or pedagogy.
In the White Paper, a vocationalist discourse worked with a regulatory discourse to construct the new senior school qualifications as relevant and valuable ones. These discourses of the relevance and the wider economic and social benefits to be gained from schooling that prepares students for employment can be traced through to the frequent references to work in the syllabus document. However, in a ‘prevocational’ mathematics course—a generalist subject that caters for a diverse group of young people with no common vocational goal—‘work’ remains a vaguely conceptualised notion—‘paid work’ is identified as one of the general demands of life. Regulatory discourses are evident in the syllabus document in the emphasis given to assessment. The concern with worthwhile credentials is materialised in authoritative statements of criteria and standards and the specifications for awarding levels of achievement.

In the White Paper, a discourse of support was constructed as relevant to all students, but particular emphasis was given to re-engaging those who might otherwise leave school. It is this latter sub-group who are intrinsically of interest in Prevocational Mathematics. In the syllabus, students who have previously disengaged from mathematics are conceived as lacking in confidence and so support is recontextualised in terms of building students’ confidence. A significant aspect of this recontextualisation is the syllabus recommendation that new ways of acting and interacting with one another be made available for teachers and students of Prevocational Mathematics. Thus, contextualised tasks do not simply encompass new sorts of knowledge in senior school mathematics; they are the enactment of a new genre of mathematics pedagogy, and an encouragement to teachers and students to develop new pedagogic styles.

This chapter has examined how a range of linguistic and interdiscursive strategies have been used by the developers of the Prevocational Mathematics syllabus document to construct a preferred vision of the practices of senior school numeracy education in Queensland. Prevocational Mathematics is represented as a very different sort of subject to other mathematics subjects offered in the senior years of schooling. Returning to examine the syllabus’s aims (Extract 1) underlines the
discursive work that the explanation of appropriate learning experiences and teaching strategies does to elaborate on the concise statement that encapsulates the intentions of the subject: the importance of confidence building; preparation for the future, particularly in relation to work; and the development of generic mathematical and social skills rather than specific mathematical content. There are a number of key aspects to this alternative approach. The syllabus emphasises that it is important that teachers give students a variety of ways to engage with the subject. In order to support students, teachers need to design tasks that require students to use mathematics in ‘everyday’ personal and work-related contexts. Such tasks will build students’ confidence in dealing with relevant mathematical content. In tandem with these discourses that focus on the support that is offered to students who have not experienced success in previous school mathematics, is a more regulatory discourse that focuses on the assessment regime that is an integral part of the subject.

Comparisons between the version of Prevocational Mathematics practice promoted in the syllabus (i.e. the authoritative discourse of senior numeracy education) and the broader discussion of legitimate senior schooling practices in the ETRF provide evidence of the operationalisation of the reform discourses in subject-specific ways. The next stage of the analysis involves a move from policy to practice to investigate the actual practices of two Prevocational Mathematics classrooms and the discourses that circulate in them.
Chapter 7

Prevocational Mathematics classroom discourses

The focus in this chapter is on the classroom discourses that constitute the final element of the genre chain framing the study. The purpose of the chapter is twofold. First, it continues the textual and intertextual analyses of texts that are required to answer the study’s final sub-question.

Which of the policy discourses of senior schooling and senior numeracy education are evident in the Prevocational Mathematics classrooms? That is, which of the preferred senior schooling/senior numeracy education practices [identified in Chapters 5 and 6] are (a) represented in interview accounts and/or (b) enacted in task specifications and classroom activities?

Second, it synthesises the findings of this phase of the analysis with the analytic work in the previous two chapters to address the study’s central question.

How, and how much, do Prevocational Mathematics students and teachers draw on the discourses of senior schooling promoted by policy reforms and syllabus specifications to make sense of their engagement with contextualised tasks?

The approach adopted in this chapter shares some similarities to that adopted in the previous two chapters. There, policy document were examined to identify (i) the preferred practices of senior schooling that were promoted in the texts, and (ii) the linguistic and interdiscursive strategies that were employed by the texts’ writers to establish these as authoritative discourses about senior schooling in general and senior school numeracy. This chapter employs similar tools and techniques to analyse a set of classroom texts to determine what, and how, preferred ways of doing Prevocational Mathematics at BGC are discursively constructed. However, whereas Chapters 5 and 6 each examined single documents, a more diverse set of classroom data is available to be analysed. In addition to two teacher-produced assignment task sheets, data from classroom observations and interviews were used to contextualise and support the analysis of these texts. Another key difference between the analysis
reported in this chapter and that from the previous chapters is the shift in emphasis from representations of practice in policy discourses to the enactment of these discourses in classroom practices. The first section of the chapter elaborates on the approach adopted in the collection and analysis of data for this phase of the study.

**Collecting and analysing data from the classroom**

While the open coding that characterised the analysis of policy documents in Chapters 5 and 6 would also have been possible in the phase of the analysis, the quantity and variety of classroom data prompted a more targeted approach. That is, rather than labelling discourses on the basis of observed patterns, the texts were examined for evidence of the policy discourses identified in the previous chapters. This approach to the analysis of classroom texts and talk, and interview and observation data is reflected in the form of the final sub-question for the study.

A related implicit question that is also considered as part of the analysis is the absence of other policy discourses. As Fairclough (2000) noted, discourse analysis has to attend to what is included and what is excluded—“to absences as well as presences” (p. 179). In Faircloughian terms, the analysis of classroom discourses in this chapter can be conceptualised as the examination of two processes. One is the further recontextualisation of policy discourses into representations of practice in classroom discourse. It parallels the previous analysis of policy documents, though here it is the interview accounts that are used as the main source of data, as students and teachers represent (talk about) their classroom practice. The second aspect of the analysis is to look for evidence of the extent to which the new policy discourses have been operationalised in classroom practices by examining the two task specifications or ‘task sheets’.

These texts documented the assessment focus of the two main tasks observed during the period of classroom data collection: (i) ‘Planning a holiday’, an Internet-based research task undertaken by the Year 12s and (ii) the production of a model doll’s house, one element of a term-long topic ‘A place to live’ undertaken by the Year 11s. (See Appendix 4.) The analytical focus on enactment was also undertaken in the previous chapter in the brief discussion of how senior schooling reforms were operationalised in the Prevocational Mathematics syllabus. However in this chapter,
the search for evidence of the enactment of policy discourses in classroom practices is a more significant issue.

The dialectical relationship between language and other social elements has led many critical discourse analysts to note the value and importance of supplementing textual analysis with other forms of analysis (Breeze, 2011; Krzyżanowski, 2011). While the analysis of texts may address issues of social relations, identities and institutions, such social elements cannot be reduced to their textual representations. The need for social theories and methods of analysis becomes more acute in investigating the operationalisation of discourses (Fairclough, 2005b). A focus on operationalisation requires an examination of whether the senior schooling discourses traced through policy and classroom texts were also enacted in the social practices of students and teachers, inculcated in their ways of being students and teachers, and had materialised into new types of tasks (as the concrete social events that are integral to the study of mathematics in these classes) and new classroom configurations. To address this need, methods borrowed from ethnographic research, specifically interviews with participants and observations of classroom practices, contributed to the examination of classroom discourses. That is, the additional data sources that did not have an easily accessible equivalent in the previous analyses of policy texts contributed to the increased analytical focus on enactment.

The transcribed interviews with teachers and students were themselves texts that could be subject to linguistic and interdiscursive analysis. As an artefact of the research process, their relationship to the genre chain of texts that frame this study was tangential. On the other hand, the fact that they provided participants’ interpretations of the processes of production and interpretation of classroom texts made them a valuable source of data. Their inclusion in the data set meant that the description of events and practices in Prevocational Mathematics classrooms articulated in this chapter did not rely solely on researcher’s interpretations. It also drew on participants’ perspectives as conveyed through the interview data, albeit co-constructed with the researcher/interviewer and reinterpreted here in the production of the thesis.

An important distinction that underpins the analysis then is that between the
interview accounts that represent teachers and students in particular ways as the informants talk about practice, and the classroom texts that shape how teachers and students interact with one another as an element of doing practice (van Leeuwen, 2008). The teachers’ and students’ explanations and justifications of what happened when they taught and learnt Prevocational Mathematics made apparent the implicit rules of behaviour that structured pedagogic practice in their classrooms. The interview data thus provided explicit accounts of how students and teachers made sense of their participation in the subject, particularly their engagement with contextualised tasks. Through the triangulation of data—the interviews, observations and written and spoken texts—a rich description of the events and practices in the two classes added a greater depth and rigour to the identification of discourses of senior schooling than could have been obtained by examining the written task sheets alone.

The analysis reported in this chapter therefore synthesises a number of distinct analytic phases. In practice, there was considerable oscillation between these phases as insights from one data source or form of analysis prompted revisiting earlier work. The simultaneous conception of task specifications as an element of classroom events (i.e. the task sheet as a text) and as an element of classroom practice (i.e. as an articulation of different discourses, genres and styles in particular Prevocational Mathematics ways) also contributed to the fluidity between phases. However, for clarity, they are presented here as a sequence of analytic moves.

The textual analysis of the assessment task sheets provided to students was the first of these moves. Following an overview of the texts as a whole, the analysis of the tasks focused on lexical choices, particularly those made in the transitivity system and those related to modality. That is, references to the processes in which students were expected to participate, and the circumstances surrounding these processes, were identified in the two task sheets.

Interviews with teachers and students were also analysed to determine how students and teachers discursively constructed their preferred versions of pedagogic practice in Prevocational Mathematics. Here again, the lexical choices related to transitivity revealed what students and teachers were expected to do, and not do, in
Prevocational Mathematics. Characteristics attributed to students and teachers and variations in epistemic modality were also noted in this pass through the interview data. That is, the analysis of the interviews focused on positive and negative evaluations of teachers and students, their attributes and actions, and the degree to which the interviewees were committed to the certainty of their evaluations. Segments of interview data that either sustained or disrupted the discourses evident in the classroom texts were of particular significance and are woven through the discussion in this chapter.

Following the textual analysis of written task specifications and interview transcripts, the final phase involved the identification of discourses at the level of new genres and styles of operating. Observations of classroom configurations and activities, talk around the tasks and the students’ responses to the tasks contributed to this phase of the analysis. That is, the analysis of classroom texts and the processes of their production and distribution identified ways in which new discourses were being enacted and inculcated into teachers’ and students’ ways of acting and being and materialised in classroom practices.

In keeping with the approach adopted in earlier chapters, a brief introduction to the two task sheets begins the analysis of classroom data. Three distinct sections from the two task sheets are conceptualised as enactments of key policy discourses and are used as a springboard for discussion that incorporates the analysis of interview and observation data. Given that “new discourses emerge through ‘reweaving’ relations between existing discourse” (Fairclough, 2005c, p. 932), the linking of each of the three sections with specific policy discourses glosses over much of the inherent complexity and contingency of the operationalisation of policy discourses in classroom practices. Nevertheless, the simplified tracing of discourses that is reported here still captures the essential elements of Prevocational Mathematics practice. (Dis)connections between the task sheets, researcher’s observations and interview accounts of classroom practice highlight the work that is done by students and teachers to reconcile new discourses about senior schooling, particularly in mathematics education, with other more traditional discourses.
An overview of the task sheets

The operationalisation of policy discourses involves a move from “imaginaries for change” to effecting “real change” through processes of enactment—the transformation of discourses into new genres (ways of acting and interacting socially), inculcation—the transformation of discourses into new styles (identities or ways of being), and materialisation—the transformation of discourses into new ways of organising social spaces (Fairclough, 2005c). Each of these processes will be considered in the chapter, though the initial focus of the analysis of the task sheets is the enactment of genres.

The overview of the task sheets reveals them to be hybrid texts that contain a mix of genres. Both Year 11 and Year 12 task sheets consist of three clearly delineated sections, associated with three distinct facets of student-teacher interactions. The first section of each outlines the conditions under which the assessment takes place. It is a common feature of assessment task sheets within Queensland senior schooling and enacts a regulatory discourse. The second section of each task sheet is likely to be more idiosyncratic to subjects where some form of contextualised task is appropriate. It serves to establish the figurative context evoked by the task (Clarke, 2006). In the case of Prevocational Mathematics, the contextualised tasks are meant to evoke “meaningful, realistic contexts… reflecting situations students know about or are likely to encounter after leaving school” (QSA, 2002, p. 35). The second section therefore has been conceptualised as the enactment of a discourse that attaches importance to the ‘real life’ relevance of the tasks. The final section of each task sheet outlines the steps required to be undertaken by the student to complete the task. These are overt interpretations by the teacher-designers of what counts as legitimate practice in Prevocational Mathematics. The discussion here will focus on how these elements of the task enact particular discourses of support. That is, the focus of analysis for the final section is on what the activities ask students to do, and how these presuppose a deficit view of students.

In the following analysis, the association of a single discourse with each section of the task sheets is used strategically to draw attention to the presence of other policy discourses interwoven through the text (and to the absence of some
policy discourses) as part of the new configurations of discourses, genres and styles that are being developed as part of the order of discourse for Prevocational Mathematics at BGC. The discussion draws on comparisons between the Year 11 and 12 examples and on the interview data to highlight synergies and tensions between the texts themselves and the students’ and teachers’ accounts of the production and consumption of the texts.

The assessment conditions: enacting a regulatory discourse

A statement of assessment conditions at the beginning of an assessment instrument is a broad expectation across all subject areas in Queensland secondary schooling (QCAA, 2015). As a succinct statement of the parameters of a task such statements also function as part of the quality assurance process for a school’s development of a subject (QCAA, 2014b). That is, as well as communicating procedural information to students, statements about (i) the conditions under which the task will be completed and (ii) the criteria on which students’ task performance will be judged, provide assurances that the school has complied with system-level policies and procedures in the delivery and assessment of the course of study. Thus, the statement of the assessment conditions contributes to a regulatory discourse whose purpose in the school-based assessment system is to establish that schools have been vigilant in authenticating students’ work and in ensuring that the assessment practices are congruent with objectives, and have met standards, established by the syllabus.

In Queensland schooling, evidence of student learning is collected continuously, by classroom teachers, across the two years of the course. Teachers have an important role as managers and monitors of student learning in the system and for many the regulatory discourse around assessment becomes part of their teaching style. For example, the Year 12 teacher’s commitment to this style of operating was evident in her interview.

If I know that they’re in danger of failing, I call them in. Because I’m going to be calling in a handful of them actually, because the last piece of assessment was not very well done by some. Excellently done by others. But some of them, the ones who were failing, they just didn’t complete the assessment.

