STUDENTS’ ACCOUNTS OF THEIR EXPERIENCES OF LEARNING MATHEMATICS

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Submitted in fulfilment of the requirements of the degree of Doctor of Philosophy
July 2005
ABSTRACT

This research identifies important features of mathematics learning from the accounts of early school leavers. These students were enrolled in a Youth Reconnected Program at a Technical and Further Education [TAFE] college. Specifically, it examines the relationship between their experiences of mathematics learning in two different social contexts, the program and secondary school classrooms, the discourses and associated discursive practices of these two contexts, and the forms of identities of participation that are constructed in them. Drawing on a social theory of learning and critical discourse theory, the research identifies the processes by which membership in communities of learning is achieved and identities discursively constructed. It draws on the accounts of forty-three early school leavers and six staff members located in a Youth Reconnected Program, a program designed to re-engage early school leavers in education and or training, about their prior experiences of secondary school and their current experiences of TAFE. From these accounts, the thesis seeks to explicate their experiences of learning mathematics in both contexts and to consider the implications of different student experiences of learning for mathematics education.

Critical discourse analysis provides the means for applying this framework to examine the discourses, discursive practices, identities, and forms of participation constructed in the accounts. It views the accounts as constituted by their social context. It shows how the language of the accounts works to construct particular versions of reality and how relations of power construct particular identities. It allows a richer qualitative exploration of the reported practices of mathematics classrooms with particular regard to linking the theoretical and practical concerns of this study. It makes transparent the relations between the social (including relations of power and domination), discourse, and discursive practice, thus enabling a more in-depth reading of the participants’ accounts.
Discourses about two different experiences of mathematics learning were identified—one about mathematics learning in the Youth Reconnected Program (TAFE) and the other about mathematics learning in secondary schools. The discourses and their associated discursive practices—differing application of instructional style, communication and interaction, source of authority, pace of instruction, grouping of students and assessment—were found to contribute significantly to the construction of particular student identities and forms of participation. Student experiences emphasised the importance of four characteristics for membership in a community of learners—mutual engagement, joint enterprise, shared repertoire and access. These characteristics and practices were shown to contribute substantially to the construction of identities of participation in mathematics learning for most of the students who participated in this study. There was strong evidence to indicate that small class sizes impacted significantly on student engagement and participation in learning. A crucial factor here rests with the role of the teachers and tutors and how, given the opportunities for reduced class size, they implement, sustain and maintain interactions with the students for effective teaching and learning to occur. If in this context, consistent interactions are provided that also includes clear and explicit explanations, discussion, and negotiation, students are more likely to maintain their interest and actively participate in mathematics learning.

This study’s significance is twofold. It lies in the critical importance of the issue it addresses—student participation in mathematics learning—and the articulation of a social theory of learning with critical discourse theory to enable a different and more effective understanding of the significance of discourses, identities and communities of participation in mathematics learning. Although the study cannot claim generalisability across other populations of learners or across all mathematics and TAFE classrooms because of the small
select sample of early school leavers drawn upon, by highlighting these accounts of students’
learning experiences in some mathematics classrooms and the TAFE program, and their
associated experiences of them, it draws attention to a different perspective on mathematics
learning. In this alternative framing, learning as a social process is contingent on access to the
discourse of mathematics learning and the discursive practices that support learning,
participation, and membership in a community of mathematics learners.

An attention to the social processes of mathematics learning infers a significant role
for mathematics teachers in enabling student access to certain discourses and communities of
learning. Such a role is often neglected in current contexts of accountability that specify a
focus on achieving syllabus outcomes.
STATEMENT

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.

Bronwyn F. Ewing

July 2005
ACKNOWLEDGEMENTS

In addition to the usual comment, advice and critique, my supervisors, Dr Sue Thomas and Professor Robyn Zevenbergen, provided the needed provocations and challenges to extend my conceptual horizons across this extended research program. Dr John Knight (Retired Associate Professor, University of Queensland) acted as a mentor and critical friend throughout this project. I am also grateful to Mr. Paul Elliott for his professionalism in providing support and encouragement in some challenging times during this study. Special thanks to my daughter, Estée Hunt, her husband Jason Hunt, and my son Alex McMahon, who have remained supportive and encouraging with this study through its entirety. I am indebted to Mr Francis Parnell McMahon (deceased 2006) and Mrs Elizabeth McMahon (deceased 2008) who showed me ‘the way’ when things got tough and modelled to me resilience and determination. My love will be with them always.

I am grateful to the following people who read part or all of the thesis and provided suggestions:

- Emeritus Professor Anthony Shannon AM – Master, Warrane College, University of NSW;
- Professor Cathryn McConaghy – Dean of Education, University of Canberra;
- Professor Tom Cooper – Professor of Mathematics Education, Deadly Maths Centre, Queensland University of Technology;
- Adjunct Professor Peter Galbraith – Mathematics Education, University of Queensland;
- Dr Katherine Samuelowicz – University of Queensland.

I am also grateful to the following people who have encouraged me at different times throughout the writing of this thesis: Leah Bailey and Michael Bailey, Dr Annette Batur, Dr Susan Byth, Anne Etschells, Professor Ann Farrell, Elizabeth Monaghan and Professor Robert Wright. Financial assistance for the study was provided by a Griffith University Postgraduate
Research Award (2002). I am indebted to the Queensland University of Technology for their patience and assistance with the writing of this thesis.
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<tr>
<td>AAMT</td>
<td>Australian Association for Mathematics Teachers</td>
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<tr>
<td>CD</td>
<td>Critical Discourse Theory</td>
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<tr>
<td>CDA</td>
<td>Critical Discourse Analysis</td>
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<tr>
<td>DEST</td>
<td>Department of Education, Science and Training</td>
</tr>
<tr>
<td>DETYA</td>
<td>Department of Education, Training and Youth Affairs</td>
</tr>
<tr>
<td>LANT</td>
<td>Literacy and Numeracy Training</td>
</tr>
<tr>
<td>LLMP</td>
<td>Learning and Labour Market Program</td>
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<tr>
<td>MCEETYA</td>
<td>Ministerial Council for Education, Employment, Training and Youth Affairs</td>
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<tr>
<td>NCTM</td>
<td>National Council for Teachers of Mathematics</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic and Cooperative Development</td>
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<td>OHP</td>
<td>Overhead Projector</td>
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<td>PISA</td>
<td>Program for International Student Assessment</td>
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<td>QSA</td>
<td>Queensland Studies Authority</td>
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<td>TAFE</td>
<td>Technical and Further Education</td>
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<td>US</td>
<td>United States</td>
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LIST OF PUBLICATIONS

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CHAPTER 1: EXAMINING DISCOURSES AND DISCURSIVE PRACTICES IN MATHEMATICS LEARNING

This study examines student participation in mathematics learning. Its central concern is to explicate, from the students’ accounts of their classroom learning experiences, those practices that facilitate or hinder effective participation in that social context. To do this, it draws on forty-three early school leavers’ accounts of their learning experiences in mathematics classrooms both at secondary school and at a Technical and Further Education [TAFE] College along with the accounts of their teachers in the TAFE setting. These accounts illustrate the ways in which the students identified themselves as participants in the social experience of learning mathematics in each context.

Current Concerns in Mathematics Education

Active student engagement in mathematics is a major concern of many recent international, national and state contemporary policy documents and discussion papers (Goos, 2004; Luke, et al., 2003; Ministerial Council on Education Employment Training and Youth Affairs MCEETYA, 1998; National Council for Teachers of Mathematics NCTM, 2000; Organization for Economic Cooperation and Development OECD, 2004; Senate Standing Committee for Employment Workplace Relations and Education, 2007; US Department of Education, 2008). Teaching practices are critical in promoting or inhibiting such engagement. For example, in findings from the Program for International Student Assessment [PISA], (2003), teaching practices were identified as having a “substantial” effect on student achievement, engagement and participation in mathematics (OECD, 2004, p. 29).

Engagement, in the sense in which it is used here and throughout this thesis, refers to reflective involvement in deep understanding, valuing what is being done and actively participating in mathematical tasks (Munns & Woodward, 2006). The result is a substantial
sense of satisfaction and investment in learning. This is distinct from procedural forms of student engagement, where students are on task and complying with the teacher’s instructions (Munns & Woodward, 2006).

Schools and teachers play a critical role in providing a positive climate and effective practices that encourage engagement and student participation. The National Goals for Schooling (MCEETYA, 1998) highlighted the need for teachers to develop in learners “the capacity for, and skills in analysis and problem solving and the ability to communicate ideas and information, to plan and organise activities and to collaborate with others” (p. 3). In the case of mathematics education, the need to establish strategies for improving student outcomes in mathematics was emphasised.

The Queensland Schools Reform Longitudinal Study (Luke, et al., 2003) strongly recommended a renewed focus on student achievement and participation, and productive and effective classroom practices to improve student-learning outcomes. The study emphasised possible inhibitors to implementing this reform, indicating rigid tradition as a contributing factor as well as the employment of ineffective practices. It called for greater efforts from schools to assist students in developing positive attitudes towards learning through improved practices and strategies that promoted life-long learning. This approach was supported by Queensland research (Goos, Galbraith & Renshaw, 1999; Goos, 2004; Zevenbergen, 2000; 2005) indicating that schools and teachers could provide effective strategies for supporting student learning through collaborative learning communities that focused on social interaction, active engagement and participation. These three factors were considered integral to learning and participation in classroom communities (Goos, Galbraith & Renshaw, 1999; Goos, 2004). These documents evidence the relevance of a study such as this that addresses the processes and outcomes of student participation in learning mathematics and in doing so,
the practices supporting or inhibiting participation.

These views have been challenged by an alternative approach based on behaviourist premises. Described variously as direct instruction, instructivism (Farkota, 2003; Rowe & Stephanou, 2007a; Stotsky, 2006), or positive teaching (Merrett & Wheldall, 1987), it rejects the reform agenda as inefficient and ineffective. In its stead, it offers “an effective teaching methodology” (Stone, 2002, p. 45) supported by “behaviourally based instructional activities . . . directly related to increasing achievement in basic academic skills” (Jones & Southern, 2003, p. 4). This approach has been gaining substantial political and popular support in the United States of America [USA], England and Australia. Recent examples include the No Child Left Behind policy in the USA (Department of Education United States of America, USA, 2004), the British National Numeracy Strategy (Department for Education and Skills, 2007) and in Australia, Effective Third Wave Intervention Strategies (Rowe & Stephanou, 2007a; Rowe, Stephanou & Hoad, 2007b) and the former Federal Minister for Education, Science and Training (Bishop, 2007) who “firmly believes that Australia’s school system should be achieving higher standards and be characterised by mainstream values and a ‘back to basics’ approach to teaching” (Australian Broadcasting Commission, 2006, p. 1).

While this thesis is framed within this debate, it cannot resolve the broader issues involved. Rather, it seeks to illuminate them from a particular perspective built from the articulation of a social theory of learning and critical discourse theory and applied to the accounts of a particular group of students about their experiences in mathematics learning in secondary mathematics classrooms and in the TAFE setting. A brief synopsis of that perspective follows.

Learning as a Social Experience: Participation in Communities

This study examines students’ accounts to explore their experiences of mathematics learning
in the two settings described above. It draws together two complementary theoretical frameworks, a social theory of learning (Lave & Wenger, 1991; Wenger, 1998) and critical discourse theory (Chouliaraki & Fairclough, 1999; Fairclough, 1995, 2001), with which to undertake this task. In combination, these frameworks provide a lens through which powerful insights into student participation in classroom learning can be gained. As far as can be ascertained, this articulation has not previously been developed. Insofar as it opens up understandings of the processes underlying student success or failure in mathematics learning, it provides a further justification for this study. It also provides the conceptual basis for the research questions around which this study is framed. Hence, while chapter 3 describes this articulation of a social theory of learning with critical discourse theory in detail, an initial overview is appropriate before presenting the research questions.

A social theory of learning considers learning as a social activity that occurs in social communities (here, classrooms) whose members are active participants in its tasks and practices (Goos, 2004; Lave & Wenger, 1991; Matusov, 1999; Wenger, 1998). In such contexts, learning (of some form or another) occurs as community members engage and interact together and in the tasks and practices they are expected to perform. As students participate in this classroom community, here, mathematics, they identify with it in ways that reflect their particular experiences in it; that is to say, they construct an identity in that particular social context and in doing so, that identification relates to the nature of their participation in it. The experiences that are constitutive of students as learners are applied through social interaction with others, in order to be identified and recognised as a member (of some form or another) of that community (Goos, 2004; Lave & Wenger, 1991; Wenger, 1998). Constructing an identity requires negotiating the meanings of the experiences of membership in social networks or communities; it requires the acquisition of the discourses
pertinent to those groups. Identities, as works in progress, are shaped by a sense of belonging and participating in a social community.