She portrays herself as an active agent undertaking actions that will redress a serious problem—‘the danger of failing’. A sense of expertise is conveyed through her
assertion that she ‘knows’ when a student is in this position, and that she is also able
to judge ‘excellent’ work by others.

Despite the importance of the regulatory discourse in senior schooling, as
evidenced by its prominent position on the front page of all assessment task sheets,
in both classes, the instructions were treated in a fairly cursory manner. After
teachers alerted students to the date that drafts and final assignments were due, the
information in the instructions to students and summary of achievements was simply
glossed over as discussion moved on to the scenario that had been set for the task.
The similarities in the wording and setting out of the front pages of the task sheets
are formulaic and there did not appear to be any expectation by either students or
teachers that they would be discussed in detail. Instead, the information was meted
out at various points throughout the unit of work by the teacher in explicit task-
specific, though largely procedural ways: reminders about due dates and what
exactly needed to be completed.

Such asymmetric power relations between teachers as the givers and students
as the receivers of instructions are reaffirmed discursively in the mix of high and low
modality statements in the ‘instructions to students’ in this section. Statements that
all working “must be shown”, “must be legible”, “must represent your own work”,
and so on, while software and calculators “may be used” position teachers as
monitors and managers of student progress. The high modality statements suggest
that teachers know that there is possibility that particular conditions may not be met,
so need to be made explicit; the low modality statements indicate that it is at their
discretion that the use of calculators and software is permitted. In contrast to
syllabus’ discourses identified in the previous chapter that pointed to a relaxing of
traditional teacher-student relations (e.g. Prevocational Mathematics students as
young adults, discourses of support through confidence-building, ‘everydayness’,
and flexibility), the first section of the task sheets explicitly reinforces traditional
relations.

**The task scenarios: enacting a discourse of ‘real life’**

In the Year 11 task sheet, the second section was entitled the ‘Doll’s House Design
Brief’. It talked directly to students (“you have been asked”), but invited them to
imagine themselves in a work context as members of a ‘design team’, who would have to meet the needs of a ‘client’ and report to a ‘supervisor’. The Year 12 task adopted a different approach to scenario building. While it too addressed students directly (your task is to plan an overseas holiday…”), it contained both an introduction that reiterated some of the instruction to students and a list of tasks that students were required to complete before it outlined the parameters of the task. The students were not asked to adopt the role of workers but to plan a trip that would express their own personal interests, a possible future self.

The ‘design brief’ could be viewed as an attempt to destabilise traditional student-teacher relations. While the teacher remained the final assessor of the students’ work, in the proxy roles of client and supervisor, she was able to step away from the role of transmitter of mathematical knowledge and work beside groups of students to clarify requirements or direct activities. This role-playing worked at times throughout the unit but seemed quite unstable and dependent upon students’ participation, so teachers and students frequently reverted to traditional ways of interacting with one another. In contrast, the repetition of the instructions to students, the dot point list of task activities, and the brief overview of the parameters of the task in the Year 12 example retain the appearance of a conventional school assignment. The conventionality was reflected in the classroom organisation of the Year 12 class with periods of teacher instruction interspersed with students working individually at computers on set work — either researching contextual elements of the task or performing the mathematical calculations that the tasks required.

The two scenarios exemplify just two of many possible approaches identified in the syllabus that might be taken in creating a scenario for a contextualised task in a ‘prevocational’ mathematics course focusing on the ‘general demands’ of everyday life. The doll’s house task asked students to imagine themselves as future workers, the holiday task as future consumers. Both tasks had been designed by teachers to reflect some aspect of future everyday experience for their students, but it was evident from classroom observations and interviews that the adult contexts that students were asked to imagine, and the role that mathematics would play in those contexts, did not always coincide with teachers’ conceptions and that this disjunction prevented students from engaging fully with the tasks.
Some students articulated their lack of identification with the given scenarios in fairly crude ways, arguing that they were unlikely to leave school and become designers of doll’s houses (or food packaging as mentioned in the example below). Other students expressed their inability to fully immerse themselves in the scenarios in more nuanced ways. The following extract from the interviews illustrates the difference.

S8: Oh that was rubbish. That was the dumbest thing I’ve ever done. That was not maths, no. There was no maths in that. It was all about writing up stuff, making a PowerPoint and that was just rubbish.
S7: No it wasn’t maths.
I: Ok if that wasn’t maths, is what you’re doing now maths then?
S8: Yeah, I’m interested in this.
S7: It’s good. I’m so happy that we are doing housing and stuff like that because like I’m eighteen next year and not that I’m going to move out cause I haven’t any money, but if I was to move out now I’d know everything. And it’s so good, cause it gets us to start thinking about saving for a house. Making a little soup bucket and its label. What am I ever going to do with that? I’m not going to be a tuckshop lady. So I don’t need that, and I’m really not going to build a house ever so
S8: Oh I don’t know, you never know.
S7: But are you going to build a house?
S8: Oh well my parents did.
S7: They didn’t do it themselves though.
S8: No, no course not.
S7: So yeah. But I really like this stuff we doing now, this housing stuff.
S8: Yeah me too.
S7: I think it’s so good.

The first half of the extract uses highly modalised evaluative language to make strong assertions about what counts as mathematics and what does not. The first comparison is between a previous task that involved the exploration of surface areas, volumes, and nets of three-dimensional spaces in the context of food packaging, considered to be irrelevant to their future needs and the activity that the class was undertaking on the day of the interview. The ‘housing and stuff’ is a specific reference to a traditional teacher-directed lesson. The lesson involved the review of methods to calculate simple interest followed by students working individually on graded exercises. The positive evaluation applies to this lesson rather than all the facets of the unit as is made clear in the later statement that ‘I’m really not going to build a house ever so’. The movement of the discussion on to the topic of building a house shows their understanding of the doll’s house activity as standing in for real
life house-building, but that they remain unable to make a connection between the construction activity and some imagined future role for themselves as homeowners who will need to understand anything about house construction.

The inclusion of the more teacher-directed lessons on buying and renting houses to go along with the doll’s house construction points to the fact that many of the observed activities did not make links to students role as future workers but might be better conceptualised as referencing students’ roles as future consumers. A student’s comment from an interview towards the end of Year 12 (i.e. after almost two years of Prevocational Mathematics) suggested that this approach to contextualisation was a common one, though the connections between contexts and the mathematical content that they developed, from her account, seemed to be both superficial and quite limited.

S9: Yeah, and sometimes it’s not even mathematical. Like what we’re learning at the moment. Like we’re learning like about Medicare and stuff, things like that. It’s not really maths but it will like lead to maths when we figure out like the money and stuff.

I: So it’s not really mathematical but it leads to mathematics? Can you explain that a bit more?

S9: Like, we’ll get taught about Medicare and all that stuff and what they do and what it is. Like we’ve just really started so I can’t give you much about it. But then it will lead to, like working with our budget. Like our money, and how much we would put, like how much would go to that, and how much would go to that, and all that sort of stuff. That’s what I reckon we’ll end up doing.

Her remarks about the characteristic form of the tasks that she has encountered over the two years of Prevocational Mathematics study suggests that a discourse of personal economic management has been enacted in tasks with such regularity that students are able to predict the sorts of tasks that they will encounter. The prevalence of such tasks was borne out during the period of classroom data collection. Three of the four contextualised tasks observed during the time with the two classes fitted the template that S9 described in that they all involved some independent student research about contextual aspects of a task (e.g. insuring a car; obtaining a passport, designing a floor plan of a house) but culminated in students needing to justify financial decisions made in buying a car, planning a holiday, or minimising costs in the production of the doll’s house.
The significance of justification as an element in the tasks is evident on the front pages of the task sheets where ‘justifying’ is listed as one of the ‘CCEs’ that the task will address. CCEs are the Common Curriculum Elements, identified by the QSA/QCAA, as the range of skills students should have developed by the completion of their senior studies. They are found across the range of subjects in schools and emphasise the gaining and development of generic skills by students rather than subject specific content. Justifying involves providing sound and logical reasons or evidence to support a statement (QCAAc, 2014). The importance of justification can be traced back to the syllabus document where students’ ability to “make informed decisions” (QSA, 2004a, p. 3) is one of the seven aims of the subject. It is noteworthy that “an ability to manage their financial affairs to empower them to make informed consumer decisions” and “an ability to use mathematical procedures to justify conclusions” are also global aims in the Mathematics A and Mathematics B syllabuses respectively (see Appendix 1). In each of these references, ‘justification’ is presented as an empowering skill for students to acquire. However, classroom observations suggest that its power is never fully unleashed in the context of the tasks that Prevocational Mathematics students undertake. For example, one student tried to take into account a range of variables to make decisions about flights and accommodation as she was planning her holiday. But while she could argue for the authenticity of her approach, it was a time-consuming process and she was eventually advised by the teacher to just “pick the cheapest”.

Throughout the classroom observations there were other instances where students’ authentic, arguably more sophisticated contextual considerations seemed to be at odds with the more simplistic mathematical requirements of a task. There were sometimes moments of tension, for example when a student rejected the given criteria to choose a car to purchase on the basis that she would have different criteria; or another decided to travel to Romania instead of Rome as that was where her family had originally come from. But there was enough room for interpretation in the student-teacher discussions and in the follow-up research interviews to give an open finding on whether these were genuine misunderstandings or small moments of student resistance.
The task requirements: enacting a discourse of support

The final sections of the task sheets detailed the mathematical and contextual activities that students had to complete. The Year 11 and 12 teachers approached this component of the task specifications in quite different ways. The Year 11’s doll’s house task is printed over several pages with spaces left to scaffold students’ progress. Apart from the final page that involves a SWOT analysis of the construction process, the wording of the questions shares many similarities with typical mathematics tasks. The activities are sequenced from less mathematically demanding design sketches, through to more mathematically demanding scale drawings and final costings. In contrast, in the Year 12’s task, the connections between the three lists of items that must be included in the itinerary, the report, and the budget are not foregrounded in the text itself but are the focus of the teacher’s orientation to lessons throughout the unit.

These differences in task design are perhaps a reflection of the differing backgrounds of the two teachers—an experienced mathematics teacher for the Year 11 class and a teacher without any formal mathematics education qualifications for the Year 12 class. In both cases, teachers have incorporated elements into the tasks to enable students to engage with them to different degrees—a necessary design feature given students’ different attendance patterns. In the Year 11 task, the incorporation of group work meant that not all students needed to be involved in all aspects of the practical component of the task. Only those students who had finished the earlier activities completed the SWOT analysis at the conclusion of the unit. Whole class instruction to undertake the core mathematical components of the task was scheduled to coincide with days when most students were at school. Planning for this flexibility was not an easy task, but it was couch as an evitable part of teacher’s work by the Year 11 teacher:

Well the doll’s house changes with every year group and I suppose it depends on how many are in the group, and the facilities. Where you’ve got to do it, who comes to school, whether your group is there or not, and who does all the work. Now that was a problem this year in retrospect. Too many people away from one group going to TAFE and I think it made it hard on the other members of the group. So that is something that’s going to have to be looked at, it’s never going to be improved because TAFE courses are always going to be run, but I don’t know. That has to be, to be re-evaluated. It’s not really been a problem before because I think less people went to TAFE and it was only one person out
of the group, whereas some of these groups had two people away and only one
present.

There is less sense of deliberate staging evident in the task sheet for the Year
12 task, and this was reflected in the organisation of the unit. The teacher’s strategy
for dealing with variation in student attendance was structured around independent
online research and the repetition of activities associated with different holiday
activities. That is, students varied their engagement with the task by varying the
number of attractions they visited and the amount of detail they provided on each
case. Though as with the Year 12 teacher, whole class instruction of core
mathematical content was scheduled for the days when most students were in
attendance.

The decisions that teachers made about what to include in tasks in terms of
mathematical content rather than contextual framing drew very much on a discourse
of student deficit. In fact, across both student and teacher interviews there was a
strong consensus that, in comparison to other senior students, Prevocational
Mathematics students lacked one or more personal attributes that were necessary to
be successful at mathematics. This belief would seem to be deeply entrenched in that
it was often given in response to the very first interview question for both students
and teachers. The question had been deliberately posed in quite open terms—“How
come some students take Prevocational Mathematics in Years 11 and 12?”—yet
garnered answers that often drew on deficit discourses. Within the answers,
explanations for students’ enrolments in Prevocational Mathematics made reference
to their deficits in ability, effort, and interest/motivation, sometimes in combination.
Extracts from the two teachers’ responses to the opening question are illustrative.

A lot of girls opt for Prevoc Maths because it is the easy option. Not just
necessarily because, like there are a couple over the years that I have taught it,
who could have managed Maths A but they’re just too lazy.

[In around September of Year 10] they’re put into classes of girls with similar
ability levels, and then maths is just a compulsory subject on there. Can I say
though it is quite obvious from Year 9 who will be in the different classes. And
I think in classes the girls work it out fairly quickly who’s got mathematical
ability and who hasn’t unfortunately. And it is a self-fulfilling prophecy. Unless
you have quite a lot of support from home, and, other places.

[At the beginning of Year 11, some students change from Maths A to
Prevocational Mathematics] because they go to the first few lessons and they
realise that it’s too much work and they don’t want to do it. And quite frankly,
all the ones in my class, most of them couldn’t cope with Maths A. S could and probably T, M could if she tried. The rest would have no hope.

(Year 11 teacher interview)

We discuss what stream of maths should you be doing if that’s what you want to do with your life and so it is up to the students and I guess their parents really because they’re the ones who pay for it. So it’s done in consultation with the school but it is the parents’ final choice.

And when it comes to change, I believe you can change. At the moment they’re really trying to get the Year 10s to really concentrate on making the right decision for their future when they’re in Year 10 rather than do one or two semesters in Year 11 and then go whoopsie changed my mind. Because then when they change subjects they don’t have the foundation from the work that they’ve missed. So I think that’s more for the electives than English and Prevoc maths.

And that’s where their abilities lie. Plus you get the support in English com and prevoc maths and different types of assessment than in the board subjects.

(Year 12 teacher interview)

The first extract identifies both ability and effort as important factors in determining class membership. Some Prevocational Mathematics students are “too lazy” and have found other subjects “too much work”; other students don’t possess “mathematical ability” and “couldn’t cope” with other subjects. In the second extract, ability along with interest motivated by future desires for “what you want to do with your life” are identified, though the latter is described as an unstable student attribute requiring the influence of parents and teachers.