A social theory of learning and its constructs—identity, participation, and a learning community—provide new ways of understanding students’ accounts of learning in classrooms. Previous work has focused on understanding teachers’ accounts of student participation in mathematics learning. In such accounts, students’ lack of basic skills, understanding word problems and motivation to learn were identified as major difficulties (Handal, Bobis & Grimison, 2001). Mathematics instruction that followed traditional practices such as reviewing homework and students solving similar problems was also identified as problematic (Magiera, Smith, Zigmond & Gebauer, 2005; Schoenfeld, 2006). These authors found that such practices were determinants of the level of student participation in mathematics. However, they did not investigate the processes of participation in a community further and how it could be understood through students’ accounts.

As noted above, a social theory of learning implies a learning community. This construct has been elaborated variously as a community of practice (Wenger, 1998), community of inquiry (Pardales & Girod, 2006), and community of learners (Matusov, 1999)—these issues are addressed in more detail in chapter 3. At this point, it is sufficient to note that in this study, a learning community is understood as being socially situated within both a teaching and training setting, here a secondary school and TAFE classroom. Both contexts in the ideal sense share similar qualities—learning as a social process occurs in both of these classrooms. The reality of course may be substantially different, particularly when the difference appears to be related to access and who endorses and manages a student’s entry into a community, and the way in which that entry is managed (Davies, 2005). This issue is of critical importance to this study. It can be further understood through the conjunction of a
social theory of learning and critical discourse theory. Together they open ways for a deeper understanding of the formation and consequences of student identities of participation and non-participation in mathematics classrooms.

Understanding Discourse and the Discursive in this Study
The use of critical discourse theory in this study acknowledges the importance of language in social contexts (Luke, 2002). Critical discourse theory provides a framework for understanding social contexts as being made up of several moments (Harvey, 1996), of which the discursive moment, evident in discursive practices, is one element, but a significant one (Chouliaraki & Fairclough, 1999).

In social contexts such as classrooms, language is viewed as “a form of social practice . . . a socially conditioned process” (Fairclough, 2001, p. 18). Discourse, in turn is “the whole process of social interaction of which a text”—such as the accounts in this thesis—“is just a part” (Fairclough, 2001, p. 20).

Discourses are constructed through language, written or spoken, facial expressions, gestures, and or visual images (Chouliaraki & Fairclough, 1999). An analysis of discourse enables a focus on social processes and practices, language, and identity. Theoretical constructions of discourse are operationalised or made practical through analysis, which in turn, contributes to an elaboration of these theories (Chouliaraki & Fairclough, 1999) and a fuller understanding of the contents of analysis, here, student and staff accounts of mathematics learning and the relationships and practices involved in that learning.

The discursive is characterised by social processes where people collaborate and represent their world with and to others (Chouliaraki & Fairclough, 1999). Through this interaction, new representations, relations, and identities emerge; to some extent, with unintended and unpredictable outcomes. The discursive practices that evolve through this
process, that is, the ways of doing things and the resources used to interact, are constituted throughout life and brought together at different moments of that practice (Chouliaraki & Fairclough, 1999; Thomas, 2004).

Discursive practices, then, are particular ways by which people produce the social, at work, at play or in the classroom. Through social interaction new social forms, that is, new social relations, new social identities, and new social structures, are forged. The generative and emerging qualities of social interaction are crucial to gaining an insight into relations and identities that are produced socially (Chouliaraki & Fairclough, 1999). In this process, discursive practices are both means and medium. They mediate experiences, relationships, interactions, offer possibilities and impose constraints on learning across social spaces. They imply participant structures, ways of participating, and available identity positions (Hirst, 2004).

In classrooms and schools, while discursive practices frequently reproduce participant structures, they can also establish new patterns of relationships and talk (Chouliaraki & Fairclough, 1999). In these contexts, discursive practices such as methods for carrying out tasks, for example, teaching mathematics using a textbook, and pen-and-paper testing, are associated with and constitutive of a discourse. These practices aim for information (Chouliaraki & Fairclough, 1999) about students, control of students, and evaluation of curriculum delivery. The power of these practices resides in their everyday application and reinforcement of routine tasks that are viewed as practical, but at the same time they create a particular image of students and mathematics in the classroom.

An analysis of discursive practices is necessary to gain a fuller understanding of social life (Thomas, 2004). In this study, analysis of discursive practices enables a fuller understanding of students’ representations of their mathematics learning experiences. An
analysis of students’ accounts of their mathematics learning gives both a valid representation of their social life in mathematics classrooms and a deeper understanding of the forms of participation associated with their identities. These accounts are regarded as spoken or written products of social interaction.

These accounts of learning mathematics at school and at TAFE can be drawn on for an effective approach to the study of student participation in learning communities. This is accomplished through the combination of Wenger’s (1998) work on identity, forms of participation and non-participation with Fairclough’s (2001) approach to discourse and discourse analysis.

The discourse most taken-for-granted in classrooms is defined as hegemonic. In this setting, a hegemonic discourse is described as one that establishes and maintains particular ideological assumptions about the nature and practice of mathematics education as commonsensical. Learning this discourse creates images of reality that take what is seen as commonsense and part of that reality (Hall, 1982; Kenway, 1990).

However, students may contest or oppose this discourse and its discursive practices by engaging in oppositional discourses and practices. An oppositional discourse is understood as standing in a relationship of opposition (Fairclough, 2001) to a hegemonic discourse; each is shaped by the relationship between the social identities and subject positions of the participants. Thus oppositional discourses develop between groupings of various individuals, such as dominating and dominated groups in institutions (Fairclough, 2001). Where discourses are oppositional, there is pressure to contain them since they oppose or reject the hegemonic discourse and thus perforce engage in a discourse and practices of non-participation (Fairclough, 2001). This issue is addressed in more detail in chapter 3.

Understanding discourse as constructed through language and practice enables the use
of students’ accounts of the social in classrooms to identify subject positions and the identities located in them. Here, through ongoing social interaction, through participation in social practices, students construct their own identities or collective identity in discourse (Chouliaraki & Fairclough, 1999). Subject positions in turn represent and locate “particular social groups” (Chouliaraki & Fairclough, 1999, p. 96), for example, in the classroom context, various student identities—nerds, failures, rebels—in relationship to one another and to their teacher.

Students’ accounts can therefore be examined for the discourses in which they are framed and the social identities and discursive practices manifest in those discourses. These accounts can also reveal how social relationships between discourse participants—here, teachers and students—are set up in and through discourse. It is through these processes and practices that the boundaries between teachers and students may be the focus of contestation, resistance, struggle, and power (cf. Fairclough, 1995; 2001).

This articulation of a social theory of learning and critical discourse theory allows for an examination of identity, participation, discourse and discursive practices. Together, they provide a way to investigate how students locate themselves in discourses relating to their participation in mathematics classrooms. Critical discourse theory, as methodology and its application in critical discourse analysis [CDA], treated as method, enable a more extensive examination of identity, forms of participation and social context as students account for their learning experiences in mathematics.

The Research Questions
This study seeks to examine the issue of student participation in mathematics learning and the discursive practices that contribute to the construction of identities of various forms of participation in this learning. To do this, the following research questions have been
formulated.

1. What practices and forms of participation can be traced in the relevant literature and research relating to the previously introduced approaches to mathematics education?

2. What discourses, discursive practices and forms of participation can be traced in the student accounts and how do they relate to those previously traced in the literature and research?

3. What identities are discursively constructed in these accounts and what relationships can be traced between these identities and the discourses, practices and forms of participation addressed in the previous question?

4. Hence, what can this study contribute to more effective mathematics learning for students such as those in this study?

These questions are addressed in chapters 2, 5, 6 and 7, and resolved in chapter 8. The first question examines the practices and forms of participation associated with such practices in the literature. The second question investigates the practices and forms of participation in student accounts and how they relate to those identified in the literature and research. This question leads into the third question that examines the identities constructed in and through discourses about learning mathematics at school and TAFE. An exploration of these experiences enables a description of the discursive practices evident in both social contexts, and how these practices enabled students to access a discourse of mathematics learning. Finally, the fourth question recognises that understanding the discursive is essential to understanding social life in classrooms and the process of social learning in them. From this insight, an alternative and more effective practice of pedagogy for students such as those in this study can be developed.

Thus far, the research problem of this thesis has been presented and its significance
demonstrated. The importance of understanding the processes shaping student participation has been presented. The research questions that were developed because of these concerns have been stated. The theoretical and methodological frameworks drawn on to inform the analysis of this study have been broadly outlined. Next, how the research questions will be addressed is outlined, and the design of the study is presented.

The Design of the Study

Forty-three young people who were early school leavers and/or non-completers of school were interviewed about their learning experiences in secondary mathematics in secondary school and at TAFE (the secondary level of mathematics is understood to include the work these students did at TAFE).

Their teachers and tutors in the TAFE sector were also interviewed to provide their interpretations of the context of the program and the participants, here the students and themselves. The study, in arguing that it is to provide a detailed analysis of the social context, attempts to theoretically and empirically connect the accounts of the teacher, tutors and the students to understandings of power and discursive struggle and to broader social conditions. Such an analysis therefore, requires an examination of the social conditions of the production and interpretation of discourse – here the social and immediate environment, the social institution, and society (Fairclough, 2001; Rogers, 2004). These conditions shape the manner in which the teachers’ and tutors’ accounts that are resources for understanding what is going on, are produced and interpreted. They are constituted by the social context.

Two understandings of context are drawn on here, situational context and intertextual context (Fairclough, 2001, p. 120-121). Fairclough (2001) argues that participants arrive at interpretations of situational contexts partly on the basis of external cues such as the physical situation, the properties of participants in that situation and what has been said previously.
They also bring to that context their background knowledge which allows them to ascribe the situations they are actually in to particular situations. The teachers’ and tutors’ interpretations of the situation determines the discourse types drawn on, which in turn affects the “nature of the interpretative procedures which are drawn upon in textual interpretation” (p. 121). Intertextual context refers how participants operate in any discourse on the basis of assumptions about which previous discourses the “current one is connected to, and their assumptions determine what can be taken as given in the sense of part of common experience, what can be alluded to, disagreed with, and so on” (p. 121).

In Australia, the secondary level of schooling typically commences at the completion of primary education at around age twelve. It lasts for five to six years. In Queensland it may extend from Year 8 to Year 12 (or equivalent) (MCEETYA, 2004). Early school leavers are defined as students who left on or before the completion of Year 10. Students who left school before completion of Year 12 are described as non-completers (Lamb, Dwyer & Wyn, 2000).

The students in this study were participants enrolled in a TAFE Youth Reconnected Program designed to support young people by improving their literacy and numeracy skills so they could access further education or enter the workplace (Department of Education Science & Training, 2002). Accounts from six TAFE staff and forty-three students were analysed using CDA. In this way, the elements of a social theory of learning and critical discourse theory were applied to understand the accounts. However, the findings of this study are context-relevant, taken from a select group of students and teachers, and broad generalisations to all TAFE and school contexts require more comprehensive research.

Structure of the Thesis

As noted previously, this thesis examines forty-three students’ accounts of their learning and the accounts of six staff who worked with them. Their forms of participation, identities and
discourses are of particular interest in this study. This chapter, the first, introduces the study. It has provided an introductory outline of the research problem, the intention of the study, the theoretical framework, methodology, the participants and the research questions.

Chapter 2 reviews two approaches to teaching mathematics that have informed the field of mathematics education: instruction-based teaching and a reform-based approach to teaching. Particular attention is paid to their differing applications of the following classroom practices: teaching style, classroom communication, source of content (for example, textbooks), student grouping (for example, homogenous or heterogeneous grouping), pace of learning and assessment. Evidence and argument for and against each approach is presented, and a major gap in the research literature is identified. The conceptual and evidential difficulties of resolving this debate are noted, and it is proposed to apply the accounts of the students and staff in this study to a critical examination of these apparently contrasting approaches to teaching mathematics.

Chapter 3 presents two complementary theoretical frameworks, a social theory of learning and critical discourse theory. They provide powerful insights into understanding identity, participation, discourse and discursive practices of secondary mathematics and TAFE classrooms. A social theory of learning assumes that learning is not something that occurs in isolation but rather, develops through engagement and participation in the interactions and processes of a community. The construct, identity of participation, is applied to students’ accounts to understand further student participation and access in mathematics classrooms. This perspective illuminates significant aspects of social action. What is not adequately illuminated, however, are issues of power relations and contestation. Critical discourse theory provides the methodological basis for examining these issues in students’ accounts. Its central concern is with issues of power and contestation and the processes of
inclusions and exclusion from social groups.

In chapter 4 CDA then provides the method, grounded in the assumptions of critical discourse theory, for the analysis of the accounts. It also presents the participants and the educational and social contexts that locate and define the study. It concludes with a justification of the research process and its outcomes for trustworthiness and ethical standards, thus providing the basis for the actual work of analysis that begins in chapters 5 and 6.

Chapters 5 and 6 are the first two of three analysis chapters. They address the research question: What discourses, discursive practices and forms of participation can be traced in the student accounts and how do they relate to those previously traced in the literature and research? CDA is applied to an examination of the accounts relating to mathematics education from members of a particular community engaged in the Youth Reconnected Program at a TAFE college. More specifically, these chapters trace and broadly describe the discourse about mathematics learning in two contexts, TAFE and secondary mathematics classrooms, as constructed in the accounts. How discourse and its discursive practices are constructed is considered.

Chapter 7, the third analysis chapter, addresses the third research question: What identities are discursively constructed in these accounts and what relationships can be traced between these identities and the discourses, practices and forms of participation addressed in the previous question? This chapter focuses on a fine-grained analysis of sixteen students’ accounts to trace how identities of participation are constructed in and through discourses and their related discursive practices.

Chapter 8 addresses the fourth research question: What can this study contribute to more effective mathematics learning for students such as those in this study? It brings together the findings from the accounts to describe discourse, discursive practice and
identities of participation. Limitations to the study are also considered. Finally, recommendations are provided recognising the need for students to learn, engage and participate in learning mathematics. Directions for future research are offered.

Conclusion

In this chapter, key aspects of the research have been emphasised. That is, a statement of the problem of the thesis has been provided and in consequence, the study has been focused on an examination of accounts by students and their teachers of their social participation in mathematics learning. A brief discussion of participation has served to indicate the central concern of the study. The research questions guiding this focus have been stated. In the next chapter, the literature is reviewed as it relates to the concerns of this study.
CHAPTER 2: INSTRUCTION-BASED AND REFORM-BASED APPROACHES TO MATHEMATICS EDUCATION

The previous chapter presented the central issue of this thesis, student participation in mathematics learning. It argued that the classroom should be viewed as a social context for learning mathematics. It further argued that mathematics learning in the classroom could be significantly enhanced through student engagement in practices that promoted learning as a social experience. It emphasised the importance of such engagement for the construction of identities as learners. It then presented the research questions, the design of the study, and the structure of the thesis.

Drawing on the relevant literature and research, this chapter addresses the first research question: What practices and forms of participation can be traced in the relevant literature and research relating to the previously introduced approaches to mathematics education? It examines and critically assesses the assumptions and practices of instruction and reform based approaches to mathematics education with particular attention to their consequences for student participation in mathematics learning. These approaches are described, their practices are reviewed and compared and the argument and evidence for and against them is considered. The chapter concludes by identifying a major gap in the research literature that the study seeks to address.

Certain caveats are appropriate. Within the compass of this study, it is not possible to provide a comprehensive review of the variety of approaches to mathematics education. Hence first, while this chapter outlines two major approaches, it acknowledges a range of approaches that may be comprehended in varying degrees under these two headings. For example, in that they hold a shared emphasis on the primacy of instruction, a range of traditional and instructivist approaches can be subsumed under the heading, instruction-based
approaches. Similarly, constructivist, social constructivist, enquiry-based and social justice or equity approaches all share a common purpose, to reform the assumptions and practices of mathematics education. Second, as these approaches are compared on a point-by-point evaluation of their practices, it may appear that this is a binary formulation. It is not. As Rowe (2006, p. 105) observes, “the relative utility of direct instruction and constructivist approaches to teaching and learning are neither mutually exclusive nor independent”.

Examining the Foundations of Instruction-Based and Reform Based Approaches

While ‘traditional’ approaches continue to dominate the practices of secondary mathematics classrooms (Boaler, 2002; cf. Good & Brophy, 1987), the term, ‘instruction-based’ has been chosen to include such recent developments as Direct Instruction in the USA and Positive Teaching in England which claim to redress the inadequacies of traditional classroom practice. Thus, where traditional approaches are predicated on long-standing tacit or explicit assumptions about teachers, students and the nature of mathematics knowledge, direct instruction and positive teaching are more explicitly grounded in assumptions from behavioural science. Whatever their epistemological differences this group shares a common commitment to an instruction-based approach to mathematics education. Reform-based approaches in turn reject instruction-based approaches in favour of more student and enquiry centred or discovery-oriented approaches to mathematics education. Their assumptions about teachers, students and the nature of mathematical knowledge are typically humanist or critical of what are perceived as the unequal or unjust social and economic relations of contemporary society; they may be grounded in the work of the pragmatist philosopher, John Dewey (1916) or the critical theorist Michael Apple (1996); at the level of practice they may draw on the work of cognitive psychologists such as Bruner (1960) and developmental psychologists such as Piaget (1936/1977; 1977) or Vygotsky (1930; 1934). These approaches are now reviewed
in turn, with particular attention to their practices and the forms of participation constructed by these practices.

Instruction-based Approaches to Mathematics Education

This section reviews several major formulations of instruction-based approaches to mathematics education—traditional, behavioural science, positive teaching and direct instruction—with particular attention to their common themes and practices.

Traditional Approaches to Mathematics Education

Traditional approaches to mathematics education are predicated on tacit or explicit assumptions about teachers, students and the nature of mathematics knowledge. Here mathematical knowledge either remains fixed and eternal, to be taught, not discovered (Wertsch, 2001), or it constitutes an essential body of facts to be transmitted to those who do not possess it (Kyriacou, 2005a; Kyriacou & Goulding, 2006). These approaches are justified in, for example, philosophies of education such as essentialism or perennialism (see for example Kneller, 1971) and in school handbooks and curriculum statements. In this didactic or transmission framework, teachers are the authoritative possessors of knowledge who transmit approved parts of that knowledge to those who do not possess it—students.

Traditional mathematics is a particular form of mathematics, “school math” (Richards, 1991, p. 13), where a collection of facts and figures is structured into an information-transfer relationship between teacher and student. It is a teach and test situation where students receive verbal and written instruction in concepts, practice working through applications of rules and formulas and then indicate their understanding by proficiency in their problem-solving accuracy with the same types of problems that they used to gain understanding, usually with pen-and-paper tests. The mathematics curriculum in secondary schools appears driven by a pedagogy centred on the belief that mathematics is a fixed, static body of knowledge which is
mechanistically manipulated using symbols and numbers (Romberg & Kaput, 1997) and
learned for its intrinsic value, as an end in it itself (Scott, 2001; Young, 2003).

As summarised from a wide body of literature (Boaler, 2002; Cohen, 1995; Franke, Fennema & Carpenter, 1997; Sierpinska, 1998), the central characteristics of traditional classroom practice include a lock-step curriculum, daily timetabled subject periods, didactic instruction, teacher-controlled communication, prescribed work (board, worksheets, textbooks), repetitive learning, formal testing, whole class teaching, a common pace for teaching and learning, homework, and ability-grouping. What is perhaps most significant about these practices is their durability. As Cuban (1988) observes, in the USA context their structure and assumptions go back to the 1880s (cf. Cohen, 1988), while for Boaler (2002, p. 48) they constitute “a common method of teaching that has been used by mathematics teachers for centuries”. Typically, then, traditional mathematics teaching is structured around a lecture and telling format, with an emphasis on students memorising procedures and learning content. Its strength is founded on the recognition that developing conceptual understanding may be of little use if students cannot understand and apply the mathematical content.

Mathematics Education as Behavioural Science

When applied to the social sciences, positivism, or the view that all true knowledge is scientific, holds that

the aims, concepts and methods of the natural sciences are also applicable in social scientific enquiries ... [and] that the model of explanation employed in the natural sciences provides the logical standards by which the explanations of the social sciences can be assessed. (Carr & Kemmis, 1986, p. 62)

Sharing these assumptions, with its focus on observable measurable behaviour, behaviourism
was seen as the “Science of Human Behaviour” (Wozniak, 1997, p. 2) from which scientific methods for teaching and learning (Skinner, 1974; Thorndike, 1913, Watson, 1919) could be derived. Learning was by a process of trial and error, success and failure, positive and negative reinforcement, and habit formation, with each process focused on increasing specific desired behaviour rather than thinking and understanding, which, it contended, could not be examined through scientific procedures. Because these processes were considered unobservable, they were either discarded or redefined in strictly behavioural terms (Wozniak, 1997). The challenge, however, with replacing thinking and understanding with observable behaviour is that to obtain the desired outcomes the learner’s behaviour was strictly controlled with limited options from which to choose. Behaviour then became more predictable (Woodworth, 1962; Wozniak, 1997). In this framework learning was goal-directed and controlled with limited choice—it became a path to a goal, or a means to an end.

This work became influential to further understandings of learning, particularly in mathematics education. Learning was considered to occur when there was an observable increase in specific behaviour, with the individual moving stepwise towards the development of complex skills and knowledge (Nye, 1992; Skinner, 1974). This process was to occur in classrooms through a systematic linear programme of instruction. The rationale for this process was that learning was shaped by its consequences and a response was made more probably or more frequently through reinforcement. If the behaviour was reinforced positively or negatively, then the likelihood of that behaviour occurring on a subsequent occasion would increase or decrease accordingly (Skinner, 1974, pp. 44-45). This process articulated with the early work of Thorndike (1913) who argued that learning occurred through positive reinforcement of correct responses, whereas the discomfort of failure diminished incorrect ones.
In this framework, learning could be engineered, with immediate reinforcement for good performance enhancing rapid and thorough learning (Nye, 1992). This influence can be traced in the more recent application of direct instruction and positive teaching to mathematics education (see for example Farkota, 2003; Grossen, 2004), and their emphasis on ‘best classroom practice’ and effective learning outcomes. Despite their behaviourist basis, however, as will be seen in the sections that follow, these approaches can be seen as adapting or modifying aspects of traditional mathematics teaching.

**Positive Teaching**

Positive teaching, a British-based “‘behavioural interactionist’ perspective” (Wheldall & Glynn, 1989), is predicated as resolving many of the criticisms levelled at traditional schooling. It claims to show

how simple and straightforward interventions by teachers can bring about dramatic results in terms of improved classroom atmosphere and the quantity and quality of work produced” (Wheldall & Merrett, 1984, p. ix).

Drawing explicitly on the work of Watson (1919) and Skinner (1974), it begins with the assumptions “that teaching is concerned with helping children to learn new skills and gain new information” and that “learning implies a change or changes in behaviour” (Wheldall & Merrett, 1984, p. 16). The logical consequence is that “teaching is about changing children’s behaviour(s), whether social or academic” (Wheldall & Merrett, 1984, p. 16).

In the British setting, then, positive teaching provides a systematic approach for teachers to employ to teach students (Merrett & Wheldall, 1987, p. 18). Although its focus is more on teacher pedagogy in general and not specifically related to mathematics teaching and learning, it provides some understandings of what positive teaching entails in mathematics classrooms.
For example, students were to be seated in rows and to work individually to prevent the aggressive and undesirable behaviour that was seen to be the consequence of working in groups. Groups were considered “an ideal cover for covert aggression or teasing by means of kicking or pinching under the table, thereby increasing disruption” (Merrett & Wheldall, 1987, p. 31). With the students seated in rows, teachers were considered more able to maintain control of their classroom and the students. This done, on-task behaviour was expected to improve because students were rewarded for obeying rules, with off-task behaviour eliminated.

Positive teaching was seen as positive because it provided teachers with a template for how to teach. Elements of a positive teaching approach in mathematics classrooms included the teacher writing extra “sums” (Merrett & Wheldall, 1987, p. 36) on the blackboard for the “quicker children” (p. 35) so that they would not distract others working on their “basic set” (p. 35) from a textbook. The purpose of this traditional form of pedagogy was to directly guide students to ensure that they all worked on systematic academic programmes that the teacher considered necessary for academic progress (Merrett & Wheldall, 1987). Hence, effective classroom management became a prerequisite for successful teaching. However, while classroom management is recognised as crucial to the teaching and learning process, in this approach the emphasis was more on the pedagogy of teaching than supporting student engagement in learning. Thus, students worked in isolation and quietly on set routine tasks initiated by the teacher. A further modification or adaptation of traditional classroom teaching is provided by direct instruction.
Direct Instruction

Direct instruction, or “instructivism”, an American-based approach that stems directly from the model created in the 1960s under a Project Follow Through grant (Bereiter & Engelmann, 1966), has been defined as

a comprehensive system of education involving all aspects of instruction from the actual organisation and management of the classroom to the quality of teacher and student interaction, and design of curriculum materials. (Farkota, 2003, p. 37)

It provides “behaviourally based instructional activities that are directly related to increasing achievement in basic academic skills” (Jones & Southern 2003, p. 4). More simply, it has been described as the teacher helping children to become aware of what they need and are to learn, and how they are to use this new knowledge (Stotsky, 2006, p. 6). For its proponents, it is a prime and proved example of an “effective teaching methodology” (Stone, 2002, p. 45).

Now in its third decade of influencing curriculum, instruction and research, direct instruction is also into its third decade of controversy (Magliaro, Lockee & Burton, 2005) because of its focus on explicit and highly directed instruction for learning (Hirsch, 2002). Through this process, teachers demonstrate and model how to think and do mathematics. They direct their students as they learn how to apply their new knowledge to other tasks and activities (Stotsky, 2006). The successful instructivist teacher follows the prescribed curriculum in detail, so that “nothing is left to chance or random discovery” (Stotsky, 2006, p. 6). This form of direct systematic instruction depends on effective and well-organised and planned lessons to ensure that every student acquires new knowledge (Stotsky, 2006).