The prominence given to the discourse of ability is particularly noteworthy given that it contradicts syllabus guidelines advising teachers to think of students’ difficulties in terms of lack of confidence rather than in terms of lack of ability. For both teachers, mathematical ‘ability’ is described as a fixed, innate quality. The Year 11 teacher calls on her experience (“over the years that I have taught it”) to support high modality claims (“Can I say though it is quite obvious”, “And quite frankly”) that there are some students who’ve “got mathematical ability” and some who haven’t. The evaluation explicated in the adverb “unfortunately” emphasises the undesirability of lacking this ability. However her assertion “And it is a self-fulfilling prophecy” is moderated with “Unless you have quite a lot of support from home, and, other places”. This caveat perhaps indicates that the teacher is aware of the tension between her assertions and research that suggests that the structuring practices of schooling may provide a better explanation of student success than
inherent ability. The Year 12 teacher’s authoritative view on ability is inscribed in the assertion “And that’s where their abilities lie”. The statement works as a non-negotiable coda to her overall answer, contrasting with her earlier more tentative statements about why students take Prevocational Mathematics that were modalized by the phrases “I guess”, “I believe”, and “I think”.

Students’ interviews were also replete with references to ability. The following three extracts demonstrate some of the linguistic strategies students used to characterise themselves as deficit learners of mathematics.

S13: Well the teacher told me I had to do it because I’m not smart enough for the other one.

S12: Well I guess I basically decided last year at the end of grade ten. And I’m not a very big maths fan and so I said I’ll just go into Prevoc.

S4: Oh, like I’m still really, really bad, like in primary school I was so bad at division. I still am. I’m terrible. I have to use a calculator. But I’m good at multiplying. I used to do a lot of revision work with multiplying with like tapes and stuff when I was a kid.

Relational processes couched in the negative do significant identity work in the first two extracts. “I’m not smart enough”, “I’m not a very big maths fan” suggest that students see these as personal attributes that are not open to change. In the third extract, the student intensifies her identification with a negative attribute (being bad at maths) through repetition, including the use of modifiers “really, really bad” and “so bad” and a higher intensity synonym “terrible”. While she also makes a positive evaluation of her ability to multiply, she notes that this success was only possible under certain conditions through the use of the temporal clause “when I was a kid”.

Although there was little disagreement between teachers and students as to lack of ability being a key factor in students’ enrolment in Prevocational Mathematics, there were differences in responses that implicated aspects of students’ affect—confidence, motivation and interest. While teachers or researchers might interpret the above students’ comments as indicative of a lack of confidence, this was not how students saw themselves. Not being “a big maths fan” or “just not liking it”, and finding the tasks “boring” or “more time consuming than anything” seemed to be sufficient reasons in themselves for students’ low levels of engagement in the subject.
But while confidence was not mentioned at all by students, both teachers took up the Prevocational Mathematics syllabus’s notion of lack of confidence as an explanatory device. Admittedly though, ‘confidence’ was used to a lesser extent than ability and with varying degrees of certainty. For the Year 12 teacher, an incident with a student who was “getting upset because she [didn’t] know what she [was] doing” was her sole reference to confidence in the interviews.

She just didn’t have the confidence. I guess when you’ve been flunking Maths A and you join prevoc maths. I guess she had this opinion of herself that she’s bad at maths. I guess she’s not so great at maths A but prevoc is really different so I don’t think it’s a fair comparison.

In this instance, the high modality of the first assertion contrasts with the following more tentative statements, suggesting that confidence as a significant student attribute has yet to achieve a stable meaning independent of the notion of ability (“I guess she’s not so great at maths”) for the teacher. The Year 11 teacher makes a number of references to students’ lack of confidence as a factor that contributes to their engagement in Prevocational Mathematics. For example,

Very often they have trouble breaking down the questions of what they actually have to do. So even if they can do it, if they don’t know what they’re being asked to do, they find that difficult and they don’t have a lot of confidence doing those sorts of things. They’re not usually confident in their own judgements.

In contrast to the Year 12 teacher’s comments, the Year 11 teacher’s remarks suggest a more developed rationale for associating a lack of confidence with students’ performance in mathematics. Her response suggests a specific set of issues that less confident students face: having trouble breaking down the questions that leads to uncertainty about what to do. Her final declarative statement suggests that she is appraising the interviewer of the facts of the matter.

Students may not mention lack of confidence to explain their limited success in school mathematics but they do draw on other personal, affective responses to describe how Prevocational Mathematics provides a more supportive environment than other mathematics subjects as the following extracts illustrate.

Well, I’ve always done Maths A in high school and Prevoc is just basically Maths A broken down a lot more. Like we do the exact same work but we do it at a slower pace and more broken down, which I need, for me to be able to get to understand it but it’s the same as Maths A. (S12)
S9: And they put a lot of pressure on you. But here, I think [our teacher] works with all of us. But in Maths A it’s like if you’re slower in this area
S10: You get left behind.
S9: Then you get left behind and you have to move on. But here we’re all together. So that’s what I like about here.

It’s a lot easier for me to do a lot of hands on. I’m very hands on. I’m very hands on with everything. (S2)

It’s just more practical and it’s not as stressful. (S3)

But that’s like the sort of maths that I’d want to do because I like can’t learn if I’m not doing something. (S2)

In general then students construct Prevocational Mathematics as a supportive, responsive subject that is different to other subjects in that it recognises their personal attributes and needs. The examples show that both procedural discourses (more time) and discourses drawing on constructivist principles (practical activities) are drawn on by students to explain their participation in the subject.

‘Work’ in a prevocational context

Prevocational Mathematics is not the only school-based, quasi-vocational subject offered in Queensland secondary schools. However it is the only one that draws attention to its not-quite-vocational status with the modifier ‘prevocational’.

Recurrent interview references to effort and work suggest that teachers and students have taken up the vocationalist discourse evident in the ETRF and the syllabus to conceptualise Prevocational Mathematics as a subject that develops students’ work ethic more than any particular work-related mathematical skills as such. In talking about the doll’s house task, the Year 11 teacher argued that

By having to present what they’ve done I think they can also see how much effort other people have put into it, ideas they had, they had to physically make something themselves, so there was that hands on thing too. Yep most of them got into that activity fairly well. It was an activity they liked. So they all completed it and everyone handed things in on time, which is not the case with all of them.

Her response emphasises through repetition the importance of students being active participants in the subject: putting “effort” into an activity, “physically mak[ing] something”, and “[getting] into that activity”. Through the conjunction “so”, the generic work skills of task completion and time management are seen as a consequence of the fact that “it was an activity that they liked”. There is an implicit
positive evaluation of the task in its comparison to others where these skills have not been evident “which is not the case with all of them”.

Perhaps the most explicit comment the Year 12 teacher made with respect to work preparation related to how the next unit of work, based around the students planning and conducting a charity bake sale, would be implemented:

I was planning on asking the girls next term which way they would like to do it. Cause some people would rather do work at home and some people would rather work at school and I think that’s a valid work option in terms of preparing them for the world of work.

The teacher portrays herself as a supportive teacher, responsive to students’ individual preferences, who is also aware of her responsibilities in preparing students for their future, though this is not a categorical assertion about what she will do. Her reference to ‘some people’ and use of the phrase ‘I think’ suggest the texturing together of discourses of student choice and preparation for work is not something to which she has fully committed.

In student interviews there were also many references to work as a moral imperative with students, in contrast to the teachers’ comments discussed earlier, typically portraying themselves as hard workers.

I like getting everything done, like I like having all my assignments handed in on time and I don’t like to, you know, to dilly-dally around with everything. (S1)

Yeah and when we work sometimes with the assignments sometimes me and another girl did it as a partnership and we did it and we finished it like a week ago and it’s not due until like another week. (S3)

Both S1’s and S3’s comments suggest that time management is an important aspect of being a Prevocational Mathematic student. The use of present tense in the first suggests that this is a personal attribute that transcends the particular subject, a sense that is not conveyed in the second where the circumstances under which the task is completed are mentioned.

**Whither diversification, flexibility and student choice?**

Students at [BGC] have the option of choosing one of three pathways to post-school options: the Overall Position (OP) Pathway or the QTAC Selection Rank Pathway, both of which lead to tertiary entrance, or a study pathway that leads directly into the workforce (quote from school’s handbook)
This extract from the handbook distributed to students to help them select their subjects for Years 11 and 12 clearly draws on the discourses of flexibility and choice promoted in the ETRF, an influence that was evident in the Prevocational Mathematics classes in material ways. Across both year levels, over half the study’s participants were involved in some form of vocational education. While not all these students left the school for work placements or training, there were still a significant number of students who were absent for one or more mathematics lessons each week. The reform discourse of flexibility had been operationalised at BGC so that missing lessons in some school-based subjects in order to participate in VET was seen as a legitimate way of doing senior schooling.

Prevocational Mathematics, along with other Authority-registered subjects, appeared to make a significant contribution to this organisation of the curriculum at BGC. Students who were likely to be absent from school each week were encouraged to select Authority-registered subjects over academic subjects that counted towards tertiary entrance. Student choice was not open-ended. It was guided by pragmatic considerations that needed to take into account existing secondary school timetables and spaces and thus perhaps favoured students taking the established academic pathway. Additionally the representation of Prevocational Mathematics students, as less confident young people who have been guided in their choice of subject by their teachers or their parents, or by their own innate abilities suggests that the flexible approach to senior schooling that had been embraced by the school was not one that was universally applied to all students.

Within the subject itself, there is a semblance of choice in the tasks themselves. In the doll’s house construction, apart from some constraints in the materials they could use, students were encouraged by the teacher to be creative in their interpretation of the task. Their different approaches were applauded by the teacher though were seen in different terms by some students.

I: Is there anything that you’ve learnt from [making the doll’s house] that will help you later on?
S6: Probably.
S5: Yeah I suppose. Learning how to measure. That would be it. The whole making it I don’t think was really necessary.
S6: We need to make it to see what it actually looked like in the end, so I think it was all right.

S6: I think that if we wanted to get the best out of it we should have put a more into it. Like theirs is hella good and they probably got a bit more out of it than we did.

S5: But like I was more focusing on that other like getting the actual assignment done than making the house look really good. If we didn’t have to do the assignment bit then I would make the house better.

S6: But that writing assignment, I didn’t even finish it.

The students’ tentative answers suggest a degree of uncertainty in their understanding of the purpose of the task—perhaps even a desire to please the interviewer whose question implies that they were intended to learn something of value. For S5, the completion of the ‘actual assignment’ involving the scale drawing of the design and the calculation of material costs is identified as what really counts.

The holiday planning tasks had also been designed by the teacher to give students opportunities to make choices as they selected different places to stay and activities to do, but was evaluated in less positive terms by students

S3: The research one. We had this assignment where we had to research like where we were going. We had a certain amount of money and we had to choose, like the place she chose, we had to choose accommodation, like we had to fill out a whole timetable for two weeks or something. It was like SO much. Some people had like hundreds of pages sometimes. It was massive.

I: Oh, so was that interesting?

S4: It was boring.

S3: Yeah it was more time consuming than anything

S2: Yeah it wasn’t hard at all. It was just like you had to find the right information, there was just heaps of information

S4: And you had to for every single thing you had to like print screen it and get an online quote like you had to get the url and you had to get the date like it was just like a constant like providing like the evidence for every single thing that’s why it was so time consuming

These two examples suggest that, despite the teachers’ best intentions to provide contextualised tasks to develop students’ confidence and positive attitudes to mathematics, and also their mathematical knowledge and skills, as the syllabus Rationale proposes, the scenarios and activities that they devise to engage and motivate students may instead do the opposite.

The analysis of the assessment task sheets and teachers’ and students’ accounts of their participation in classroom activities indicates that a number of senior
schooling discourses promoted in the policy reform and syllabus documents have been taken up by teachers and students. The regulatory syllabus discourse that emphasised the integral role of assessment in the subject is operationalised in the task sheets in lists of instructions to students that confirm the role of teachers as monitors and managers of students’ progress. Policy discourses that focused on the importance of senior schooling as a preparation for future employment and other ‘general demands’ of post-school life are transformed in the classroom setting into concerns with developing a work ethic. In contrast to the emphasis in the syllabus document on the importance of building student confidence, teachers and students draw on a discourse of ability to explain students’ participation in the course. Contradictions are inherent in the intertextual links between discourses of flexibility, diversification and choice at the school and classroom level. On the one hand, a diversified senior school curriculum enables students a choice of subjects though most students see their participation in the subject as an inevitability rather than a choice. A discourse of flexibility gives permission for teachers to adopt a wide range of approaches, though students seem to prefer traditional approaches.

Making sense of contextualised tasks

The final section of the chapter explicitly addresses the study’s overarching question. The discussion focuses on teachers’ and students’ explanations and evaluations of two facets of contextualised tasks—their mathematical content, and the figurative context of the task (i.e. the scenarios created by teachers), and how these understandings draw on the discourses of senior schooling that have been traced from the policy documents through to their recontextualisation and operationalisation in the classroom texts and interview accounts. As the analysis in Chapters 6 and the first part of this chapter showed, the movement of meaning both within the field of policy (between broad policy reforms and subject specifications) and between policy and classroom practice was not a simple replication of discourses but rather involved selective transformation of discourses. Discourses were “appropriated and drawn into local spaces by actors who [treated] the discourses as a resource” (Fairclough & Thomas, 2004, cited in Spicer & Fleming, 2007, p. 521).
For both students and teachers, there was a tacit recognition that Prevocational Mathematics was a lower status mathematics option, based on a narrow ‘basic skills’ conceptualisation of numeracy. For students, it was a choice that they made (or that was made for them), not so much because of what they wanted to do in the future but because they knew what they could not do. Contextualised tasks then were not really expected to involve any complex mathematical reasoning or to develop skills. Students explained that it was “mostly just common, just common knowledge” or “maths that we already know” that was needed to complete most of the tasks. Even when new material was incorporated into the tasks, students recognised that there was little conceptual development involved.

S4: We did currencies as well … well it was kind of easy, like you just looked it up on the computer.
S3: Yeah you just looked it up on the Internet cause they calculate it for you.

In contrast to the general consensus between teachers and students over the preferred level of mathematical content, there was a much wider range of views about the purpose and relevance of the scenarios that were created by teachers. Some of this seemed to be due to teachers’ assumptions about students’ prior experiences. When students did not recognise themselves, their families and friends in the contexts, they resisted fully engaging in the tasks. The presumption that contextualised tasks would be motivating for students did not hold. The Year 12 teacher’s comments on students’ efforts in completing tasks in the holiday plan begs the question as to how familiar the student was with the teacher’s preferred approach to taking international holidays.

She wrote things like laze around in the hotel, sun bake. She’d have four days in a row just by doing that. Well I suppose that is kind of relaxing but the whole point is to do things while you’re there.