The primary goal of direct instruction is to enhance the learning of students who are experiencing failure and to close the educational gaps faced by these students (Engelmann, 1970; Grossen, 2004). Learning is said to be accelerated through the provision of curriculum
that is highly structured and engineered for success and efficient learning (Grossen, 2004). On-task behaviour is expected to be one hundred percent during “every available minute of the school period” (Grossen, 2004, p. 161). In this highly structured approach, explicit teaching and well scripted lesson plans are crucial (Adams & Engelmann, 1996; Rumph, et al., 2007b; Stone, 2002). This requires building on “previously mastered skills and knowledge”, “fast-paced, scripted explanation” with “appropriate examples”, teacher feedback to student response, and “independent practice” in workbooks under teacher supervision (Grossen, 2004, p. 46). Through this structured sequence, instruction is expected to convey the concept to be learned accurately, that is, it is “logically faultless” (Engelmann & Carnine, 1991, p. 3).

Other recent studies have claimed substantial benefits for students from direct instruction (Klein, 2007; Wartonick, 2005). In particular, the direct teaching of logical sequences of concepts and skills has been claimed to extend students’ mathematics knowledge in systematically effective ways. Such ways include the teacher directly instructing students to routinely recite and repeat mathematics skills such as multiplication, division, and other basic skills within and across grade levels (Wartonick, 2005).

Common Themes in Instructivist and Traditional Mathematics Education

A number of inter-related practices characteristic of traditional mathematics education can be identified from the literature on direct instruction and positive teaching. For example, direct instruction is intended to provide a highly structured, rigorous and effective form of teaching. Students are to focus on the teacher who presents well-designed and scripted lessons at a fast pace. Rehearsal, memorisation and testing of content are central. The students, who are grouped by ability, are expected to respond as a group and or individually. The teacher, who provides feedback and correction to the students, initiates the interactions. Key practices in
this formulation (see for example, Schoenfeld, 2006; Wood, Shin & Doan, 2006; Zevenbergen, 2004; Zevenbergen, Mousley, & Sullivan, 2004) include didactic instructional style and rote learning, teacher-centred communication, highly structured instructional programs, fast-paced instruction, homogeneous grouping, that is, streaming or ability grouping, and objective testing.

Reform-based Approaches to Mathematics Education

The view that students can construct their mathematical ways of knowing has been at the centre of recent debates over the last twenty years (cf. Cobb & McClain, 2001; Kyriacou & Goulding, 2006; Kyriacou & Issitt, 2007). By the late 1980s and early 1990s two cognate approaches, constructivism and social constructivism, began to influence mathematics education, constructivism which has its origins in cognitive theory and the work of Piaget (1936/1977), and social constructivism which is influenced by the work of Vygotsky (Vygotsky, 1930, 1934). Both are claimed to have significantly influenced the way mathematics has been taught and learned in classrooms (Cobb & Yackel, 1998; Ernest, 1996; von Glasersfeld, 1995; Waschescio, 1998). Dewey’s (1916) rejection of traditional conservative forms of education for more progressive, democratic and approaches where education for natural development could take place has been significant, along with Bruner’s (1960) emphasis on ‘children as natural problem solvers’ and the importance to successful learning of the child’s interest in the material to be learned. Action for equity and social justice in mathematics education should also be noted (Atweh & Keitel, 2007; Zevenbergen, 2001b). These strands of the reform approach are now addressed in greater detail.

Constructivism

Constructivism, which focuses on the individual, rests on two main premises, first, that the knowledge, attitudes and interests learners bring to the learning situation provide the starting
points from which, second, as that knowledge and those interests and attitudes interplay with experience, “learners construct their own understanding, from the inside, as it were” (Marti, 1996, p. 58-59). Some researchers (see for example, von Glasersfeld, 1991; 1995) explored the application of Piaget’s (1977) theory of assimilation and accommodation to the mathematics classrooms to further understand how students construct their mathematical understanding. Piaget found that individuals constantly strove for equilibrium (Piaget, 1977), that is, the cognitive stability that occurs through the process of assimilation and accommodation. Assimilation occurs when new information meshes with existing understanding. Through this meshing a person is said to be accommodating this new information to fit with their cognitive schemata and schemes (Piaget, 1977). Equilibrium occurs because of these two processes and is crucial to a student’s cognitive development (Piaget, 1977).

Knowledge then is not a commodity that rests outside the knower, where it is simply passed from the teacher to the child, but rather it is an individual’s constructive activity. Von Glasersfeld (1990) proposed that students were capable of constructing their mathematics knowledge and understandings with support from the teacher who constrained and guided the students’ cognitive constructions (p. 37). Others looked at the complexity of the interplay between students’ mathematical development, teachers’ pedagogical development as well as their mathematical development in classrooms and the wider school community (Cobb & Bauersfeld, 1995; Cobb & Yackel, 1998; Yackel, Cobb & Wood, 1991).

The influence of von Glasersfeld’s work (1990; 1991; 1995) provided a framework to assist teachers to move away from a transmission model of teaching mathematics. This shift placed learners on centre stage where they were supported by their teacher in becoming active participants in constructing their mathematical knowledge (Cobb & Bauersfeld, 1995; Cobb
However, teachers were required to alter or modify their classroom practices. The early work of Cobb, Wood and Yackel (1991) with American teachers in the 1990s was instrumental in supporting them in renegotiating classroom social norms so that they and their students together constituted a community of active learners—a forecast perhaps of the rise of social constructivism. This meant classroom learning involved small-group collaborative activities and whole-class discussions of students’ interpretations and solutions (Cobb & Yackel, 1998). They found that the interplay between students’ thinking and mathematical concepts was increasingly important and therefore required the teacher to make instructional decisions and changes to their teaching practices in order to accommodate this interplay (Cobb & Yackel, 1998; Fennema, Sowder & Carpenter, 1999).

Constructivism was hailed as the paradigm that offered students opportunities to gain mathematical power through problem-solving and communication with their teachers. Nonetheless, as noted previously, it was not free of criticism or challenge. The constructivist’s exclusive focus on the individual came under question. The issues that emerged were coming from socio-cultural perspectives which focused not only on the individual but on social interaction and the culture of the mathematics classroom (Ernest, 1994; Lave & Wenger, 1991; Renshaw, 1992; Saxe, 1991; Voigt, 1994). Findings supporting this position came from studies such as Saxe (1991) and Lave and Wenger (1991). Their investigations demonstrated that mathematics knowledge and understanding were influenced by participation in cultural practices such as completing worksheets in class, selling candy on the streets, and shopping at the supermarket. The findings give credence to the claim that such communities become the social fabric of learning (Cobb & Yackel, 1998).
Social Constructivism

Social constructivism builds on the constructivist position and rests on the premise that what children can do with assistance is more indicative of their cognitive development than what they can do alone (Brown, Metz & Campione, 1996; Marti, 1996). Moreover, the focus is on the interplay between language and thought (Sierpinska, 1998) and cognitive development and culture (Lave & Wenger, 1991; Saxe, 1991). Researchers who claim that priority should be given to social and cultural processes (Engestrom, 1996; Forman, 1993; Levine, 1996; Minick, 1996; Voigt, 1994) draw mainly from Vygotsky’s (1930) contention that social interaction and culture are constitutive of an individual’s cognitive development. Extending the constructivist view, Vygotsky observed that a student’s abilities are strengthened through quality social interaction between the child and the adult. In the classroom context the teacher supports the child at the cutting edge of their competencies and adjusts the amount of scaffold (Bruner, 1985) or support, to take account of the new learnings of the student (Diaz, Neal & Amaya-Williams, 1990). Vygotsky (1930) refers to this as a student’s “zone of proximal development” (p. 137), that is, the difference between a child’s actual development and potential development at that point in time. The actual extent of this zone is determined through problem-solving and collaboration with the teacher or more capable adult.

Using qualitative methodologies such as ethnographic research, researchers applied Vygotsky’s socio-cultural theory to investigate the significance of culture and social interaction with students in mathematics classrooms (Forman 1993; Voigt 1994; Engestrom 1996; Levine 1996; Minick 1996). Minick (1996), for example, suggests that there is much to learn from exploring the connections between social practice and cognition through the face-to-face encounters of teachers and pupils in the classroom. One way of doing this is to explore the influences of curriculum and teaching materials on teachers and learners. Similarly, Voigt
(1994) found that negotiation of meanings is a necessary condition for mathematics learning. He pointed out that this was the case when “students’ understandings differed from the understanding the teacher wants the students to gain” (p. 215). Such differences are seen to be crucial to negotiations of meanings in the classroom. Hence communication between students and teacher and individual expertise should be supported in classrooms cultures

_Equity and Social Justice Approaches to Reform_

As Michael Apple (2000, p. 243) has observed,

there is not a long tradition within the mainstream of mathematics education of both critically and rigorously examining the connections between mathematics as an area of study and the larger relations of unequal economic, political and cultural power.

Moving beyond constructivism and social constructivism (Boaler, 2000, p. 3), situated theory and critical theory address this lack. They share a common epistemology in which “knowledge is socially situated” and “learning is a social phenomenon, constituted in the world” (Boaler, 2000, pp. 2, 5). It follows that the practices of mathematics classroom can be seen as “discursive formations within which what counts as valid knowledge is produced and within which what counts as valid participation is also produced” (Lerman, 2000, p. 27) and school success itself is “a function of linguistic, social and cultural background” (Zevenbergen, 2000, p. 201).

In this socially situated or socially critical frame,

social justice concerns are no longer seen at the margins of mathematics education research and practice. Issues relating to gender, multiculturalism, ethno-mathematics, and the effects of ethnicity, indigeneity, socio-economic and cultural backgrounds of students are regularly discussed in the literature and many of these have found their
way into education polices in many countries around the world. (Atweh & Keitel, 2007, p. 95)

What is central to these concerns for equity and social justice is their recognition of the structured nature of inequality in contemporary societies, its consequences in unequal access to valued resources such as power and knowledge, and the ways and means by which this situation can be changed. In response, in various ways, they seek to construct “social relations that expand the emancipatory possibilities of education” (Connell, Ashenden, Kessler & Dowsett, 1982, p. 207). Critical discourse theory, as addressed in chapter 3, extends this analysis to an examination of “the knowledge/power of discursive practices” and “the way in which individuals are constructed by and within those practices” (Lerman, 1998, p. 345).

Common Themes in Reform-based Education

Reform-based approaches share an increased emphasis on students and their needs, interests and present capacity and a common view of the student as an active constructor of knowledge, not a passive recipient of information. This in turn requires a different role for the teacher, as knowledgeable mentor and facilitator of learning and learning material that is relevant in level and interest. Inquiry and discovery are valued methods, while process and higher-order thinking is favoured over basic skills and content. They will differ, however, over the relative emphasis placed upon the individual learner or the social dimension of learning, including the social group or community in which particular learners are embedded. They will also differ in the degree to which they explicitly address issues of equity, social justice and power in and beyond the classroom, and in the means by which they seek to transform learning and learners.
Assessing Instruction-based and Reform-based Approaches to Mathematics Education

From the review of a range of instruction-based and reform-based approaches thus far, and drawing also on a recent comparative study (Handal, 2003) of philosophies of mathematics and pedagogies of mathematics education, the following conclusions can be drawn. There are two divergent views of the nature of mathematics. In one, mathematics is “an abstract, absolutist, universal and infallible system” while for the other, it is “practical, fallible and situated and socially and personally constructed” (Handal, 2003, p. 1). Broadly speaking, instruction-based approaches are grounded in foundationalist and positivist conceptions of mathematics while behaviourist principles provide the pedagogy for mathematics education; reform-based approaches in turn draw on “quasi-empirical” views of mathematics that align with constructivist and social constructivist pedagogies for mathematics education (Handal, 2003, p. 1). Hence as previously reviewed, instruction-based pedagogies presume a transmission model of mathematics education in which the teacher, program and textbook are central, while reform-based pedagogies are more student-centred and situated learning is prioritised. Table 1 summarises these differences.

Certain significant implications can be drawn from this review. In the debate between instruction and reform-based approaches to mathematics education, it is difficult to find a common ground from which to begin. First, since they differ over the nature of knowledge and what constitutes mathematics, they are not likely to agree on what should be examined and what constitutes evidence. Second, any argument about the more effective pedagogy contains its own proof and justification in its premises. Thus, third, while the evidence and argument each presents in its support is valid, the case it advances against the other approach cannot disprove it in terms of the premises on which it is based.
Table 1: Comparing the two major approaches in mathematics education

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<tr>
<th>ASPECTS</th>
<th>INSTRUCTION-BASED PERSPECTIVES</th>
<th>REFORM-BASED PERSPECTIVES</th>
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<tbody>
<tr>
<td>Philosophy</td>
<td>technical-positivist/Euclidean</td>
<td>relativist/quasi-empirical/constructivist</td>
</tr>
<tr>
<td>Epistemology</td>
<td>absolutist</td>
<td>fallibilist</td>
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<tr>
<td>Method</td>
<td>behaviourism</td>
<td>social/constructivism</td>
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<tr>
<td>Orientation</td>
<td>traditional/authoritarian</td>
<td>progressive/reform/non-traditional</td>
</tr>
<tr>
<td>Intention</td>
<td>imitation (mimetic)/reproduction</td>
<td>transformational</td>
</tr>
<tr>
<td>Primacy</td>
<td>content</td>
<td>process</td>
</tr>
<tr>
<td>Emphasis</td>
<td>basic skills</td>
<td>higher order thinking</td>
</tr>
<tr>
<td>Mode</td>
<td>transmission of factual and procedural knowledge</td>
<td>emphasis on qualitative transformations in the character and outlook of the learner</td>
</tr>
<tr>
<td>Pedagogy</td>
<td>teacher &amp; subject-centred/transmission</td>
<td>child-centred/enquiry-discovery/constructivist</td>
</tr>
</tbody>
</table>

Adapted from “Divergent views in mathematics education” in “Philosophies and pedagogies of education” by B. Handal, 2003, Philosophy of Mathematics Education 17.

However, finally, both accept the classroom as the site or field of mathematics education practice and both acknowledge the same participants—teachers and students—in that field of practice. This then opens the possibility explored by this study: what can be learned from the accounts of students who have experienced both approaches?

At this point, a bricoleur’s adaptation (cf. Denzin & Lincoln, 2000) of Bourdieu’s (1977, p. 168) theory of practice is useful. For this study, then, the classroom can be conceptualised as a field or site where “orthodox” (instruction-based) and “heterodox” (p. 168) (reform-based) opinions of mathematics education contest for control of its pedagogic practices (Bourdieu, 1977, p. 168). At stake are the practices by which mathematics education is constituted in the classroom site, that is, its forms of instruction, types of communication, use of sources of authority, the pace at which instruction proceeds, the basis on which students are grouped or segregated, and the ways in which they and their work are evaluated.
In all of this, however, the classroom is a taken-for-granted prerequisite, an undisputed “doxa” (Bourdieu, 1977, 168) along with its members (teachers and students) and practices (instruction, sources of authority, processes of assessment and so on) whose application, not their existence, is contested. That given, it is now appropriate to examine and compare how instruction and reform-based approaches apply these practices in the mathematics classroom, and what evidence and argument is adduced for and against each position.

The Practices of an Instruction-based Classroom

A number of inter-related practices that are characteristic of instruction-based mathematics education can be identified from the literature on direct instruction and positive teaching. For example, direct instruction is intended to provide a highly structured, rigorous and effective form of teaching. Students are to focus on the teacher who presents well-designed and scripted lessons at a fast pace. Rehearsal, memorisation and testing of content are central. The students, who are grouped by ability, are expected to respond as a group and or individually. The teacher who provides feedback and correction to the students initiates the interactions. Key elements of this formulation include direct instruction and rehearsal, clear didactic communication, a sequenced program of instruction and practice, brisk pacing of instruction, streaming by ability and objective assessment. These practices are now discussed in turn to identify their claimed influence on student participation and engagement in learning.

Instructional Style

Direct instruction has been advocated as a highly structured approach that uses explicit teaching and well scripted lesson plans (Adams & Engelmann, 1996; Rumph, et al., 2007b; Stone, 2002). It focuses on “small chunks deliberately isolated from the complexities of actual situations” (Hirsch, 2002, p. 63). A step-by-step direct and explicit approach is said to benefit
students because of the limitations of the working memory (Hirsch, 2002). During instruction, the teacher’s task is to ensure meaningful attention by students to what is to be learned using whatever methods are available. Rehearsal, also referred to as rote learning (Mayer, 2002) or drill, is seen as one means to this end (Hirsch, 2002).

There is a strong argument, well supported in the literature on direct instruction, that rehearsal or rote learning (Mayer, 2002) is necessary for the retention of what is learned (cf. Hirsch, 2002; Rumph, et al., 2007a; Schoen, Fey & Hirsch, 1999). Directly and explicitly teaching what is to be learned requires students to rehearse what they have learned. This is done at a very fast pace, rather than through drawn out explanations of new concepts (Becker, 1992). Typically, what is remembered is determined by how often it has been rehearsed (Hirsch, 2002).

In this framework, retention is understood as the “ability to remember material at some later time in much the same way it was presented during instruction” (Mayer, 2002). Rehearsal or rote learning provides the means by which students retain what is learned and then transfer it to solve problems or to learn new content (Mayer, 2002). Paradoxically, this accommodation of knowledge and skills to the uniqueness of the student is claimed to be more effective in improving student learning (Stone, 2002) than if they were allowed to discover ideas on their own (Evers & Walberg, 2001; Siegel, 2006). Similarly, direct instruction that is result-orientated and uses methods such as rehearsal and rote learning is claimed to boost student self-esteem through success in learning (Stone, 2002; Farkota 2003).

It should be noted, however, that direct instruction has different characteristics depending on the grade level to be taught (Stein, Silbert & Carnine, 1997). Direct instruction in the primary grades or for students who experience difficulties in the middle year grades, is characterised as more structured and teacher-directed. The teacher asks more questions,
provides immediate feedback and corrections and praises the students (Stein, et al., 1997). In the upper grades of primary, group work is decreased and independent work increases (Stein, et al., 1997). Similarly, if instruction is intended for students who are “average or above average” (p. 3) and in the middle years of schooling, there is a strong emphasis on student-directed independent work (Stein, et al., 1997) and “didactic” instruction (Jones & Southern, 2003, p. 1).

Communication and Interaction

Direct instruction and positive teaching are teacher-centred pedagogies that focus on clear didactic communication. In these approaches, “educational effectiveness for all students is crucially dependent on the provision of quality teaching by competent teachers who are equipped with effective, evidence-based teaching strategies that work” (Rowe, 2006, p. 105). The teacher, who possesses sound mathematical content knowledge, is seen to be the expert who passes this knowledge onto students via direct instruction, rehearsal and rote learning. It is the teacher who tells the students what they need to know and learn (Hirsch, 2002; Stotsky, 2006). Hence classroom interactions are largely initiated by the teacher, that is, they are didactic (Jones & Southern, 2003). Here,

instruction is delivered with a standard format in which the teacher secures the students’ attention, prompts their overt responses during acquisition, requires overt and unassisted responses to demonstrate mastery, and follows acquisition with systematic practice. (p. 5)

Interactions generally do not involve student-to-student interactions, although these are not discounted (Jones & Southern, 2003). However, if teachers are to instil a deep understanding of mathematics in the students they teach (Aharoni, 2005; Siegel, 2006), they must provide explicit explanations that students understand (Stein, Kinder, Silbert & Carnine,
In this framework, then, teachers are expected to possess a thorough knowledge of the content and processes of mathematics. They require an understanding of the underlying general principles of mathematics to guide their application effectively and to support student learning (Hirsch, 2002). If these requirements are met, it is claimed that instruction will succeed when concepts are conveyed accurately through “faultless communication” (Engelmann & Carnine, 1991, pp. 2-3).

The intention of faultless communication is to lead students directly to a “single interpretation of the instruction, and ideally that same instructional communication would work for all learners” (Engelmann & Carnine, 1991, p. 3). Here, the students’ responses to the instruction are seen to provide precise information about their learning. In this approach, what a student learns is seen as a function of the communication received and the characteristics of the student and what she or he brings to the situation. In short, if faultless instruction fails to achieve the intended communication, the instruction is not considered to be at fault. Rather, the failure of instruction indicates that there is a problem with the student and her or his behaviour (Engelmann & Carnine, 1991). In this event, the teacher is required to observe and analyse the student’s behaviour and provide appropriate remediation. The intention is not to blame the student for her or his failure to learn, but rather to analyse the behaviour of the student in order to “correct deficiencies in the learner’s cognitive repertoire” (Engelmann & Carnine, 1991, p. 3).

A key characteristic of direct instruction is “unison responding” (Stein, Silbert & Carnine, 1997, p. 9). Unison responding increases student attention. When used correctly, it is considered an “effective tool for engaging students in learning, as well as for monitoring students’ progress” (p. 9). However, for teachers who include unison responding in their classrooms, this requires specific presentation skills, including the use of “signals” (p. 9).
Signals are cues given by the teacher that indicate to students when to make a unison response (Stein, Silbert & Carnine, 1997). The effective use of signals is claimed to enhance the participation of all students, “not just the high performers who, if allowed, tend to dominate the lower-performing students” (p. 9). Their use apparently avoids the problem of reducing the amount of practice that low performing students receive.

To signal a unison response, the teacher is required to give directions, provide a thinking pause, and cue the response (Stein, Silbert & Carnine, 1997, p. 9). When using directions, the teacher “tells the students the type of response they are to make and asks the question” (p. 9). The duration of the thinking pause is determined by the length of time that the lowest-performing student takes to find the answer. “If one student is unable to answer or takes longer to answer, the student is either provided with more individual practice, or placed in a lower-performing group” (p. 9). Carefully controlling the thinking pause is crucial for maintaining student attention and successful learning experiences (Stein, et al., 1997). It is generally signalled by the teacher who says, “Get ready!” just before the thinking pause (Stein, et al., 1997, p. 9). The get ready prompt is to indicate to students when to expect the signal to respond (Stein, et al., 1997). The cue to respond may include a click of the fingers, clapping the hands, touching the board or any action that indicates a cue.

In short, effective teaching is didactic, communication is directed from the teacher, and its success is contingent on their ability to communicate with clarity. Advocates of faultless communication, unison response and signals argue that this type of instruction supports student learning of mathematics. They claim that it provides adequate learning and practice opportunities for all students. Such practice includes using student textbooks for instruction.
To this point, attention to mathematics classroom interaction has focused on oral communication from the teacher who follows a highly structured sequence to instruct students (cf. Stein, Silbert & Carnine, 1997). Written direct instruction programs provide that highly structured sequence for instruction. Significantly, in addition to textbooks for student practice and independent work, there may be teacher presentation textbooks—textbooks for teachers that provide scripts on how to instruct students about mathematics (Bessellieu, Kozloff & Rice, 2001; Stein, Silbert & Carnine, 1997). The latter are characterised as scripts for teachers that provide clear, explicit, concise teaching strategies to assist student learning (Kenny, 1980; Stein, Silbert & Carnine, 1997).

These scripts provide teachers with explicit pre-tested examples and sequences that relieve them of programming (Kenny, 1980). As concepts and strategies are taught, the script provides “step-by-step transition from explicit teacher-directed instruction to completely independent work” (p. 17). Independent work refers to the “mass practice” of exercises that students are required to complete without teacher assistance at a time designated by the teacher (Stein, Silbert & Carnine, 1997, p. 25). Students are never assigned independent seat work if they have not demonstrated success during supervised practice (Stein, Kinder, Silbert & Carnine, 2006).

Transitions to independent work are achieved through guided practice and the teacher prompting the next steps (Stein, Silbert & Carnine, 1997). Systematic prompts are used to draw student attention to signals (“Listen to this”); help craft ongoing actions in a more competent fashion; or help direct attention to the results of past actions (“Did the solution turn pink?”). Prompts include: 1) gestures (a teacher points to a trouble spot in an
equation); 2) suggestions; 3) instructions (“Pour acid INTO water, not water into acid”); 4) highlighting features of the setting (e.g., crucial information in a text is in italics); and 5) models (“Try it like this.”). (Kozloff, 1999, p. 1)

Prompting in this sense assists students with efficiently maintaining and transferring the new skills and knowledge acquired (Jones & Southern, 2003; Stein, Silbert & Carnine, 1997). Textbooks and worksheets serve similar functions and are described in similar ways in a direct instruction program. Worksheets provide prepared sequenced material for each of the different concepts to be taught. Their purpose is to enable the teacher to coordinate the related teaching activities and memorisation exercises. This allows the teacher to monitor easily the progress of the students’ performance and mastery.

In a typical example from one such program (Stein, Silbert & Carnine, 1997), the worksheets are divided into two parts for practising number facts. The top half provides practice in new and previously learned facts. The bottom half of the worksheet includes the facts from the new set, each written twice, along with previously introduced facts, each appearing just once (Stein, Silbert & Carnine, 1997, p. 88). The pace at which this work moves is critical in this process.

*Pace of Instruction*

In a review of the literature on time management (Kelly, et al., 1999), pace has been described in two related dimensions. The first refers to curriculum pacing. It is concerned with the rate of progression through the curriculum. The second dimension is lesson pacing. This refers to the pace at which the teacher conducts lessons (Kelly, et al., 1999).