Notions of everydayness and relevance were personal and limited in their scope. Perhaps the least contentious aspect of what counted as relevant to ‘real life’ was a fairly limited view of economic management.

S9: Buying a car and planning a holiday it’s like managing money and planning I guess.
S10: It’s maths that you need like for the future it’s not.
S11: It’s not like a big equation to write down and stuff. It’s like stuff that we’ll probably need when we’re older.
S10: Yeah to work out prices and stuff like that.
Another student, drawing on her family background indicated that more advanced money management was not considered relevant.

Maybe, if I want to start my own business then yes I will need to know like how to pay my bills and you know stuff like that. But I’ll probably hire someone to do that for me. (S12)

Both Year 11 and 12 teachers drew comparisons between their students’ abilities and interest in tasks that were related to financial mathematics and those that related to spatial reasoning. In the following extract that refers to the students’ construction of the doll’s house, the Year 11 teacher comments:

They had no concept of what volume and surface area are. They find it difficult and they don’t like it. Yeah, the financial maths they don’t mind. … Yeah, they don’t mind doing that but still they’re very weak at it.

She goes on to argue that students perform better on tasks involving money because it is already so much a part of their life.

But these girls too all work, so they all have access to money, and they’re starting to learn what things cost. So, in terms of money they are pretty savvy. In terms of something which is not part of their life, even when you ask them to renovate a bedroom or something like that. They love the concept of it, but when they come to do the work, they’re not interested in measuring curtains or carpet or things like that.

The Year 12 teacher also discusses her students’ interest and performance in mathematics tasks that involve spatial reasoning in some detail. Her description of an activity that was included in the first unit of the year, on navigation, also touches on her belief that spatial reasoning is not a part of everyday life for many of the female students.

And most of them did ok with it. Some of them needed a bit of a reminder to get started but once they got started they were fine. I didn’t have any real problems with that assessment cause I think they liked that sort -- well out of all the kids there, only two of them really liked that unit and that’s because they’re in girl guides or something like that. And so for them compass use was something they had been doing for years. So they really liked it and they were getting As but no one else seemed to really enjoy it.

There is a stark contrast between the Year 11 teacher’s confidence in her knowledge of her students, and the Year 12 teacher’s more hesitant assessment of student’s performance on the task that perhaps reflects their differences in experiences and specialist knowledge. However, the shift in polarity from positive to negative in the Year 12 teacher’s comments are also indicative of interpersonal
tension in the interview. These comments made reference to a noteworthy disruption to the usual classroom practices. A delegation of students approached the head of the Mathematics department to protest about the unit of work. In initiating discussions with the head over the relevance of the tasks they were undertaking, the students challenged the notion of Prevocational Mathematics students as passive, deficit learners lacking in confidence. The incident was the sole example of a shift in student-teacher power relations that elements of the syllabus appeared to advocate. That it did not have a lasting impact on classroom practice is indicative of the contradictory discourses at play in the construction of contextualised tasks. On the one hand, contextualised tasks that referenced adult education principles and adult social contexts were an invitation to teachers to enact a new pedagogic genre (including new teacher-student relations), and to develop new pedagogic styles. On the other, students were also constructed, in more traditional ways, as socially and pedagogically dependent, requiring lots of guidance and support to participate successfully in senior schooling.

In considering the study’s overarching question about the extent to which students and teachers draw on policy discourses, it is clear that they engaged with these multiple discourses in varying ways. Teachers drew on regulatory discourses associated with their role as monitors and managers of student progress and on discourses of student confidence and ability and curriculum variation to explain their approaches to designing tasks that supported student learning. Both students and teachers were concerned with the relevance of the tasks to students’ future participation in society, particularly as workers and consumers, though at times students were unable to relate to the scenarios created by the teachers. While there were some attempts to challenge existing student-teacher relations, both students and teachers appeared more comfortable when traditional ways of working with each other were maintained.
Chapter 8

Conclusions

This study investigated the extent to which Prevocational Mathematics students’ and teachers’ understandings of and engagement with contextualised tasks drew on the discourses of senior schooling promoted in the ETRF White Paper (Queensland Government, 2002) and the discourses of senior school numeracy education promoted by the Prevocational Mathematics syllabus document (QSA, 2004a). The study drew on research in mathematics education (Morgan, 2009; 2014; Valero, 2010) for the initial conceptual framework. Policy development and classroom practices were conceptualised as interconnected elements of a network of social and discursive practices that constitute the contemporary field of senior school numeracy education in Queensland schools. Both Valero and Morgan incorporated a critical discursive perspective associated with Fairclough in their theorising. The current study strengthens this connection analytically through the concept of the genre chain (Fairclough, 2003). That is, the two policy texts, together with a set of classroom texts, were conceptualised as elements of a genre chain.

The notion of the genre chain as a set of genres that are linked to one another in regular and predictable ways was fundamental to the trajectory of the analysis for the study. It provided the framework for tracing the (dis)continuities between (i) the discourses associated with the senior school educational reform processes, (ii) their recontextualisation into subject-specific discourses and operationalisation into subject-specific genres in Prevocational Mathematics, and (iii) the further recontextualisation and operationalisation of these discourses in the classroom practices of one school’s Year 11 and 12 Prevocational Mathematics classes. Chapters 5, 6 and 7 detailed the three phases of this analytical work, culminating in a discussion of the different ways that students and teachers drew on (or rejected) policy discourses to make sense of contextualised tasks. The first section of Chapter 8 synthesises the findings from these three chapters as a preliminary to discussing the contributions of the study to policy and practice in senior school numeracy/mathematics education. The chapter concludes by reflecting on the
theoretical and methodological contributions that the study makes to mathematics education and proposing directions for further research that these imply.

**Revisiting the research questions: tracing discourses of senior schooling across the genre chain**

Two sets of sub-questions guided the analysis of the texts. The first set focused on the identification of authoritative discourses/preferred practices within the social fields of senior schooling (Chapter 5) and senior numeracy education (Chapter 6). The second set of sub-questions shifted attention to the movement of meaning between social fields. The first of these questions focused on looking for evidence of the broader discourses of senior schooling in the representations and enactments of practice in the Prevocational Mathematics syllabus (Chapter 6). The remaining question looked for evidence of both general senior schooling and specific senior numeracy discourses in (i) representations of practice in participants’ accounts of classroom activities and (ii) enactments of practice in the activities themselves (Chapter 7). This staged approach prepared the ground to address the overall question about how, and how much, students and teachers drew on these policy discourses to make sense of their engagement with contextualised tasks.

Rather than restating the study’s findings in the text-by-text sequence that was prompted by the sub-questions and that structured the discussion in Chapters 5, 6 and 7, the following summary of findings attempts to disentangle the multiple discourses that were articulated together in particular configurations in the policy and classroom texts. It follows four discursive threads across the fields of policy reform, syllabus development and classroom practice. The threads begin with four key discourses identified in the ETRF—discourses of inclusion, diversification/flexibility/choice (combined here because of their close interdiscursive ties), vocationalism and support. These discourse have been selected because of the contribution they make to addressing the study’s central concern with how teachers and students make sense of contextualised tasks. A significant finding of the study is that these discourses do not simply replicate as they move from one genre to the next. The movement of meaning between genres involves processes of recontextualisation and operationalisation that
encompass selective transformation of discourses, filtering out some and privileging others.

**A discourse of inclusion**

In the ETRF, a discourse of inclusion established an underlying justification for the reforms to senior schooling. Senior schooling it was argued needed to change so that all students could complete twelve years of education. Higher retention rates were necessary so that students would be better prepared to participate fully in a more highly skilled workforce and a more complex society. The result would be a better future for all students and the state as a whole. While there are no overt references to the inclusive nature of senior schooling in the syllabus document, the standardisation of the subject at the state level, and thus incorporation into the suite of senior mathematics subjects, marked a shift in its previous, more marginal status with local variability. The discourse of inclusion recognized a new category of senior school students and authorised the existence of the new subject to cater for them. Similarly, a discourse of inclusion was not foregrounded by the teachers or students at BGC. However, their accounts of Prevocational Mathematics practice suggested that the discourse had achieved a hegemonic status in the school. While some students might have been described as lazy or some tasks as boring or irrelevant, neither teachers nor students suggested that it would be better for individual students or the category as a whole to leave school before completing Year 12, or that there was no need for them to be studying some form of mathematics in their final years at school.

**Discourses of diversification, flexibility and choice**

A more inclusive phase of senior schooling was discursively constructed in the ETRF through legitimating a broader range of senior schooling practices than had previously been the case to cater for a more diverse senior school student group. The proposed reforms involved an expansion rather than replacement of existing practices—traditional ways of doing senior schooling were to be augmented by a diversification of the curriculum. The discourse of diversification articulated closely with a discourse of flexibility. The new model of senior schooling was constructed as
one consisting of flexible pathways, with students represented as having ‘options’ and exercising choice in selecting a course of study.

Whereas the ETRF’s discourse of inclusion lent authority to the recognition of a new category of mathematics students, its discourses of diversification, flexibility and choice lent authority to the construction of Prevocational Mathematics as another option for students, one that adopted a fundamentally different approach to curriculum and pedagogy from traditional senior mathematics offerings. As an example of a legitimate, alternative approach to mathematics in senior schooling, the syllabus was conceptualised as an enactment of the ETRF policy, as a specific instance of the operationalisation of the policy discourses of diversification, flexibility and choice. These expansionary discourses were couched in student-centred terms in the policy reforms, while in the syllabus they were evident in the construction of the subject as one that required teachers to provide students with a variety of learning activities. That is, much of this flexibility related to course design, as a feature to be exploited by teachers, rather than as a set of choices to be exercised by students.

Policy discourses of diversification, flexibility, and student choice, and their transformation into syllabus discourses of difference, variety and teacher choice interact in complex ways in practice. On the one hand, the option to undertake VET subjects was accepted as a legitimate way to complete senior schooling. The consequence of this student flexibility for Prevocational Mathematics teachers was the need to design tasks and structure learning experiences that could accommodate variation in student attendance. This factor, together with both teachers’ and students’ limited expectations of the students’ abilities to learn mathematics meant that, paradoxically, their opportunities for developing mathematical skills and knowledge were restricted.

**Vocationalism and everyday life**

The discourse of vocationalism, an emphasis on the need for senior schooling to prepare students for future employment, articulated closely with the discourses of inclusion in the ETRF. It was through learning work-related skills that all students would prosper socially and economically, and contribute to the stability and
prosperity of the state. Forms of vocational education and training were represented as an equally valid form of education in Years 11 and 12 as existing, more academically oriented subject offerings.

The value and relevance of vocational education and the wider economic and social benefits associated with work can be traced through into the Prevocational Mathematics syllabus and classroom. A preoccupation with the vocational intents of senior schooling is evident in the choice of subject name and in the adoption of a definition of numeracy that references the development of the effective use of mathematics to meet the demands of paid work as a guiding principle for the subject. However, the notion of the school-based subject as ‘prevocational’ seems to acknowledge that it cannot provide vocational opportunities in the same way that industry-based vocational subjects can. The collocation of paid work with other ‘everyday’ concerns—the ‘general demands’ of life at home and in the community—also scales back the curricular expectations of the subject such that the broad social and economic imperatives advanced in the ETRF are reduced to concerns with personal economic management. In the classroom, teachers designed tasks that referenced work and leisure contexts to provide opportunities for students to engage with these issues. Students expected to work on ‘useful’ tasks, and felt aggrieved when they failed to recognise connections between the tasks and their understandings of post-school life.

**Supporting students – disrupting/reinforcing discourses of deficit**

Within the ETRF, a discourse of support was constructed as both relevant to all students and particularly relevant to the new category of students envisaged by the reforms. All students would need assistance to navigate the flexible pathways now on offer, but it was particularly important to provide structures and mechanisms that would re-engage those who might otherwise leave school. The development of the Prevocational Mathematics syllabus, designed for this latter group, is a subject-specific operationalisation of this discourse.

The syllabus attempts to disrupt a deficit discourse that centres on students’ lack of ability by proposing that students who have previously disengaged from mathematics are more purposefully conceived as lacking in confidence. Thus support
is explicitly couched in terms of building students’ confidence through the provision of tasks that are interesting, enjoyable, and contextualised in meaningful, realistic situations. Despite the overt rejection of the notion of ability, Prevocational Mathematics students are nevertheless still constructed as unlikely to be able to participate in other mathematics subjects successfully. The tasks they undertake should only require (and develop) simple, straightforward, ‘basic’ mathematical skills and concepts.

Discourses of deficit, and thus the need for support, in terms of ability, confidence, and interest are also evident in the classroom context. Teachers tried to ensure the tasks they designed were of interest to students, but also gave them opportunities to review and practice fundamental skills. Students expected to work on tasks that were interesting, but also expected that they would be highly scaffolded and that they would involve re-learning mathematics from earlier years.

In summary, the separate tracing of discourses across the genre chain, if anything, reinforces the complex interdiscursivity in each of the texts. It reveals the stability of the discourse of inclusion as it persists across the chain, and the way that less stable discourses, such as discourses of flexibility, vocationalism and support, are modified as they articulate with existing discourses to construct preferred versions of senior schooling in the reform, syllabus and classroom contexts. In the process, ambiguity and inconsistency are evident in the classroom discourses. For example, how particular activities prepare students for the world of work, or more general demands of life beyond school is not always apparent. Worksheets consisting of sets of simple interest exercises are seen by students as examples of ‘real maths’, but at other times repetition of procedures as part of a task is seen as boring.

**Contributions of the research to policy and practice**

Before discussing the contributions that this study makes to understanding policy and practice in the subject Prevocational Mathematics, it is important to note the caveats about empirical generalisability that are inherent in discourse analytic work (Jaworski & Coupland, 2006). Some of this has been foreshadowed in the outline of the research design in Chapter 4. There, the need for educational research to satisfy broad principles of warrant and transparency (AERA, 2006) was proposed as an
alternative measure of a study’s worth. The importance of transparency was taken up in Chapter 4’s detailed descriptions of (i) the constraints imposed by external factors and (ii) the deliberate selections of data for detailed analysis, within the scope of the study.

To return to the classroom component of the study in particular, in a state with over 400 secondary schools, most of them offering Prevocational Mathematics (QSA, 2014), the implications that can be drawn from a small-scale study in a single suburban Catholic girls’ college—one which is not typical of the majority of schools in Queensland—can make no claims towards generalisability. Nevertheless, in seeking to systematically explore the discursive practices existing in two particular classrooms, and to describe these practices using theoretically based understandings about discourse, the study’s findings resonated with my own experiences in other sites. Such resonances suggest that they may be transferable to other Prevocational Mathematics classrooms. The findings therefore provide an important starting point given the lack of research related specifically to senior secondary school students’ participation in numeracy-focused subjects such as Prevocational Mathematics. As such, the study flags some issues around policy and practice that are worthy of consideration.

A key contribution of the study is its examination of classroom practice in a previously neglected sector of senior schooling. It corroborates research that has drawn attention to the problematic aspects of contextualised tasks with other student cohorts. The current study confirms that advocating the contextualisation of students’ learning experiences in everyday, real life contexts relies for its success on assumptions about shared understandings of the tasks’ figurative contexts (Clarke, 2006), and of the implicit rules about what aspects of contextual knowledge are appropriate for consideration in a mathematical task (Cooper & Dunne, 2000). Contextualised tasks also limit student access to the more highly valued, abstract, disciplinary knowledge of mathematics (Dowling, 1998; Morgan, 2007).

Much of this earlier research was underpinned by Bernstein’s (2000) theories about the structure of knowledge. While this study has also drawn on Bernstein’s work, in shifting the focus to an examination of practice from a critical discursive
perspective, it contributes additional insights into the problematic nature of contextualised tasks. In proposing that contextualised tasks should be the cornerstone of Prevocational Mathematics, the syllabus developers were not just suggesting that a different sort of mathematical knowledge was more appropriate for this group of students. They also suggested that different sorts of student-teacher relations were more suitable for students characterised by their lack of success in earlier mathematics studies. Through the identification of ambiguous, and potentially contradictory, ‘new’ policy discourses, and the variability with which they have been taken up by teachers, and by students, and incorporated into their existing frames of reference, the study suggests that while reforms may propose new genres, the inculcation of new teacher and student styles to suit these new genres remains incomplete and fragile. The teachers and students remained locked into more traditional ways of being a secondary school mathematics teacher/student.

There are hints of an emancipatory agenda in the notion of Prevocational Mathematics being influenced by adult learning principles, in valuing the everyday knowledge that students bring to school with them; and in the syllabus’s representation of teachers as task designers rather than experts at mathematics. However, the findings from the study suggest a number of reasons why such an agenda is unlikely to be realised. Prevocational Mathematics is a school-based subject within the broader senior school curriculum where there is a different set of relationships between learners, teachers and the curriculum to that which exists in the non-compulsory adult education sector. There were considerable tensions in attempting to transplant adult education practices in the Prevocational Mathematics classrooms.

The focus on developing students’ mathematical confidence in Prevocational Mathematics attempts to move away from a deficit discourse around ability, but is itself based in a deficit view of students and the knowledge they bring with them, and may be self-limiting. Prevocational Mathematics does align with current popular conceptions of numeracy as a set of easily transferable basic mathematical skills necessary to function in everyday life, exacerbating a narrow conception of numerate behaviour. However, alternative conceptualisations of numerate behaviour, involving complex abilities rather than a set of basic skills and more nuanced notions of
context (e.g. Tsatsaroni & Evans, 2014; Venkat et al, 2009) are available as the basis for a more emancipatory approach to teaching Prevocational Mathematics students and challenge its conceptualisation as a low-status subject.

While the syllabus does provide a plethora of advice for the development of tasks, less experienced teachers may be unable to make deeper mathematical connections across contexts for their students. By including two teachers with different levels of pedagogical content knowledge in mathematics, the study identified both the particular difficulties that are faced by a less experienced non-specialist mathematics teacher in her day-to-day decision-making, and the dilemmas faced by a more experienced teacher as she adopted new ways of working. The study’s findings suggest that all teachers, but particularly non-specialists, would need support to challenge the privileging of a simplistic, uncritical view of contextualisation and its ostensibly direct relationship with participation and performance that is promoted by the syllabus, or to successfully adopt an alternative approach, following Clarke (2006), to allow students to generate their own tasks. In a sense, the syllabus’s raft of suggestions position teachers as consumers of ready-made templates rather than as informed professionals.

However, the study’s findings also suggest that while it might be possible to reframe senior school numeracy—to challenge the current syllabus from a principled position—Prevocational Mathematics in its current form performs other functions in the broader senior schooling curriculum that would in turn be compromised. The notion that senior secondary school mathematics functions as a gate-keeper subject, with successful completion of advanced subjects regulating entry to many further education and training opportunities is not a new one. In contrast, Prevocational Mathematics, along with other school-based, quasi-vocational senior school subjects functions as a necessary gap-filler in the pursuit of a more flexible vocationally-oriented course of study for those students who do not intend to further study.

Finally it should be noted that while the analysis has problematised the central role that contextualised tasks play in the subject, this should not be taken to suggest that they should be totally abandoned. Rather, the concern is with the potentially negative consequences of an uncritical acceptance of their role. This study suggest
that Prevocational Mathematics teachers need to have the capacity to engage with the syllabus, and consequently teach it, in critical and informed ways. This suggestion has implications for teacher education in an era of mathematics teacher shortage.

Reflections on the research

This section reflects on two unintended aspects of the research design, looks at the contribution of the networked model of mathematics education research to the study and proposes further research that might be done as a result of this study.

Research design

Two aspects of the research design emerged by chance rather than design as a result of the selection of Bankside Girls’ College for the fieldwork component of the study. They warrant greater consideration than is possible within the limits of the thesis and are flagged here as possibilities for follow-up research. The first was the lack of attention to the issue of gender in the study. The analysis has glossed over the preferred classroom discourse of female students as good at money management, but poor at spatial reasoning that mirrors popular gendered discourses about women’s mathematical abilities.

The second was the development of the thesis around the differences between the two teachers’ pedagogic approaches, and in particular the impact of the power relations between the researcher and the researched teachers on this development. Both teachers knew that I had previous experience as a secondary school mathematics teacher. The Year 11 teacher’s interview responses acknowledged a shared background, exemplified in the following extract:

I thought, oh well, I’ll do something easy so I got together a book full of different activities on all the different sports. Measuring the distance someone runs in an athletics track if you were on the inner lane compared with the outer lane. You know the kind of thing?

In contrast, the Year 12 teacher’s responses often seemed to forestall an anticipated negative judgement from a more experienced teacher, as the following justification of a decision by referring to the higher authority of the district panel illustrated:

So the car one was moved and it was going to be on hiring a car but I changed it to buying a car so to make it a bit more fun. And as it is, I
went to panel with this subject. There isn’t actually a set number of assessment pieces for the subject. It’s just per topic and we are meeting all five standards.

This tension has been made more visible largely because of the critical discursive approach adopted in the analysis of interview data.

**Mathematics education as a network of social practices**

A theoretical framework that conceptualised students’ and teachers’ sense-making as more than an individual phenomenon, but rather as constituted by their relations with each other and with the broader social, economic, political and cultural contexts in which they participate, has proved useful in examining the role that classroom teachers play in the curriculum reform process. Applying a critical discursive perspective to policy and classroom data revealed how power was exercised through authoritative policy discourse and in student-teacher relationships. Interdiscursive analysis within and between texts revealed how multiple discourses were textured together to legitimate an alternative approach to doing senior school mathematics.

Much of the research that has explored the problematic nature of contextualised tasks in mathematics has drawn on Bernstein’s (2000) differentiation between abstract and everyday knowledge. This theorisation was central to the initial framing of the study over different levels of curriculum. It also remained an important consideration in the distinction between numeracy and mathematics that underpins the distinctiveness of Prevocational Mathematics. This study’s focus on practice rather than knowledge, and on the detailed textual analysis of data complements Bernsteinian-inspired research in that it foregrounds another facet of contextualised tasks as they have been put into service in Prevocational Mathematics. The tasks are not only differentiated from ‘traditional’ mathematics tasks by their incorporation of everyday rather than abstract knowledge. The focus on non-specialist knowledge in turn results in the creation of a new genre—a different way of enacting teacher-student relations.
**Future directions**

It is perhaps inevitable that a study framed as an examination the interrelationships between nodes in one ‘slice’ of the network, namely policy-practice relations, would prompt an interest in examining interrelationships between other connected nodes in a similar way, by tracing discourses across the fields. The selective uptake of a constructivist research perspective on contextualisation in the Prevocational Mathematics syllabus that prompted this study is one direction that deserves further examination. In particular, given moves in Australia in recent years towards a national framework for mathematics curriculum at the senior secondary level, an investigation of national and international research influences on the development of the four proposed mathematics courses, and their implications for equitable access and participation in senior school mathematics could be undertaken from a critical discursive perspective.

The study’s finding that students held quite firm views about what counts as mathematics suggest that the interrelationships between public discourses about mathematics and Prevocational Mathematics students’ and teachers’ perspectives are another possible slice of the network that could be fruitfully examined. While there have been studies that examine the influence of popular culture and newspaper advertising on images of mathematics and mathematicians (Epstein, Mendick, & Moreau, 2010; Evans, Tsatsaroni, & Czarnecka, 2014), a similar approach to the current study could be used to investigate media coverage of the recurring interest in the role of numeracy in preparing young people for future employment. Such a study would align with existing educational research that has employed CDA to examine how news media and policy construct public discourses that serve to uphold a hegemonic position (Thomas, 2006).

Finally, taking up the challenge presented by Valero (2010) to think more reflexively about the field of mathematics education research, in the light of this study, further research might well be conducted on the relative lack of interest in the sector of senior school numeracy amongst mathematics education researchers. My construction of Prevocational Mathematics as a gap-filler rather than a gate-keeper might suggest there is little urgency in researching this new cohort of students.
Nevertheless, if we are interested in the uneven distribution of mathematical knowledge, there is much that could be gained from trying to better understand how to improve access to and participation in useful, relevant, and equitable mathematics education for such a group.

In the early stages of planning this research, it was envisaged that a study simply seeking the views of teachers and students, or watching them at work in classrooms, would provide sufficient data to answer many of the questions about the problematic role of contextualised tasks in Prevocational Mathematics. The critical discursive perspective that emerged from a conceptualisation of mathematics education as a network of social practices prompted a different direction—an examination of how contextualised tasks had come to be at the centre of the subject in the first place. The shift of focus, to problematising policy at the broader level of senior schooling and the subject-specific development of the syllabus has enabled the problem to be conceptualised as one that goes beyond individual sense-making. The adoption of a critical discursive perspective has revealed, in a systematic way, the kinds of power interests that shape teachers and students relations with one another and to imagine alternative ways of ‘doing Prevoc Maths’.
References


Atweh, B. (2012). Commentary on the chapter by Paul Dowling and Jeremy Burke, “Shall we do politics or learn some maths today? Representing and interrogating social inequality”. In H. Forgasz & F. Rivera (Eds.), Towards equity in mathematics education (pp. 105-109). Berlin Heidelberg: Springer.


Appendix 1

Comparison of Prevocational mathematics with other Queensland senior mathematics subjects
<table>
<thead>
<tr>
<th>PVM¹</th>
<th>Maths A</th>
<th>Maths B</th>
<th>Maths C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Choice of subject:</strong>&lt;br&gt;Informed by the four strands of level 3 of the National Reporting System, i.e. meaning-making strategies, problem-solving strategies, mathematical knowledge and mathematical representation. Builds on <strong>levels 3 and 4</strong> outcomes of the Yrs 1–10 Maths KLA (or equivalent)</td>
<td><strong>Choice of subject:</strong>&lt;br&gt;Recommended precursor to further study &amp; training in the technical trades; suitable as a precursor to tertiary studies with a moderate demand in maths&lt;br&gt;Prospective students should have consistently demonstrated outcomes at <strong>Level 6</strong> of the Yrs 1-10 Maths KLA</td>
<td><strong>Choice of subject:</strong>&lt;br&gt;Recommended precursor to tertiary studies with a high demand in maths&lt;br&gt;Prospective students should have consistently demonstrated outcomes at <strong>Beyond Level 6</strong> of the Yrs 1-10 Maths KLA</td>
<td><strong>Choice of subject:</strong>&lt;br&gt;Additional preparation for tertiary studies with a high demand in maths&lt;br&gt;Prospective students should have consistently demonstrated outcomes at <strong>Beyond Level 6</strong> of the Yrs 1-10 Maths KLA</td>
</tr>
<tr>
<td><strong>Rationale:</strong>&lt;br&gt;Designed to help students improve their numeracy (the effective use of mathematics to meet the general demands of life at home, in paid work, and for participation in community and civic life) by building their confidence and success in making meaning of mathematics. It aims to assist students to overcome any past difficulties with, or negative attitudes towards, mathematics, so that they can use mathematics efficiently and critically to make informed decisions in their daily lives. Elaborates how this will be</td>
<td><strong>Rationale:</strong>&lt;br&gt;Mathematics is an integral part of a general education. It can enhance understanding of our world and the quality of our participation in a rapidly changing society. Mathematics pervades so many aspects of daily life that a sound knowledge is essential for informed citizenship. Through enhanced understanding of mathematics, individuals can become better informed economically, socially and politically in an increasingly mathematically oriented society. Mathematics A encourages the development of positive attitudes</td>
<td><strong>Rationale:</strong>&lt;br&gt;Mathematics is an integral part of a general education. It enhances an understanding of the world and the quality of participation in a rapidly changing society. It is a truly international system for the communication of ideas and concepts, and has developed over many thousands of years through contributions by scholars of ancient and present-day cultures around the world. Mathematics is a:&lt;br&gt;- unique and powerful way of viewing the world …&lt;br&gt;- way of thinking …&lt;br&gt;- powerful, concise and unambiguous symbolic system …&lt;br&gt;- creative activity …&lt;br&gt;Overview of topics &amp; reasons for studying them.</td>
<td></td>
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</table>
achieved through course of study. towards mathematics through the use of relevant personal and work-related learning experiences and focusing on the development of mathematical knowledge & understanding through investigative and explorative approaches to learning (provide opportunities to work collaboratively and cooperatively in teams as well as individually. Overview of topics and why to study them.