In this framework, the key to a sound mathematics learning program that uses textbooks and or worksheets is to maintain student focus throughout the learning process. However, this focus has been shown to be dependent on how the teacher introduces the
concepts orally and questions the students (Farkota, 2003). The pace at which this is done should be easy enough to accommodate all the students but also brisk enough to ensure that they have no time to be bored (Farkota, 2003; Kinder & Carnine, 1991; Sangster, 2006). The National Numeracy Strategy in British schools (Kyriacou, 2005b) has also advocated a brisk pace for mathematics lessons. Teachers were expected to commence lessons in a quick and lively way with a mental/oral whole class activity, and students were expected to respond quickly. The intention of this part of the lesson was to arouse the students’ interests, making this part of the lesson enjoyable and motivating (Kyriacou, 2005b).

Brisk lesson pacing has been shown to be important for student achievement. In studies of classroom teacher performance (Heward, 2003; Kelly, et al., 1999; Wyne, Stuck, White & Coop, 1986), it was found that a brisk pace in lessons improved the learning of most students, including those considered low-achievers. Student attentiveness and participation was stimulated and more content was covered (Wyne, et al., 1986). Content coverage, however, was found to be dependent on the level of difficulty of the lesson. Here, an effective lesson was one that permitted a high rate of student involvement and success. Difficult and poorly presented lessons could not be learned at any pace (Kelly, et al., 1999; Wyne, et al., 1986). Significantly, fast-paced instruction was seen as necessary for the progress of students with learning difficulties (Heward, 2003; Kame'enui & Simmons, 1990).

In short, fast-paced lessons and instruction were claimed to provide more learning opportunities by the teacher, more student responses and accuracy per lesson and improved on-task behaviour. The students’ learning was said to be accelerated because of the effect of a brisk pace on student achievement (Berliner, 1984; Heward, 2003). Indeed, it is claimed that when a brisk pace is done effectively, teachers cover more content on a daily rate. In consequence, they do have time over a year to consolidate and review the content covered.
Grouping of Students

Homogeneous grouping of students, Engelmann (2002) argues, is influential in maximizing and benefiting student learning. Here homogeneous grouping describes the practice of using general measures of performance—and thus by inference, ‘ability’—in mathematics to allocate students to an appropriate group level in the classroom. These small groups are graded from low through to high ability. A similar process of ability grouping occurs across classes and grades.

Such grouping is seen as necessary for direct instruction and cognate approaches (Engelmann, 2002). Instructivists argue that this enables individuals and groups of students to get maximum benefit from effective instruction. In this process of classification, they are to be grouped according to the level “where they have the necessary prerequisite skills and have not yet mastered the objectives” (Watkins & Slocum, 2004, p. 40). Here, the skills to be taught should be closely aligned with what students have already learned but just beyond their current level of understanding (Watkins & Slocum, 2004). In this way, it is argued that teachers can instruct the groups and attend to the learning needs of individual students in those groups.

According to a report on balancing approaches for teaching students with learning difficulties (Ellis, 2005), this type of small group instruction is effective for providing opportunities for the teacher to direct and attend to students and provide them with feedback about their learning. In this way, those students who are achieving can progress more quickly, whilst those who are not can receive the necessary support and practice to further their learning (Ellis, 2005). However, if groups are heterogeneous—comprised of students who know the content to be learned and those who do not—the latter are less likely to learn that content in the allocated time. This will particularly be the case if the instruction is targeted at
those who have the prerequisite skills and are ready to move on. In this instance, the effectiveness of the program of instruction for accelerating all students is considerably reduced (Engelmann, 2002; Kauffman, Landrum, Mock, Sayeski & Sayeski, 2005).

Students placed appropriately are those who “perform at 70% correct on any skill or content introduced for the first time” (Engelmann, 2002, p. 1). This percentage indicates that they are ready to master new content. However, if a student performs at fifty percent correct on the same tasks, that student is considered to have too much content to learn in the allocated time (Engelmann, 2002). This student will therefore be changed to a lower grouping that matches her needs (Engelmann, 2002; Kauffman, et al., 2005).

Students do not enjoy learning mathematics when they have not been well matched or grouped to their prior knowledge or ability to learn and perform (Kauffman, et al., 2005). They are more likely to do whatever it takes to withdraw or exclude themselves from that instructional situation. This may be because the instruction requires understanding and performance that is too difficult for the student, thus resulting in embarrassment, disruptive, inattentive behaviour and anxiety (Kauffman, et al., 2005). Alternatively, it may be that the instruction is too easy for the student and requires them to review what they have already mastered and the likely result is boredom and inattention.

In short, homogeneous student grouping is claimed to benefit all students in their learning. Providing the instruction is effective, the needs of students will be appropriately addressed. However, if they have not been appropriately matched and or grouped to their level of performance, effective learning is less likely. This is because they are trying to learn at a level that is well beyond their current knowledge and skills. Testing students to allocate them to the appropriate group apparently works to alleviate these consequences.
Assessment

The allocation of students into homogeneous groups is largely informed by the students’ performance on placement tests (Watkins & Slocum, 2004). These ‘objective’ tests are generally designed to measure student performance on subject matter and encompass a range of specific skills needed for progress and successful learning (Rumph, et al., 2007b; Watkins & Slocum, 2004). Their results are used to indicate each student’s starting place in a program of instruction (Stein, Silbert & Carnine, 1997; Watkins & Slocum, 2004).

Objective testing is also referred to as summative testing. Summative testing measures pre-existing knowledge. Put another way, it attempts to summarise a student’s learning at a given point in time (Larson & Keiper, 2007). Although assumed to have negative consequences, supporters of direct instruction argue that it can have positive effects if it is aligned closely with instruction that is “deeply criterion-referenced, incorporating the intended curriculum, which should be clearly salient in the perceived assessment demands” (Biggs, 1998, p. 107).

Timed tests are used in direct instruction. The teacher sets a specified time that is realistic for the students. A short time, “a minute or two”, (Stein, et al., 1997, p. 89) is provided for students to study the test that is located at the bottom half of their worksheets. The teacher then instructs them to get ready (Stein, et al., 1997, p. 89).

The teacher tells the students how much time they have and to start. At the end of the specified time, the teacher says, “Stop”, has the students trade papers, and reads the answers. Students are to mark all mistakes, write the total number correct at the top of the page, and then return the worksheets to its owner. (p. 89)

The results are then recorded by the teacher. Depending on the performance of the students, the same worksheet will be presented to students again in the next lesson, if less than
three quarters of the class performed satisfactorily. This system of testing claims to allow the teacher to link activities similar to the test and utilise memorisation exercises. It is also claimed that it allows for precision and fluency in basic skills (Wu, 1999) and easy monitoring of student performance and progress (Stein, et al., 1997).

In short, through testing and practice, rapid and effortless performance of basic skills “frees attention for thinking about complex operations” (Snider & Crawford, 2004, p. 213). In this framework, then, basic skills are seen as forming the foundation for conceptual understanding. Their acquisition provides the stepping stones to higher-level skills (Snider & Crawford, 2004). Testing enables teachers to monitor student mastery of basic skills so that they can move to more complex tasks.

Thus far the claims advanced by proponents of direct instruction or positive teaching and the practices devised for this approach to mathematics learning have been reviewed without substantial comment. Their critique will follow shortly. The evidence supporting these approaches is now outlined.

Research Evidence Supporting Instruction-based Approaches

Much research conducted over the last forty years provides strong support for the effectiveness of approaches such as positive teaching or direct instruction in schools. The evidence, largely quantitative and statistical, has been used to justify its practices for improving mathematics achievement for students (cf. Engelmann, 1991; Stein, Kinder, Silbert & Carnine, 2006; Watkins & Slocum, 2004), including those with learning difficulties (Grossen, 2004; Kame'enui & Simmons, 1990; Kauffman et al., 2005).

One of the most comprehensive large scale, longitudinal educational investigations of instructional approaches was Project Follow Through, conducted in the USA. This study was conducted from 1967 to 1976, with follow-up work continuing to 1995. It reviewed twenty
different approaches to educating disadvantaged students from Kindergarten to Year 3. It incorporated seventy thousand school children and one hundred and eighty schools (Adams & Engelmann, 1996). Of all the approaches, direct instruction was found to contribute most significantly to closing the gaps faced by students identified as at-risk of school failure (Adam & Engelmann, 1996; Ellis, 2005; Engelmann, 1970; Engelmann & Carnine, 1991).

Support for direct instruction was also provided in an early review of research conducted in Australia (Lockery & Maggs, 1982). This review argued that, when used appropriately, direct instruction was effective in supporting both mainstream students and those with learning difficulties. Further Australian studies of effective intervention strategies for students with learning disabilities in mainstream primary school have recently concluded (see for example Rowe, 2006; Rowe & Stephanou, 2007). The Third Wave project and the Intervention Project Working Out What Works have shown that much of what is currently implemented in schools for mainstream children and children with learning difficulties is grounded in findings from evidence-based research (Rowe, 2006). In particular, the most effective instructional strategies for students with learning difficulties were found to be a combination of aspects of direct instruction and strategy instruction.

Other studies have addressed the effect of instruction-based approaches on student performance in mathematics. For example, in a study of the application of fractions, decimals and percentages, fifty-eight students from Years 5 and 6 were randomly assigned to either a direct instruction group or a constructivist group (Grossen & Ewing, 1994). The results demonstrated that students in the direct instruction group performed significantly higher than those students assigned to the constructivist group. Another study addressed the effects of direct instruction on the performance in fractions of thirty middle years school students from twelve to fourteen years of age, who had learning difficulties in mathematics (Flores &
Kayler, 2007). The results demonstrated the statistical and educational significance of the program.

In a comparative study of teacher-student interactions in mathematics conducted in Russia and England, different patterns of interactions were noted (Wilson, Andrew & Below, 2006). These findings seem to justify a more traditional approach over a more reform-based one. The Russian lessons focused on mastery of factual and procedural knowledge of mathematics content through repetition of previously taught procedures that reinforced algorithmic approaches, whereas the English lessons emphasised individual ideas and justifications of responses to a task. That is, the Russian context prioritised performance using prescribed approaches, whereas the English context placed importance on students applying reasoning to new mathematical situations and ideas. The study highlighted the difference between the English approach that asked students to think for themselves about mathematics which they might not have grasped, and the Russian approach that motivated the students as it built their capability, confidence and enjoyment of mastery of mathematics. The Russian approach supported the students’ interest and performance in mathematics (Mullis, Martin & Foy, 2005).

Other recent studies have shown the benefits of direct instruction for student progress in mathematics. One Australian study examined Year 7 students’ self-efficacy in mathematics using a direct instruction model (Farkota, 2003). This study of nine hundred and sixty-seven school students across fifty-four different classrooms from 2001-2003 found that direct instruction was significant for improving students’ self-efficacy, and in consequence for improving their performance on mathematics tasks. In short, proponents of direct instruction claim they have a solid base from which to argue because of the theory and consistent evidence-based statistical research that informs and drives it (Farkota, 2003; Hempenstall,
Critiquing Instruction-based Approaches

A substantial critique, typically informed by a reform perspective, has been levelled at the traditional and behaviourist approaches to mathematics teaching and learning. There are two dimensions to this critique. At the level of theory, it is largely driven by liberal-progressive and cultural studies assumptions about human nature and society (Beane & Apple, 1999; Dewey, 1916). At the corresponding level of practice, the argument is typically based on ethnographic accounts, interviews and case studies of teachers and students, schools and classrooms. It is in this second level, the level of practice that much of what follows is set. It is important to note that this critique is often directed more at what was observed in classrooms than the ideal formulations of, for example, direct instruction. Here, too, Bernstein’s (1990) insight into the ways in which practices at the workplace differ from their initial formulation is pertinent. That is, what is observed and called into question in classroom practice may be somewhat removed from an ideal situation.

Certain practices central to traditional approaches to mathematics education have been identified in a number of reform-based studies of mathematics classrooms (see for example, Boaler, 2002; Schoenfeld, 2006; Wood, Shin & Doan, 2006). These practices were found to inhibit student engagement in learning mathematics. They had a substantial influence on how the students identified themselves as mathematics learners, to the extent that some students reported that they could not do mathematics. These practices include, a didactic teaching style, memorisation and rote learning; teacher to student communication and interaction; learning mathematics from a textbook; a common fast pace of work in mathematics classrooms; streaming students by ability; and pen-and-paper assessment. This selection is now critically examined from a reform perspective, with attention to the effects of their
application in classroom contexts.

**Instructional Style**

A didactic teaching style is associated with a long standing tradition of mathematics education, in which mathematics teachers, as the authoritative possessors of the requisite mathematical knowledge, transmit approved parts of it to those who do not possess it, their students (Scherer & Steinbring, 2006). In this transmission or ‘sender-receiver’ model of education (Scherer & Steinbring, 2006), the receiver is passive and their function trivialised (Wertsch, 2001). Their task is about extraction—to find the meaning in the words, take it out of them, and get it into their heads (Wertsch, 2001). Such an approach, with its emphasis on “processes of repetition, replication and reproduction of received knowledge” (Kalantzis, 2006, p.17) seems ill-suited to the reality of an increasingly knowledge-based and innovation-based economy.