<table>
<thead>
<tr>
<th>Aims – students should:</th>
<th>Global aims – students should develop</th>
</tr>
</thead>
<tbody>
<tr>
<td>• build confidence and experience success when using mathematics in everyday contexts</td>
<td>• broad mathematical knowledge and skills</td>
</tr>
<tr>
<td>• improve their preparedness for entry to work, apprenticeships, traineeships, or further study by developing their numeracy</td>
<td>• the ability to recognise when problems are suitable for mathematical analysis and solution, and be able to attempt such analysis and solve problems with confidence</td>
</tr>
<tr>
<td>• develop skills such as using a calculator, identifying, measuring, locating, interpreting, estimating, applying, communicating, explaining, problem solving, making informed decisions, and working cooperatively with others and in teams</td>
<td>• an awareness of the uncertain nature of their world and be able to use mathematics to help make informed decisions in life-related situations</td>
</tr>
<tr>
<td>• be able to organise mathematical ideas and represent them in a number of ways such as objects and pictures, numbers and symbols, rules, diagrams and maps, graphs, tables, and texts</td>
<td>• an understanding of the diverse applications of mathematics</td>
</tr>
<tr>
<td>• be able to present findings orally and in writing</td>
<td>• an ability to comprehend mathematical information which is presented in a variety of forms</td>
</tr>
<tr>
<td>Global aims - students should develop</td>
<td>• an ability to communicate mathematical information in a variety of forms</td>
</tr>
<tr>
<td>• an appreciation of the value of mathematics to the lifelong learner</td>
<td>• an ability to use mathematical procedures to justify conclusions</td>
</tr>
<tr>
<td>• sound number sense and an ability to view and interpret the world from a quantitative perspective</td>
<td>• an ability to benefit from the availability of a wide range of technologies</td>
</tr>
<tr>
<td>• the ability to recognise when situations in their everyday life can be dealt with through mathematical analysis and procedures, and be able to attempt such analysis or procedures with confidence and success</td>
<td>• an ability to choose and use mathematical instruments appropriately</td>
</tr>
<tr>
<td>• an awareness of the elements of chance which exist in some aspects of life and an ability to make decisions informed by this awareness</td>
<td>• positive attitudes to the learning and practice of mathematics.</td>
</tr>
</tbody>
</table>
- be able to use relevant technologies
- be able to make informed decisions.

decisions
- an ability to visualise and represent spatial relationships in two and three dimensions
- an ability to comprehend mathematical information which is presented in a variety of forms to become informed and critical citizens.

**General objectives organised into four categories:**
- Knowing
- Applying
- Explaining
- Affective

**Course organization / topics**
- Maths for interpreting society strand
  - number (study area core)
  - data
- Maths for personal organization strand
  - location and time
  - finance
- Maths for practical purposes strand
  - measurement

**Course organization / topics**
- Financial mathematics strand
  - Managing money 1 & 2
- Applied geometry strand
  - Elements of applied geometry
  - Linking 2 & 3 dimensions
- Statistics and probability strand
  - Data collection & presentation
  - Exploring & understanding data + elective topics

**Course organization / topics**
- Introduction to functions
- Rates of change
- Periodic functions and applications
- Exponential and logarithmic functions and applications
- Optimisation
- Introduction to integration
  - Applied statistical analysis.

**Course organization / topics**
- Introduction to groups
- Real and complex number systems
- Matrices and applications
- Vectors and applications
- Calculus
- Structures and patterns
  + elective topics

**Learning experiences:**
Detailed advice on teaching strategies based on subject rationale & expectations of learners. Suggested strategies derived from *Instructional Strategies For Teaching Adult Numeracy Skills*

**Topics** elaborated in terms of focus, subject matter, & suggested learning experiences (SLEs) which all state “The following suggested learning experiences may be developed as individual student work, or may be part of small-group or whole-class activities.”

**Assessment** includes detailed advice on range of alternative

**Assessment** must include alternatives to supervised tests at least twice/year e.g. extended modelling and problem-solving tasks; reports.
| Assessment strategies (recommended instead of traditional tests). Elaborates conditions of assessments (QSA) | Elaborates conditions of assessments (QSA) |
| Language education – standard QSA senior syllabus statement | [no equivalent] |
| Quantitative concepts and skills – prerequisites and new concepts & skills listed | [no equivalent] |
| Equity – standard QSA senior syllabus statement | [no equivalent] |
| Resources – detailed list of resources (both middle school & adult numeracy sources) – mostly electronic; only texts suggested are teacher texts | Resources – little detail – electronic & print including websites, DVDs, periodicals, newspaper reports, ABS, BOM |
| Appendix 1: Examples of courses of study 3 examples given – a semester’s work designed around  (i) a broad theme  (ii) 1-2 ‘projects’ + associated expository teaching  (iii) 4-5 projects/investigations Specific content not detailed | Appendix 1: A sample course of study Single example – subject matter detailed and chunked in terms of mathematical content; little emphasis on context |
| [no equivalent] | Appendix 2: Sample student profile |
| Appendix 2: Examples of contextualised tasks 7 examples given – detailed outlines e.g. resources required, questions to ask students – emphasis on creating the context rather than the mathematical content | Appendix 3: Sample Unit of work Single example – more emphasis on mathematical content/less on context |
| Appendix 3: Establishing a positive learning environment | [no equivalent] |
Appendix 2

Extracts from policy documents


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<td>Executive summary – senior schooling segments only (Extract 2)</td>
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Study Area Specification for Prevocational Mathematics (QSA, 2004a)

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<td>Teaching strategies – overview, approaches 1 &amp; 11 (Extracts 3 &amp; 4)</td>
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<tr>
<td>Assessment strategies &amp; Developing tasks (Extract 5)</td>
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</table>
1 Many of us reflect on our years at school as amongst the best and most important years of our lives. If we look forward we see a world that is rapidly changing, and we know that if we are to keep up with the pace of change we too must change.

It is important that we all work together to achieve this change. The Queensland Government will work with industry and the community to ensure that future generations gain the benefits of a rewarding and fulfilling education that sets the foundations for future success.

Our vision for the Smart State is to create a state of prosperity and social justice with a commitment to equality of opportunity.

Education and training are at the heart of the Smart State vision and that means providing the very best learning opportunities possible for every young Queenslander regardless of their economic and social circumstances.

Thousands of Queenslanders have taken part in consultations about proposed reforms to our education and training system and we want to thank those who participated for their valuable contributions.

A well-educated and skilled population has become a defining characteristic of a modern society with high living standards. To compete in today’s world, young Queenslanders need exciting and flexible pathways from school to work, training or further education.

Learning should prepare students for the world. Our education and training system must teach them about the world as it is now and prepare them for a future that we — today — can only imagine.

Queensland is committed to delivering these opportunities through an innovative and vibrant education and training system. This system provides students with an excellent foundation for future success.

However, to maintain this strength we must reform the system from time to time in response to the changes that are reshaping our world and our communities.

National and international research shows that completing Year 12 or its equivalent gives young people greater opportunities in further education and employment.

Gone forever is the job for life with on-the-job training that delivered a comfortable lifestyle. High-level qualifications are the currency of today’s global economy and rapidly changing job market.

Today, 10 000 Queenslanders aged 15 to 17 years are not in school, not in work and not in training. This is simply not good enough and we have to try harder.

The future of every young Queenslander depends very much on their ability to achieve high-level qualifications and to continue learning throughout their lives.

That is why our Government wants all young people to complete Year 10, then go on to gain at least a Senior Certificate or a Certificate III vocational qualification. We will introduce legislation to achieve this.

Our Government is committed to supporting young Queenslanders and helping them to achieve. We are demonstrating that commitment by changing the education and training system to ensure that young Queenslanders lead the way, and are not left behind, in a world of rapid and constant change.
Education and Training Reforms for the Future White Paper: Extract 2

Executive summary

1 Young Queenslanders can no longer expect to get good jobs, earn decent incomes and lead rewarding lives without obtaining Year 12 or some kind of substantial vocational or university qualification that gives them the skills for work and life.

5 In Queensland — the Smart State — we are responding to these challenges by creating one of the most flexible education and training systems in Australia to ensure that our young people are equipped to lead the way into the future.

At least 10 000 young Queenslanders aged 15 to 17 years are not in school, not in training and not in any kind of substantial work. The future is bleak for most of these people unless better ways are found to help them re-engage in learning to gain the skills and qualifications needed to survive and prosper in today’s society.

15 The Smart State means positioning Queensland to take its place among the best in the world. It is about encouraging innovation. It means educating and skilling people so they can compete for and create jobs in emerging fields, and revitalise traditional industries.

20 In 2000, the Government set a target to increase completion rates in schools from 68 per cent to 88 per cent by the year 2010. Already we have achieved 73 per cent. For many of these students, the pathway through school and into university or further studies will not change.

25 In March 2002 the Government released Queensland the Smart State — Education and Training Reforms for the Future, a landmark package of proposed education and training reforms in which we proposed that all young people should be ‘learning or earning’.

30 The reforms contained in this White Paper follow a comprehensive process of consultation with parents, young people, employers, schools, TAFE and community leaders.

During the consultation, two reports commissioned by the Government were completed. The Pitman report — The Senior Certificate: A New Deal, and the Gardner report — The Review of Pathways Articulation provided valuable guidance in developing this paper. Out of a total of 99 recommendations, 62 are supported in this paper and will be fully implemented or trialled, 22 are partially supported in this paper and 10 will require further consideration by Government for future action.

This package of reforms also encompasses our commitment to Stepping forward: improving pathways for all young people, a declaration signed in mid 2002 by education, employment, training, youth affairs and community services ministers from around the nation.

This White Paper reaffirms the Government’s commitment to providing the very best education possible for every young Queenslander and outlines the actions to achieve this.

We are building an unprecedented partnership between parents, students, state schools, non-state schools, TAFE, training providers, the Queensland Studies Authority, community organisations, universities, and employers to trial and implement the package of reforms outlined in this paper.

The Queensland Government recognises that a range of different options is needed to cater for the diverse needs of our young people. More than a quarter of our young people do not complete school. That is why we are tailoring our solutions to give them a range of options to help them achieve the academic or vocational education qualifications they need to compete in the world of work. We are also encouraging those who leave learning for full-time employment to return by recognising a broader range of previous learning achievements.

In this document the term young people refers to those aged 15, 16 and 17 years.

All young people in education and training

Our excellent education and training system is meeting the needs and aspirations of the vast majority of young Queenslanders and helping to transform Queensland.

The Government wants all young people to complete Year 10 and then go on to gain at least a Senior Certificate or a Certificate III — a competency-based vocational qualification issued through TAFE institutes or registered training providers.

What is a Certificate III?

More than 100 different types of Certificate III vocational qualifications are available to students. These range from veterinary nursing and retail to engineering and furnishing. The training ranges from six months to four years. Vocational qualifications vary in complexity and provide a variety of skills, from basic to advanced. Students enrolled in a Certificate I are fully supervised and acquire basic practical skills, while Certificate II-level students are expected to take more responsibility in the tasks they perform. Students at Certificate III level apply their knowledge independently in the workplace.

To achieve this we will change the compulsory school leaving requirements, and we will change the law to require young people to participate in education and training after Year 10.
We will give them greater flexibility to achieve qualifications beyond Year 10. This could be in school, in TAFE or through other forms of training.

We will introduce new laws that:

- make it compulsory for young people to stay at school until they finish Year 10 or have turned 16, whichever comes first
- require young people to then participate in education and training for:
  - a further two years; or
  - until they have gained a Senior Certificate; or
  - until they have gained a Certificate III vocational qualification; or
  - until they have turned 17
- provide exemptions for young people who enter full-time work after they have either completed Year 10 or turned 16.

These changes will take effect for students who enter Year 10 in 2006. The penalties for breaking the law will remain the same as they are now.

If you are in Year 6 in 2002, what do the changes mean for you?

- You will have to stay at school until you finish Year 10 or turn 16.
- In Year 10, you and your parents will work out your future education and training plan with your school. This is called a Senior Education and Training Plan.
- When you have finished Year 10 or turned 16, you will have to participate in education and training for a further two years, or until you gain a Senior Certificate or a Certificate III vocational qualification, or until you turn 17. Your education and training could be at school, in TAFE, or in an apprenticeship or traineeship, or a combination of these.
- If you get a full-time job after you have completed Year 10 or turned 16, you won’t have to participate in education and training, but you can come back to it later.

This reform is about engaging young people in learning. It is not about forcing reluctant or disruptive students to remain in classrooms or lowering the standards of behaviour we expect from young people. Processes for dealing with disruptive behaviour, such as suspension and exclusion, will continue. Extra career guidance and personal support, and more flexible learning options will be provided for these young people to continue their learning in different environments.
Reshaping senior

The Government also wants young people to have exciting and relevant opportunities in the Senior Phase of Learning so they go into the world with knowledge, skills and confidence.

While the pathway through schooling will continue to be the main track to university or further study for most students, we want to ensure that the 27 per cent of students who currently do not finish Year 12 have the best possible chances to succeed.

The valuable learning gained through work can be counted toward vocational education qualifications and may be considered for recognition on the Senior Certificate.

The Senior Certificate will change so it becomes an even more valuable document for young people and employers. That means young people will have to achieve an agreed amount of learning, including literacy and numeracy, to receive a Senior Certificate.

To achieve this we will:

- establish the quantity and quality of learning that students must achieve to receive a Senior Certificate. This will take effect from 2006
- record a broader range of learning, including learning in both school and vocational education and training, that will count towards a Senior Certificate, from 2006
- design a system so that students’ achievements can be ‘banked’ with the Queensland Studies Authority
- provide students and their parents or guardians with easy access to information about their achievements and progress toward a Senior Certificate.

Providing more options and flexibility for young people

We will introduce a range of measures to give young people more options and more flexibility so they are better equipped for further education and the world of work.

We will:

- enhance options and flexibility in schools, TAFE institutes and other settings to meet the needs of even more 15- to 17-year-olds, by reviewing existing courses and offering a wider range of tailored courses
- work with communities to develop localised services and better access to education and training for young people in rural, remote and Indigenous communities
- enhance distance, online, and virtual education provision
- ensure that more young people who undertake vocational education and training in schools achieve qualifications that are highly regarded by industry
- provide more school-based apprenticeships and traineeships
- improve the recognition of learning and qualifications between the education and training sectors
- give young people equitable, affordable access to vocational education and training in schools and TAFE
- provide an employment program specifically designed to assist young people at risk of disengaging from learning.

We want all young people to achieve at least a Senior Certificate or a Certificate III vocational qualification, however, we accept that some need time-out from formal learning. For this small group, full-time employment may be the best option at this time in their lives and exemptions will apply. They will, however, be encouraged to return to education and training at a later stage. A brief time-out from learning is okay, dropping out from learning is not.

Giving more support to young people

Young people will be offered more career and personal support to assist them to move successfully through the Senior Phase of Learning.

The Queensland Government will provide funding to help young people improve participation in learning and achieve qualifications by:

- engaging up to 100 additional youth support workers
- assisting schools and TAFE institutes to coordinate vocational education and training and enhance career guidance and counselling. Schools and TAFE institutes may wish to pool these funds at the local or regional level. They will have the flexibility to buy services and expertise as required
- establishing a grants program to trial initiatives that improve participation, retention and attainment for 15- to 17-year-olds in learning, including:
  - offering Fresh Starts — an innovative program of workplace learning and community activities designed to re-engage young people who have disengaged from learning
  - supporting schools to provide a range of education programs in new learning environments for those students not suited to traditional schooling
  - creating local models to support young people who need to be away from home for school, work experience or work placement
  - providing targeted support, such as transition brokers, for young people who are making the transition to work or further learning in Indigenous communities
  - purchasing industry or vocational education and training expertise to support schools in rural and remote areas
The Queensland Government has started improving collaboration and coordination between schools, TAFE institutes and universities.

However, each of us has a responsibility to the young people in our community. Along with parents, schools, TAFE and universities, there is a special role for industry and business because they can provide work experience and ultimately jobs for our young people.

We will also call on the dedication and professionalism of teachers in state and non-state schools, TAFE and vocational education and training providers to help implement these reforms.

The way ahead

This section: summary (repeats key reforms) not included in extract 2

1 using mentors — experienced people from the community with local knowledge, expertise and standing — who will volunteer to work with young people at risk of not achieving

5 using the arts and music to re-engage young people with the learning process.

Some young people enter into full-time work without obtaining qualifications. To ensure that they have every opportunity to succeed, we will encourage them to return to learning and we will recognise previous achievements.

We will also make schools, TAFE institutes and other participating vocational education and training providers the local coordinators for renegotiating and monitoring Senior Education and Training Plans. They will work with other agencies and providers to implement these plans.

Working together — building new community partnerships

The Queensland Government has a significant investment in the education and training of young people.

We will:

• foster a Community Commitment to young people by building partnerships at the local level
• develop District Youth Achievement Plans that will set local targets for participation, retention and attainment in education, training or employment programs.

We will amend the Training and Employment Act 2000 and the Education (General Provisions) Act 1989 to include, in the objects, the fostering of a Community Commitment to youth, and to include provisions to the legislation incorporating the intent of the national education, employment, training, youth affairs and community services ministers’ declaration Stepping forward: improving pathways for all young people.

It is important that we build new relationships that draw on the best from across our communities for our young people, coordinate programs and services at the local level, and use resources more efficiently across sectors.
I  Rationale

Numeracy is the ‘effective use of mathematics to meet the general demands of life at home, in paid work, and for participation in community and civic life’\(^1\). Prevocational Mathematics is designed to help students improve their numeracy by building their confidence and success in making meaning of mathematics. It aims to assist students to overcome any past difficulties with, or negative attitudes towards, mathematics, so that they can use mathematics efficiently and critically to make informed decisions in their daily lives.

Numeracy is more than being able to operate with numbers. It requires mathematical knowledge and understanding, mathematical problem-solving skills, literacy skills and positive beliefs and attitudes. When students become numerate\(^2\) they are able to manage a situation or solve a problem in real contexts such as everyday life, work or further learning. This involves responding to these contexts by identifying or locating, acting upon, interpreting, and communicating mathematical ideas and information. Students learn to represent these ideas and information in a number of ways.

This study area specification provides teachers with the flexibility to design courses of study that cater for the broad range of skills, attitudes and needs of students. Students study five topics (number, data, location and time, measurement and finance) integrated into teaching and learning contexts which have relevance to them. Because these contexts foster cooperation, and are supportive, enjoyable and non-competitive, students develop positive attitudes towards the use of mathematics.

Students’ confidence improves when they have sufficient time to discover how to solve problems, discuss, guess at answers, take chances, try things out, be wrong, and most importantly, experience success. Students learn that there is rarely one way of doing things and that workplace mathematics is often very different from school mathematics because of the particular requirements in different industries where mathematical skills are adapted to ensure efficiency. As students become more confident in using mathematics, they willingly contribute to class and group discussions — they question, propose, argue, challenge, seek advice and clarification, and become aware of the benefits of working independently and in groups.

The teaching and learning contexts of this study area specification also provide opportunities for the development of the seven key competencies\(^3\). In a course of study based on this study area specification, students, while working independently and in groups,

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\(^1\) EQ Australia Assessment Spring, 1997, Curriculum Corporation — www.curriculum.edu.au/eq/archive/eq_97/mclean.htm


\(^3\) The seven key competencies referred to in this subject are: KC1: collecting, analysing and organising information; KC2: communicating ideas and information; KC3: planning and organising activities; KC4: working with others and in teams; KC5: using mathematical ideas and techniques; KC6: solving problems; KC7: using technology.
employ mathematical ideas and techniques as well as communicate ideas and mathematical information. These activities are supported by collecting, analysing and organising information, planning and organising activities, investigating solutions to problems or tasks, and using suitable technologies where relevant.

In summary, Prevocational Mathematics provides opportunities for students to improve their numeracy to assist them in pursuing a range of vocational and personal goals. It develops not only students’ confidence and positive attitudes towards mathematics but also their mathematical knowledge and skills (through the general objectives: knowing and applying), and their communication skills (through the general objective: explaining).

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4 This study area specification is informed by the four strands of level 3 of the National Reporting System, that is: meaning-making strategies, problem-solving strategies, mathematical knowledge and mathematical representation. It has also been written to build on levels 3 and 4 outcomes of the Years 1–10 Key Learning Area (KLA) syllabus (Mathematics) or their equivalent.
2 Aims

During a course of study, students should:

• build confidence and experience success when using mathematics in everyday contexts
• improve their preparedness for entry to work, apprenticeships, traineeships, or further study by developing their numeracy
• develop skills such as using a calculator, identifying, measuring, locating, interpreting, estimating, applying, communicating, explaining, problem solving, making informed decisions, and working cooperatively with others and in teams
• be able to organise mathematical ideas and represent them in a number of ways such as objects and pictures, numbers and symbols, rules, diagrams and maps, graphs, tables, and texts
• be able to present findings orally and in writing
• be able to use relevant technologies
• be able to make informed decisions.
5 Learning experiences

5.1 Overview

The intent of this subject is to build confidence and success in using mathematics in everyday contexts by reducing or removing anxiety when doing mathematical activities; by countering deep-seated negative beliefs and attitudes towards mathematics learning (through providing a supportive environment and scaffolded activities in which students can succeed); and by increasing students’ repertoire of skills with practical time-saving strategies.

Therefore, to assist teachers in designing a course of study that reflects the intent of this subject, the expectations of the learner have been outlined with a range of teaching strategies in sections 5.2 and 5.3. These sections have been provided to characterise teaching and learning in this study area specification, and differentiate it from the strategies used in teaching Authority mathematics subjects.

5.2 Expectations of the learner

The expectations listed below are drawn from and align with level 3 (and some level 4) standards of the National Reporting System (NRS), (Commonwealth and ANTA, 1994-5) and are to be read in combination with the teaching strategies outlined in section 5.3.

When making meaning, problem solving and communicating, the student is expected to:

• develop practical mathematical skills such as:
  – representing concepts with concrete and visual materials
  – measuring with a range of instruments
  – estimating in everyday contexts
  – using a calculator extensively
  – becoming proficient at using and interpreting displays on calculators and computers
  – working individually and in groups

• develop mental computational abilities such as:
  – determining the reasonableness of an answer
  – recognising limitations in the accuracy of data and measurements
  – rounding numbers to suit the context
  – selecting a suitable degree of accuracy.
When **making meaning**, the student is expected to:

- draw on a combination of hands-on (concrete and visual) and real-life materials, diagrams, language and symbols to derive mathematical meaning
- draw on personal experience, prior knowledge and basic operational mathematical knowledge within everyday contexts to make predictions and check reasonableness
- reflect and question by relating the mathematics to personal experience, prior knowledge, and the experience and opinions of others
- clarify the intended meaning of an activity by asking questions which go beyond repetition and rephrasing
- use dictionaries for assistance with general and mathematical vocabulary when necessary.

When **problem solving** the student is expected to:

- use a number of different pieces of mathematical information
- interpret information from easily accessible texts, (for example, plans, maps, newspaper articles and graphs, information fliers, television programs, videos, online texts, etc.)
- use a blend of personal 'in-the-head' methods, pen-and-paper and calculator procedures
- begin to adapt prior experience and examples in the selection of suitable and efficient methods of fulfilling task requirements
- use some approximation with reference to relevant experience to check that the result fits the task or activity
- solve straightforward problems and provide answers in the context of the problem
- make informed decisions *with assistance when needed* in contexts in which the choice of actions required is usually clear and the actions are not very complex
- apply learned strategies to a limited range of predictable problems
- develop skills and confidence to contribute to the efforts of a group
- collaborate with others as part of a group in some complex or non-routine activities.

When **communicating**, the student is expected to:

- comprehend activities or tasks which include *limited formal mathematical symbolism, abbreviations and language*, and which come from a variety of sources
- use some of the symbolism and conventions of formal mathematics
- provide explanations in predictable situations using informal language and some mathematical language
- interpret and analyse how mathematics is represented and used
- use some unfamiliar information as long as it is accessible (in terms of culture, gender, literacy, etc)
- demonstrate a basic understanding of the use of rules to generalise about everyday situations
- use, but not necessarily manipulate, given rules
- use a variety of formal and informal strategies (such as concrete and visual materials, oral and written mathematical and general language, some symbolism and diagrams), singly or in combination, to indicate the problem-solving process and results
- participate actively in group discussions with peers and teacher.
5.3 Teaching strategies

5.3.1 Overview

In this subject, the role of the teacher is ‘to increase the range of options for students by helping them deepen their mathematical knowledge and understanding so that they can make choices in tune with their needs and desires, taking control of their lives when they choose to’ (Johnston et al 2001, page 24 – see footnote).

The following strategies\(^7\) aim to help teachers develop a balance between those practices and skills that are necessary for functioning in the world, and those that are viewed by students as useful and meaningful. These strategies take into account how and when students actually do mathematics away from school, whether for employment, interest, enjoyment or informed citizenship.

These strategies go hand in hand with a supportive learning environment that develops students’ confidence and ensures they experience success in a variety of contexts. In a supportive learning environment:

- learning is cohesive: highly-structured, scaffolded and in manageable steps under close supervision
- students’ own experiences are valued and used as starting points for teaching instead of viewing students in terms of the ‘deficit model’
- activities are varied sufficiently to increase attention span and improve memory by:
  - allowing students to move around to other locations in the classroom (or outside as a class) for some activities rather than remaining continuously desk-bound
  - including whole- and small-group class discussions, roleplays, seminars, etc. rather than relying primarily on ‘teacher talk’
  - using humour where suitable to engage the emotions
- assistance such as hints, rules and modelled examples are provided to help students make informed decisions
- more than one opportunity is provided for students to demonstrate their understanding
- adequate time is provided for students to process information
- encouragement and constructive feedback are given freely
- students are praised, reassured and rewarded for improvement in learning — thus the learning environment is non-threatening
- there is a range of different stimuli such as posters (that are changed regularly), plants, soft background music, videos, guest speakers, games, computer software, manipulatives.

5.3.3 Approaches to consider when choosing teaching strategies

1. Ascertain and evaluate attitudes and beliefs regarding both learning mathematics and using mathematics: getting to know your students.

Many students come to the classroom with negative attitudes and beliefs that prevent them from engaging in mathematical tasks in meaningful ways and from trusting their own mathematical intuitions. For many, negative attitudes towards mathematics initially develop in response to early school experiences of failing to understand, followed by a lack of further explanations or assistance from the teacher, leading to a loss of confidence and panic over the loss of control of his or her own learning.

As these experiences are repeated, the student feels frustrated and assumes it is futile to expect to understand mathematics. Finally, the student ‘switches off’ to distance him/herself from the situation.

Suggestions

• Conduct a series of lessons at the beginning of the course that provides students with the opportunity to explore their feelings and attitudes towards mathematics and to share them with other members of the class. Discuss previous classroom learning experiences and produce a student-generated contract that establishes the climate of the learning environment for this course (see appendix 3 for a detailed outline on how these lessons could be structured).

• To understand the students’ existing numeracy practices, encourage students to talk or write freely in a trusting environment about their attitudes and beliefs, what engages their interest, what they desire; share your own fears and experiences.

• Point out, and encourage students to look for evidence of their existing (even if informal) mathematical understandings, of which they may be unaware, to encourage the development of feelings of comfort and control.

• Ensure that all students experience success early in the course so that their confidence can be built up, for example, record and reward small successes of individuals and groups with tick sheets or stars, or use online games that reward the player with encouraging comments.

This strategy should be used throughout a course since different negative attitudes and beliefs may be tied to different topics.
Approaches to consider when choosing teaching strategies omitted:

2. Determine what students already know about a topic before instruction.
3. Provide opportunities and time to explore mathematical ideas with concrete or visual representations and hands-on activities.
4. Encourage the development and practice of estimation skills.
5. Encourage development of mental mathematics skill as an alternative computational strategy.
6. View computation as a tool for problem solving, not an end in itself.
7. Encourage the use of multiple solution strategies.
8. Develop students' calculator and computer skills.
9. Provide opportunities for group work.
10. Provide opportunities for students to communicate about mathematical issues.
11. Develop students' skills in interpreting numerical or graphical information in everyday texts.
11. **Plan for practical and contextualised learning.**

Students can see clearly that what they are learning will be directly applicable to situations in their own lives if they are using their new skills in environments that are very similar to the life and work environments in which they will have to function, rather than just in context-free environments such as workbooks with extensive isolated arithmetic practice exercises. Contextualised learning is more likely to interest and motivate students, provide opportunities for success and show them that mathematics is a necessary lifeskill that can also be fun. Teachers may decide to teach students the prerequisite knowledge and skills and then help them to apply these in a context, or use the context in which to develop knowledge and skills. For detailed examples of contextualised learning, refer to appendix 2.
1  **Suggestions**

- Use students’ experiences of situations in which mathematical issues arise, their interests and needs, as well as current events to develop meaningful, realistic contexts for problem-solving tasks. These tasks must be practical and not trivial (whether actual or hypothetical) and could also reflect situations students know about or are likely to encounter after leaving school. They should also not be written as extensive word problems that take excessive decoding before the mathematics is revealed. For example, if students live in an area that has some public transportation, a project could be developed around whether to buy a car or not — they could investigate car costs (car payments including interest, upkeep, insurance, and frequency of usage) in relation to public transportation costs and limitations.

- Encourage students to reflect on what is different between school, everyday and workplace problem solving (in terms of constraints, skills, beliefs, dispositions, degree of accuracy expected, tools used, etc.), for example:
  - When shopping, to decide whether a block of tasty cheese is overpriced, school ratios are not used because this method is too time-consuming — instead, a shopper will simply find a different brand of cheese of similar weight and compare prices by observation.
  - Pool builders do not use formal measurement and geometry; instead, they use more informal, more efficient and common sense mathematics that reduces mistakes.
  - Cash registers at fast food outlets are pre-coded with text or icons so that no data entry or calculations by the user are required.
  - Boat builders mix fibre-glass and binders by the feel of the mix, adjusting the amount of binder by trial and error when necessary (such as on a humid or cold day).
  - Carpet layers not only have to calculate the area, but also have to take into account the nap of the carpet, the pattern (if any) and where to place the seams to avoid wastage and cost blow-outs.