In the transmission framework, and in contrast to those expectations, mathematical knowledge remains fixed and eternal; it is taught, not discovered (Wertsch, 2001). The teacher provides information, demonstrates procedures, and determines whether the necessary knowledge has been acquired through questions that require rehearsal and recall of the relevant facts or procedures (Kyriacou, 2005a; Kyriacou & Goulding, 2006). Hence opportunities for students and teachers to discuss together not simply how, but why the procedures work are necessarily limited. Teaching, learning and mathematical knowledge continue to be viewed in isolation rather than as three interactive elements of a “didactic triangle” (Scherer & Steinbring, 2006, p. 159).

Moreover, if mathematics is seen as the transmission of knowledge with minimal or no discussion, it follows that it is about rote learning, rehearsal, memorisation and isolation (cf. Kalantzis, 2006). In primary and secondary classrooms that reflect an instructivist
approach, an overemphasis on memorisation of procedures has been found to occur instead of conceptual understanding (Cooney, 2001; D’Ambrosio & Harkness, 2004; Wood, Shin & Doan, 2006). Typically in these classrooms, superficial memorisation rather than fluency and flexibility (Wood, Shin & Doan, 2006) is the natural concomitant to instructing and lecturing students (Cooney, 2001).

Thus, as students move through the grades of schooling, limited opportunities are provided for defending answers and justifying their mathematical thinking. Their learning of mathematics becomes largely procedural with minimal opportunities for inquiry and constructing an identity as a successful mathematics learner (D’Ambrosio & Harkness, 2004). A focus on the transmission of mathematical knowledge rather than learning how to inquire into mathematical ideas with understanding (Carpenter & Lehrer, 1999) means that most students receive little or no practice at participating in solving mathematical problems (Schoenfeld, 1994). In mathematics classrooms that adopt a traditional approach, students learn that there is only one correct way to solve mathematical tasks—usually the rule most recently demonstrated by the teacher (Schoenfeld, 1994). However, step-by-step instructions for working through rules that emphasise speed and accuracy have been shown to limit any form of knowledge construction or inquiry (Brown, Askew, Rhodes, Denvir, Ranson & Wiliam, 2003).

In short, in the critique of a didactic style of teaching, the following points have been made. Classroom interaction is largely a one-way process from the teacher to students. When confronted with this style of teaching, learners have limited opportunities to inquire and investigate mathematics. Memorisation, rehearsal and rote learning are inevitable concomitants of this process. The assumptions underpinning this approach have been brought into question, in particular, that mathematics knowledge can be passed or handed over from
the teacher to the student (Scherer & Steinbring, 2006; von Glasersfeld, 1991). A more
detailed examination of teacher and student interactions within a traditional approach to the
teaching and learning of mathematics is now appropriate.

*Communication and Interaction*

Traditional classroom communication is characterised by “teacher dominated classroom talk,
most learners silent for most of the time” (Kalantzis, 2006, p. 17). That description seems
appropriate for many mathematics classrooms where the teacher is the authority on
mathematical knowledge, while students by definition lack that knowledge. Consequently,
classroom communication is directed and controlled by the teacher. It is initiated by the
teacher, directed to a student or students, who respond, and the teacher then evaluates their
response. Unless sanctioned by the teacher, and then seldom, student-to-student interaction is
not legitimated (Cooney, 2001; Lampert, 1998).

The consequences are significant. Because communication is largely one-way and
student to student interaction is inhibited, students’ opportunities to discuss and apply the
language of mathematics in social interaction are constrained (McNair, 1998). They most
likely learn a restricted and narrow version of mathematics that has come largely from the
teacher. Hence also, when they are expected to reason their solutions to mathematical
exercises and logically support their conclusions, they do not have the language or the
experience to do so because of limited opportunities to interact and communicate at a
conceptual level of understanding (McNair, 1998). Consequently, they are less likely to
succeed in using mathematical language to articulate their thinking and to justify their
responses to tasks. One might also conclude that teachers’ knowledge of what and how
students think mathematically is limited to their written exercises and test results.

More recent international comparisons of interactions between teachers and students
reported in the *Knowledge and Skills for Life: First results from the OECD Programme for International Student Assessment* (PISA) 2000 (OECD, 2001) indicate that the type of interactions between teachers and students is statistically significant when associated with student success/failure and performance. It was found that traditional one-way interaction from the teacher to the student did not support student achievement in mathematics because it provided limited opportunities to talk about mathematics.

Indeed, one-way communication appears to be a central aspect in teacher-student interaction across international boundaries. In *Teaching Mathematics in Seven Countries: Results from the TIMSS 1999 Video Mathematics Teaching* (Hiebert, et al., 2003), teachers were identified as talking more than students “at a ratio of at least 8:1 words” (p. 4). While the typical intention of teacher talk is to support students with learning mathematics, it can have the opposite effect on students (Begehr, 2006). The consequence is that they are denied opportunities to describe the content to be learned in their own words, to reflect what they are learning and have learned and what they need to learn in the future (Begehr, 2006). Their efforts to understand the mathematics content are reduced to disjointed fragments without explicit links made while opportunities diminish for them to interact genuinely in and with the overall content (Begehr, 2006). Instead, they are guided along a narrowly defined path that does not grant them time to express their own thoughts about their learning or engage with and use the mathematical language (Begehr, 2006). In consequence, they are less likely to develop and learn the rich body of language associated with mathematics and use it when talking about their learning.

In summary, in this critique of traditional mathematics, one-way communication from teacher to student contributes to limited opportunities for student exploration or inquiry in mathematics. Because of these limited opportunities, students are less likely to access or use
the language of mathematics to express their mathematical ideas. Typically, their strategies
remain in their heads, hence their teachers have limited understandings of what students know
and can accomplish. Rather, what is more likely to be known is those who can succeed and
those who do not—which is further emphasised when textbooks are a central feature of
classroom teaching.

Source of Authority

In her portrayal of traditional education, Kalantzis (2006) noted the subordination of the
teacher to the textbook as the legitimate authority of subject knowledge: “syllabi, textbooks
and disciplines command, and the teacher is the mouthpiece. . . . Teacher as medium for the
syllabus, textbooks speaking singularly for the discipline” (p. 170). In what follows, drawing
on the relevant research and literature critiquing this practice, the dominance of the textbook
in instruction-based mathematics classrooms is investigated and its consequences for
mathematics learning addressed.

Textbooks feature significantly in many primary and secondary mathematics
classrooms. Typically, learning mathematics involves doing mathematics from a textbook
(Shield, 2000). For example, according to The TIMMS 1999 International Mathematics
Report (Mullis, et al., 2000), textbooks and or worksheets of some kind were found to be used
in ninety percent of lessons. More than fifty percent of the students who participated in the
TIMSS study reported working on worksheets or textbooks in class and that the use of the
board to present mathematics was “extremely common” (p. 20).

In secondary mathematics classrooms, work from a textbook is an individual process
and is separated from other curriculum areas (Askew, 2001; Nickson, 2002). In consequence,
students learn that mathematics is about solving routine exercises that are broken into discrete
steps and isolated from their daily experiences. Furthermore, and as noted previously, they
learn that they cannot communicate mathematically because of the narrowly defined path they are guided down with its limited vocabulary often only possessed by the teacher (Nickson, 2002).

Confirming Kalantzis’s (2006) observation above, a research study of textbook use in classrooms found that authority is invested in the textbook authors and not classroom teachers (Romberg & Kaput, 1997). That is,

the expert knowledge of the teacher was deliberately subjugated to that of the textbook. Because of that process, the teacher was able to camouflage his [sic] role as authoritarian, thus eliminating student challenges of authority. (Weller, n.d., cited in Romberg & Kaput, 1997, p. 358)

For example, when textbooks were used in classrooms, teachers used the term, they—as in ‘Do it as they show you in the book’—to imply that the authors of the textbook knew what students needed to know (Romberg & Kaput, 1997). In this way, teachers reduced any likely challenges to their authority from students, potentially shifting responsibilities for teaching and learning to the authors. Consequently, the textbook and authors were used as a substitute for the teaching and learning process.

This substitution was found to be more likely in classrooms where there was heavy reliance on textbooks to demonstrate how something was done, and where learners were expected to work separately though on the same exercises to reproduce what the textbook had shown them (Romberg & Kaput, 1997). Thus teachers were released from the responsibilities of planning work and considerations of student differences in learning (cf. Kalantzis, 2006).

An international comparative study of textbook use indicated a similar dependency on their use in primary school classrooms (Harries & Sutherland, 1999). This dependency was associated with teachers relinquishing responsibility for lesson planning to the textbooks. That
is, the textbooks provided a routine and time-saving approach for teaching mathematics, and so they also informed what happened in mathematics lessons from one day to the next (Harries & Sutherland, 1999). Consequently, mathematics was discussed in relation to exercises or chapters in textbooks rather than focusing on the teaching and learning of the concepts of mathematics (Harries & Sutherland, 1999). Meaningful conceptual interaction and inquiry into mathematical concepts were less likely because getting through the content of the textbook became the driving factor. In consequence, how learning shaped students’ developing knowledge and understanding was discounted.

The use of textbooks raises further concerns about the audience for which they are intended. A study of three high school and college textbooks indicated that the same text was provided to students of varying mathematical knowledge and understanding (Raman, 2004). This one-size-fits-all approach negated meeting the requirements of students at different levels of learning. For students who experienced difficulties with reading and mathematics, learning was inhibited because of the amount of reading required to solve the problems (Gagnon & Bottge, 2006). Consequently, such students are excluded from learning about mathematics, thus reinforcing what they may already know about themselves—that they cannot do mathematics and do not belong in the mathematics classroom.

While textbooks intended for students of ‘low ability’ offer an alternative to this one-size-fits-all approach, they bring fresh problems in that they work to construct their users as lower in ability (Dowling, 1998). In this case, the teacher draws on the textbook to use with particular students, but in so doing, has assessed them as being low ability. This assessment is also associated with other labels for these students, for example, they are students who have short attention spans, and are unable to follow and cope with complex instructions and tasks (Dowling, 1998). The consequence of using the textbook is that it enables the teacher to
define the student intellectually as well as in terms of their capacity to work through a textbook.

Further investigations of textbooks and the way they are used in classrooms indicates that the activities in the texts were often poorly thought out and written, focusing more on repetition and review, with concepts covered superficially rather than for conceptual understanding (Lithner, 2004; Remillard, 2000; Shield, 2000). For example, in a study of mathematical reasoning in calculus exercises in textbooks, the exercises focused mainly on the surface properties of questions (Lithner, 2004). That is, the rules and definitions were described in the texts at the expense of the mathematical properties involved in reasoning. Similarly, while superficial tasks may have their place in textbooks, textbook authors need to provide a balance between these exercises and more complex ones where students were required to consider the mathematical properties of the exercises (Lithner, 2004). If not, the risk is that students might develop weak conceptual understandings and superficial and ineffective strategies for solving tasks. A further recommendation is that while textbook authors do not have complete authority over how textbooks were used in classrooms, writers of textbooks need to talk to teachers about the mathematics and pedagogical ideas underpinning the texts (Remillard, 2000, Shield, 2000).

Yet what reasonable alternatives to a substantial reliance on textbook use are there when, as Kalantzis (2006, p. 17) observes, the traditional classroom formulation involves “thirty or so students facing one teacher”, with “all thirty such learners regarded for practical purposes as the same [and with] one-size-fits-all curriculum and pedagogy”. Any resolution involves changing or rejecting some element or the other in this formulation.

In summary, the authority of the textbook in traditional mathematics has been addressed and its implications have been explored. When the textbook serves as the teacher
surrogate, it has the potential to exclude students from effective mathematics learning and gaining mastery of mathematical concepts they need to support them in their future schooling. When the textbook is used in a one-size-fits-all approach, the consequence for many students who, for whatever reason, cannot do the work, is failure. However, when low achieving students are provided with textbooks suited to their level, their status as ‘low ability’ or failures is further confirmed. In this ‘catch 22’ situation, how textbooks are used has the potential to increase the gap between those who can do mathematics and those who cannot or who cannot muster interest in what passes for mathematics in these books. When considered together with the common pace at which all students are expected to work through the textbook, and the prescriptive nature of communication in the traditional classroom, the mathematics textbook is a powerful tool that contributes to sorting students along the lines of success and failure in mathematics.

Pace of Instruction

A fast common pace of work in mathematics classrooms is a further consequence of what Kalantzis (2006, p. 17) described as the “one-size-fits-all curriculum and pedagogy”. Here pace refers to both the limited duration of time taken or allowed to undertake specified work and to develop conceptual understanding in mathematics lessons and the underlying pressures for curriculum delivery within a specified period—a lesson, a term or a year. While the pace at which conceptual understanding occurs varies for individual students, moving the class along at a common pace when working through a textbook is the accepted practice in many traditional classrooms and a taken-for-granted corollary of a prescribed curriculum. The pace at which students are expected to learn as they work through the textbook or workbook exercises has implications for their future success or failure in what they come to know and understand as mathematics.
The pace of a lesson has been shown to lead to tensions between the desirability of student understanding and a duty to maintain the attention and interest of the remainder of the class (Wilson, Andrew & Below, 2006). For example, in studies of English and Russian mathematics lessons, short durations of time for interactions predominated in English lessons because of the need to get through the prescribed content and to maintain the attention of the class. Hence they were found to be largely tentative listeners instead of active inquirers. In consequence, mathematics learning was largely focused on what the teacher did and said, rather than what the students learned and understood (Wilson, Andrew & Below, 2006). This was likely to be at the expense of slowing down and analysing how a response was obtained rather than getting through quantities of content (Office for Standards in Education, 2001) that was superficially taught and learned. In the Russian context, however, students were expected to listen attentively to their teachers and more time was allowed for individual students to demonstrate their oral or working responses to tasks on the board with the class listening and watching.