- Organise field trips, excursions, and visits away from the classroom to different workplaces to investigate how they use mathematics, and to local places of interest where data and information can be collected, surveys conducted, photographs taken, etc, to be analysed back in the classroom.

- If possible, arrange for students to have work experience in a workplace that interests them — they can learn how their numeracy practices can be applied or adapted as well as the particular numeracy practices of the industry.

- Support students with poor literacy skills when setting contextualised learning tasks by:
  - ensuring that the written wording uses short sentences and is concise
  - keeping terminology to a minimum
  - using diagrams, flow charts or steps to follow
  - helping students to understand the task by explaining.
6.2 Assessment strategies

Overview

The following strategies are developed from the expectations of the learner and the teaching strategies outlined in section 5. Because students may be fearful of formal assessment, informal assessment can validly be used to provide additional evidence upon which to award a level of achievement. Once students’ confidence has been built up sufficiently with supportive teaching strategies, they may be able to demonstrate achievement of the general objectives in more formal assessment tasks.

Regardless of whether assessment is informal or formal, it should extend well beyond examining students’ ability to find the right answer for a computational exercise. It should assess the many additional skills and knowledge areas that are part of being numerate, such as interpreting claims about data, acting upon numerical information in technical documents and forms, applying mathematical reasoning and solving realistic problems, communicating about mathematical issues and explaining one’s reasoning9.

Suggested strategies

1. **Conduct assessment mostly in class time.**

So that students can be fully supported and scaffolding provided, assessment should be conducted mostly in class time. This includes not only assessing responses to small tasks in class time under the teacher’s close supervision, but also projects and investigations that are carried out over several weeks. This strategy can provide many opportunities for the teacher to record observations of students, assist them in completing tasks, and authenticate student work. It also means that students will have access to resources, and sufficient time for problem solving and group work.

2. **Encourage students to talk about what they are doing and the choices they are making.**

In order to be able to communicate about issues involving mathematics, students should be encouraged to explain how they are working with given rules, operations, procedures and open-ended problems. This enables teachers to not only assess understanding, but also to diagnose difficulties and provide guidance. Records of observations of the student’s explanations can contribute to evidence of their achievements.

Explanations by the student can be given:

- in informal discussions with the teacher and peers
- more formally, for example as a:
  - presentation
  - demonstration.
  - roleplay
  - mock interview
  - debate.

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3. **Develop contextualised assessment tasks.**

Genuinely contextualised assessment is real and meaningful to the student because it is practical and realistically related to the world of work, personal organisation, and interpreting society. Examples of contextualised tasks are provided in appendix 2.

4. **Use open-ended extended tasks that may have more than one reasonable solution and/or solution path.**

Students should not be restricted to working on sequences of sums or word problems in a book to which there is only one correct answer. They should be involved in open-ended tasks that require them to:

- understand and apply mathematical concepts
- explain their reasoning and the significance of their solutions
- present their work in the form of combinations of:
  - graphs
  - tables
  - drawings
  - timelines
  - posters
  - PowerPoint presentations
  - flowcharts
  - short written or oral reports describing a problem-solving process (of an individual or a group)
  - written recommendations for a course of action
  - simulated memos aiming to communicate about issues with specific real-world audiences (and demonstrating both appropriate mathematical know-how and literacy skills)
  - simulations of real-world tasks relevant to a particular student population.

5. **Assess a broad range of skills and reasoning processes using a range of written and non-written methods.**

Because this study area specification emphasises contextualised assessment of a broad range of skills and reasoning processes and is not test-based, it is strongly recommended that examinations be kept to a minimum or not used at all. If they are used, then they should be ‘open book’ — students should be able to bring resources to the examination to help them.

Suggested written methods

*Short written answers* (one word, sentence, or paragraph) such as:

- questions requiring short answers or paragraph responses
- matching/true/false/classification
- cloze passages and sentence completion
- multiple-choice questions
- student self-assessment sheets

*Extended written answers* (at least three paragraphs — not essays)

- written reports of investigations, projects, case studies
1. journal entries
2. websites entries

Suggested non-written methods

3. oral presentation of results, for example, using audiovisual facilities, navigating own material on a website for the class
4. roleplay
5. demonstration of particular practical skills, techniques or processes, for example, estimating using a calculator, measuring using a range of equipment, using mathematics software to solve a problem

6. simple diagrams
7. sketches
8. flow charts
9. digital photographs or video as record of the project
10. diagrams: hand-drawn, using a computer, or sourced on the internet

11. making real two-dimensional or three-dimensional models, for example, a set for a school production, landscaping for the senior lunch area
12. virtual models using computer software
13. websites based on visual material

6.3 Developing tasks

Tasks should:

1. state whether the student response is to be a demonstration, oral, visual, written, multimedia or a combination of any or all of these
2. provide clear descriptions, written in a manner that is logically sequenced and easily understood by students — this may require the use of graphics and text in boxes to enhance presentation and readability
3. provide scaffolding or guidelines that clearly explain how to complete the task, including:
   - step-by-step instructions which may be presented in a flow chart
   - expectations in relation to things such as time management, cleaning of workspaces, safety issues, noise control, etc
4. apply the principles of equity and fairness to all students and take account of students with special needs
5. provide suitable stimulus material to help students generate ideas and complete tasks, such as:
   - newspaper and magazine articles
   - letters to the editor
   - internet information
   - industry-based information, pamphlets, manuals
   - brochures, advertisements for coming events
   - audiotapes or videotapes
6. photographs
7. computer software
8. films, television programs
Appendix 3
Assessment task sheets

Year 11 task sheet 198-207
Year 12 task sheet 208-210
INSTRUCTIONS TO STUDENTS:
All working must be shown.
Scientific and graphic calculators may be used.
Computer software may be used and acknowledged in the bibliography.
All working must be legible, and completed on the student’s own paper.
This is a group assignment but individual responses are required.
All assistance must be acknowledged in the bibliography.
Late submission of the assignment will be dealt with in line with the College’s assessment policy.
All work must be submitted and must represent your own work.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Grade</th>
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<tbody>
<tr>
<td><strong>Knowing</strong> – Demonstrate knowledge of content and use given rules, operations and procedures to carry out simple, familiar tasks</td>
<td>A, B, C, D, E, F, G</td>
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<tr>
<td><strong>Applying</strong> – Interpret and analyse different contexts, identify familiar mathematics, develop strategies, and then select and apply rules and procedures to carry out tasks.</td>
<td>A, B, C, D, E, F, G</td>
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<tr>
<td><strong>Explaining</strong> – Use basic mathematical and everyday language to present and explain responses to tasks in both familiar and different contexts.</td>
<td>A, B, C, D, E, F, G</td>
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CCEs: Recognising letters, words and symbols; interpreting; diagrams; using correct spelling; punctuation; grammar; creating; substituting in formulae; calculating with calculators; analyzing; justifying.
Doll’s House Design Brief

As a member of a design team (3-4 members) you have been asked to design a new Doll’s House to be released onto the market in time for Christmas this year. The Client requires sketched, plans, costings, a model of the Doll’s House accompanied by an analysis of the project and a bibliography.

Your supervisor’s signature is required at the completion of a number of parts.

Whilst this task will be the result of a collaborative effort, each member of the design team is required to submit an individual response for all parts except part C.

You are required to submit the following:

Part A: Design Drawings

1. The dimensions of the architectural board to be used for the design
   A) Length ___________   B) Width ___________

2. A set of design sketches highlighting features/elements of design/dimensions to be incorporated into your Doll’s House. One diagram should be the floor plan of the house. (Use a ruler where necessary.) Perhaps you could include a front elevation or a side elevation.
3. A written explanation of your design sketches.
Part B: Scaled Drawings

4. On the grid paper provided, draw at least two different scale drawings for the proposed cutting layouts for the board. Scale drawings must be clearly labeled with an appropriate scale.
5. An explanation of the cutting layout to be used and justification that your design minimises wastage of the architectural board used. Calculate how much wastage occurs with each layout

.................................................. supervisor’s signature
Part C: Materials list

6. A detailed list of the materials required for the construction of the model.

7. Justification of the materials required. (Some reference should be made to Parts A and B)
Part D: Cutting and production schedule

8. A step-by-step guide for the cutting of the board and a schedule for the construction process. A flow chart might be handy here. Once you have the design on your board obtain your supervisor’s signature before cutting.

………………………………………….supervisor’s signature

Part E: Construction

9. The finished Doll’s House.
   (Be careful when constructing your Doll’s House. The basic materials are supplied for you.) Foamboard and pins
Part F: Costing
(Some information will need to be accessed from your supervisor.)

10. The cost of the Board $12 per sheet

11. The amount of foam board to be painted. (Hint: Work out the surface area for surfaces to be painted. Answer in cm$^2$

<table>
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<tr>
<th>Section of House (Dimension)</th>
<th>Surface area (cm$^2$)</th>
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TOTAL

12. The amount of paint need for one undercoat and one topcoat. Coverage details and size of the paint tins will be discussed in class. (Answer in L)
13. Calculation of the total cost of paint used. (Details of paint prices will be given to you in class.)

14. The total cost of producing the Doll’s House. Explain and give reasons for what is included in the total cost.
Part G: Design Analysis

15. A **SWOT** analysis of the construction process is required. (Note: this method of analysis is a useful tool used by businesses to assist with understanding and decision-making in a variety of situations. **SWOT** is an acronym for **Strengths**, **Weaknesses**, **Opportunities**, and **Threats**. The process explained in class.)

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<th>STRENGTHS</th>
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16. An analysis of the project which includes a description and discussion of the mathematical and organizational procedure used/implemented in this project.
3.3 PLANNING A HOLIDAY

TIME ALLOWED: 3 weeks

DATE GIVEN: Monday 10 May
DATE DUE: Friday 11 June

TOPIC ASSESSED: Travelling Overseas

INSTRUCTIONS TO STUDENTS:
All working must be shown for all questions.
Scientific and graphic calculators may be used.
All working must be legible, and completed on the student’s own paper and typed where possible.
Computer software may be used, but must be acknowledged in the bibliography.
This is an individual assignment and all assistance must be acknowledged in the bibliography.
Late submission of the assignment will be dealt with in line with the College’s assessment policy.

SUMMARY OF ACHIEVEMENT:

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<th>Criterion</th>
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<tr>
<td>Knowing</td>
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<td>Applying</td>
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<td>Explaining</td>
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Drafting comments

Mon 31 May Digital copy of draft to be submitted

CCEs addressed in this task: recognising letters, words and symbols; interpreting the meaning of words and other symbols; translating from one form into another; compiling lists; structuring/organizing a mathematical argument; calculating with calculators; approximating a numerical value; applying a progression of steps to achieve the required answer; justifying.
Planning a Family Overseas Trip

Introduction:

- Overseas travel is a wish of many families. One day you may be fortunate enough to travel for the first time or again. Your task is to plan an overseas holiday that meets the needs of the scenario below and satisfies the expectations listed in parts A, B and C.

- This task is to be completed individually.

- The use of referencing, bibliography and appendices is compulsory.

The task provides you with an opportunity to exhibit your ability to:

- **Convert** Australian dollars into another currency using buying and selling tables.

- **Investigate** the cost of going on an overseas trip, including travel insurance, daily costs and travel taxes.

- **Produce** an itinerary for an overseas holiday.

- **Calculate** the distance in kilometers between cities.

- **Prepare** a budget for an overseas holiday.

- **Find** the time differences for a range of cities.

- **Calculate** the arrival time in a destination city in a different time zone, given the city of origin, flight duration and departure time.

- **Obtain** an Australian passport.

- **Create** tables or spreadsheets in order to convey information.

The Scenario:

You **are planning** a trip and **have** a choice of destinations. You may visit, the UK, USA, or Europe. You **want** to leave between 18 September and 23 September and have to return to Brisbane some four weeks later, on or before 21 October. You **will travel** with a friend to London, Los Angeles, or Rome where you **will spend** one week and then visit other places of interest.

You would like to save money on flights and accommodation so you **will have more** spending money.
Part A

**Produce** an itinerary that must include:

(i) Details of all flights e.g. flight numbers
(ii) Times of departures and arrivals. Each of these should be given in local time.
(iii) The length of each flight i.e. time taken.
(iv) The time you are to spend in each city.
(v) Make a calendar with details of your daily activities.

Part B

A **report** detailing:

(a) Travel insurance options and costs.
(b) Possible tourist attractions you **may like** to visit near or in the cities visited.
   Include the costs of each and web references or brochures as well as maps showing how to get there from your hotel.
(c) How you **will pay** expenses while overseas.
(d) The current exchange rate in the cities you **will visit**.
(e) The total budget for the trip.
(f) Passport and visa information and costs.
(g) Telephone options for keeping in touch.
(h) On a world map, show the time zones of your chosen country. Also, on a country map, list co-ordinates of major cities / attractions (at least 5). Detail the differences in time between Brisbane and your country of choice to enable telephone calls. Give examples of the time difference, e.g. “If someone in Brisbane needs to call me at 8:00am in Washington, the time in Brisbane would be…”

Part C

A **budget** for this holiday that includes:

(a) Cost of airfares – **include** 3 quotes for proof of cheapest purchase.
(b) Accommodation – **include** quotes.
(c) Passport and visa costs.
(d) Telephone costs.
(e) Travel insurance – **include** 3 quotes for proof that you **chose** the cheapest.
(f) Spending money for each place you stay.
   1. Justify the amount you have chosen.
   2. Convert this amount into the local currency for the place.
(g) All other expected expenses e.g. attractions, meals, entertainment.
(Individual costing only is required.)
Appendix 4
Lexical classification schemes in the policy documents
Table 1 Lexical classification in the Education Training Reforms for the Future White Paper

<table>
<thead>
<tr>
<th>Non-government participants</th>
<th>Senior schooling</th>
<th>The government</th>
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<tr>
<td>young people students youth</td>
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<td>ensuring improve</td>
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<td>school/s</td>
<td>developing improve</td>
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<td>develop improve</td>
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<td>improve</td>
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<td>senior [phase, schooling, certificate, …]</td>
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<td>new [laws, approaches, skills, opportunities, partnerships, processes, certificate, …]</td>
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<th>Schools, teachers</th>
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