The negative effects of pace are particularly evident in classrooms that promote competitive learning where the focus is on speed and accuracy in mathematics. Students have been shown to demonstrate a dislike of mathematics because they perceive themselves as unable to keep up with the competitive demands of the classroom (Ulep, 2006). This stress on speed and accuracy reinforces students’ perceptions that success in mathematics is attributed to ability, thus having a negative effect on lower achievers (Kyriacou, 2005b). The consequence for many students is induced anxiety (Kyriacou & Goulding, 2004) and learned helplessness (Ulep, 2006). As a consequence of their experiences of forced pace in traditional mathematics, rather than knowing what mathematics to learn, how and why they need to learn it and where they need to go in terms of their learning, students learn that mathematics is
about success and failure.

A further negative consequence of an emphasis on speed during mathematics lessons is that students watch, copy or guess answers rather than thinking more deeply about the questions asked and the mathematics involved (Kyriacou, 2005b). This process, in part, may be associated with what students come to know as mathematics—right or wrong answers rather than inquiry. Students who need more time to think have been left behind in terms of their learning because they do not have time to discuss their responses. Low-attaining students have been found to be vulnerable to public exposure and less likely to participate because they could not keep pace (Kyriacou, 2005b; Myhill, 2002). However, the risk of slowing the pace too much has been found to fall short of the need to cover the year’s curriculum content that is assumed by the next year’s curriculum (Balfanz, MacIver & Byrnes, 2006). Consequently, in a ‘catch 22’ situation, in fact, less curriculum was found to be covered.

In findings from studies of British and Australian secondary students’ experience of learning mathematics, differences in pacing were found between upper and lower-streamed classes (Boaler, 2002; Ireson, Hallam & Hurley, 2005; Zevenbergen, 2001a). For example, British students in the upper-streamed classes experienced the mathematics curriculum delivered at a rapid pace (Boaler, 2002). Opportunities to explore, analyse and investigate mathematical concepts were limited because of the need to get through the content. However, for students in lower-streamed classes, the pace was slowed, with less curriculum content covered, more repetitive work, less discussion and analysis (Ireson, Hallam & Hurley, 2005) together with prescribed work that was considered easy (Boaler, 2002). Much like their British counterparts, lower-streamed Australian students were found to be taught a restricted curriculum at a slower pace (Zevenbergen, 2001a).

In summary, issues relating to pace in mathematics classrooms and in curriculum
coverage create tensions for teaching and learning mathematics, which, in turn have implications for what students come to know as mathematics and the extent of their participation. When the focus in the classroom is on getting through the curriculum content whilst at the same time maintaining student interest and engagement, less time is spent on inquiring into mathematics. Thus, the mathematics taught and learned is more inclined to be fast paced at a superficial level that emphasises accuracy rather than a deeper level of understanding. Consequently, what some students come to know and learn about mathematics is that it is about success and or failure, a view that has been shown to contribute to learned helplessness and or anxiety. The pace of mathematics classrooms and the extent to which mathematics concepts are addressed have the potential to contribute to sorting students along the lines of those who can keep pace and those who cannot. In consequence, students are more likely to be grouped according to their ability to keep pace and other measures such as pen-and-paper testing.

**Grouping of Students**

Streaming has been described in various ways. For example, in the USA it is described as tracking and differentiation (Linchevski & Kutscher, 1998), while the UK uses the terms set and ability grouping (Boaler, Wiliam & Brown, 2001b; Hallam & Ireson, 2006; Ireson, Hallam & Hurley, 2005). In Australia the most frequently used terms are streaming and ability grouping (see for example, Zevenbergen, 2001a). Whatever the terminology, streaming influences and shapes how students identify themselves as participatory mathematics learners and their social roles within secondary mathematics classrooms, their interactions with teachers, and their attitudes towards school and schoolwork (MacIntyre & Ireson, 2002).

The streaming of students by ability has been shown to be influential on student success and achievement in secondary mathematics (Ireson, Hallam & Hurley, 2005; Wiliam
& Bartholomew, 2004a). In studies of streaming in secondary schools, the class that students are allocated to has been shown to have a significant influence on how well they will do in mathematics (Wiliam & Bartholomew, 2004a). Thus, ability grouping has a small positive effect on high attaining students (Ireson, Clark & Hallam, 2002), while the opposite applies to students in the low sets (Wiliam & Bartholomew, 2004a). There was a range of differences between these two groupings, including the type of work covered, the teaching they were given, and what was expected of them. Further it was better to be streamed into higher classes than lower classes because their differences contributed to widening the achievement gap across an age cohort (Wiliam & Bartholomew, 2004a).

As with pace, success in mathematics has been at the expense of students finding out about what they should know and how they should learn it (Hallam & Ireson, 2005; Wiliam & Bartholomew, 2004a). What has been shown to be significant is that this practice was adjusted according to the groupings of students. For example, in the higher streamed groups, the curriculum content was covered at a fast pace, whereas in the lower streamed groups, the opposite was the case. In the lower groups, student work was undemanding and copied from the chalkboard (Wiliam & Bartholomew, 2004a). Students were provided with more structured work that covered less of the curriculum topics (Ireson, Hallam & Hurley, 2005). These kinds of experiences were found to negatively influence the students in the high and low streamed classes (Zevenbergen, 2001a).

The pressure to compete and perform and to keep pace with content delivery during lessons has been identified as causing stress among students in the higher streamed classes (Boaler & Wiliam, 2001). In these classes, the students were unable to learn the meaning of the mathematics because there was minimal time to inquire, question and explore mathematical topics (Boaler, 2002; Boaler & Wiliam, 2001). Less time was spent on
responding to individual students’ needs (Boaler, Wiliam & Brown, 2001b).

In mathematics more than any other subject, more rigid views are held that the subject must be taught sequentially and certain concepts and skills mastered before others are introduced (Gamoran & Weinstein, 1998). Mathematics teachers have been similarly reluctant to move away from streaming students because of their rigid conceptions of the subject and their belief that students could be taught more effectively when they were divided into groups of similar ability.

In summary, ability grouping has been found to be detrimental to student progress in mathematics. It has substantial implications for students’ future opportunities. That is, students in the lower ability classes are less likely to be exposed to the mathematical content of the high ability classes, thus limiting their opportunities. Students in the higher ability classes, on the other hand, experience stress because of the need to perform and keep pace with the content delivery. The practice of ability grouping has significant implications for what students come to know as mathematics. This knowledge is further reinforced through pen-and-paper testing.

Assessment

Pen-and-paper testing is a logical concomitant of streaming students by ability. Several studies (Black & Wiliam, 1998; Shen, 2002; Tierney, 2006) have shown how summative assessment such as pen-and-paper testing continues to dominate in classrooms. Summative assessment in this instance refers to a judgement that encapsulates pieces of evidence to a given point (Taras, 2005). The dominance of this type of assessment is not only a product of external standardised assessment requirements, it is also the consequence of an “assessment revolution” (Broadfoot & Black, 2004, p. 19) that prioritises quantitative data for “delivering transparency, accountability and predictability” (p. 19). In this framework, teachers provide
little or no feedback to students about their learning (Black & Wiliam, 1998). This sort of testing has been shown not to be very purposeful for day-to-day learning (Black & Wiliam, 2003) because feedback was by way of right or wrong answers rather than on developing understandings. It has been found to have a negative effect on students because of the dominance of frequent low-level skill testing rather than high-level conceptual development and feedback on their learning (Black & Wiliam, 1998).

Student performance on traditional assessment tasks, such as pen-and-paper tests, has been shown to be used to define the students’ ability in the subject (Marshall, Wiliam, Harrison, Lee & Black, 2007; Ruthven, 2002; Watson, 2001; 2002). As a consequence, student treatment is differentiated according to their performance in the tests, with ability perceived as relatively fixed and able to be measured on the basis of test scores (Gillborn & Youdell, 2001, p. 77). Thus, ability is seen as a measurable and permanent trait, a perception that restricts the capacity for learning of many students (Ruthven, 2002; Gillborn & Youdell, 2001). Increasing the predictability of test tasks and limiting them to repetitious questions and practice items imposes further restrictions on student capacity for learning (Watson, 2001). Hence items that have been identified as encouraging rote and superficial learning, with the giving of marks overemphasised (Marshall, et al., 2007), should not be considered reasonable grounds for determining students’ knowledge and understanding of mathematics (Watson, 2001). Finally, when interpretations of formal assessment are made, ability has been found to be shaped by comparisons between and within groups of students (Ruthven, 2002).

These comparisons, focused on recognisable understanding in relation to peers, have tended to undermine many students’ interest in learning, particularly those students considered less successful in mathematics (Marshall, et al., 2007). Students who perceived themselves as unable to do mathematics have been shown to give up in advance because they
have learned that the only measure of success in mathematics is on a test and only a few people will get it (Ulep, 2006). Once more, what students such as these learn is that they cannot do mathematics.

Poor achievement in mathematics assessment has been found to occur in the same social groups of students, reinforcing the idea that mathematics assessment is a tool for sorting different groups of students (Berry, 2005; Bol & Berry, 2005; Walkerdine, 1998). Unfortunately, when students have been viewed as possessing the problem, they have been precluded from the very things they needed for their success in mathematics, that is, “an interest in, and curiosity about their surroundings, perseverance, and enthusiasm” (Walkerdine, 1998, p. 140). How students were perceived as a result of assessment has influenced how they identified themselves as mathematics learners, thus “forcing them into an unbreakable circle of performance” (Walkerdine, 1998, p. 146). That is, if students saw themselves as unsuccessful in mathematics they were not likely to have a strong sense of themselves as mathematics learners nor were they likely to participate in the mathematics learning of that classroom.

Achievement on tests has also been shown to be closely associated with teacher expectations of groups of students (Bol & Berry, 2005; Thompson, 2004). Differences in teachers’ expectations of particular groups of students work to widen the gap between those students who can perform well on tests and those who cannot (Bol & Berry, 2005). The consequence for low achieving students is that the emphasis is placed on teaching and testing basic, low-level skills (Lubienski, 2002). Consequently, when particular groups of students do demonstrate that they are capable of achieving, they are confronted with the low expectations of the teacher, thus constraining their educational opportunities in the subject.

In summary, pen-and-paper testing has been shown to influence students’ learning of
mathematics significantly in the short and long term. Students do not receive purposeful feedback on their day-to-day learning nor do they find out and know where to go in terms of their mathematics learning for the future. What they do learn is that they can succeed or fail on a test. Their performance on such tests contributes to how they are treated, with ability seen as a permanent trait that is relatively fixed. In short, pen-and-paper testing should not be considered reasonable grounds for determining what students know and can do in mathematics.

**Summing Up: The Case against Instruction-based Mathematics Practices**

Six practices identified from a substantial body of research critiquing instruction-based mathematics have been reviewed in sequence. This review has noted the consequences of each practice for student learning in mathematics. What was also noted was that these practices do not operate in isolation. This section draws on that evidence to evaluate the combined effect of these practices on student learning in traditional mathematics classrooms.

In a didactic style of teaching, mathematical knowledge is transmitted to the class with minimal or no discussion. The teacher is the authoritative possessor of knowledge, and students are passive recipients of selected aspects of that knowledge. This knowledge is inculcated by drill for memorisation and the working through of graded exercises in textbooks and worksheets or board work. This use of texts constitutes a further authoritative source of knowledge and further inhibits active student involvement in understanding mathematics. Knowledge acquisition is thought to be ensured by pen-and-paper testing.

Testing enables students to be graded according to ability, where ability refers to their actual performance in these tests. This process of classification into degrees of success or failure supports the establishment of homogeneous ability groups, that is to say, groups of students whose tested performance is relatively comparable. This differential grouping
justifies teaching mathematical knowledge ‘appropriate’ for each group and forms of teaching deemed appropriate for the capacity of each group. In this situation, while less successful students can readily fall to a lower ability group, the possibility for students to move to a higher group is limited, because they lack access to the skills and knowledge possessed by that group.

In this didactic framework, however, while teaching is pitched to the group and a common test is given to all, students work and are tested as individuals. Group interaction or student-teacher interaction is limited or non-existent. Through this ongoing individualised competitive process, winners and losers are defined and labelled. Again, since work is pitched at the level of the group, and since prescribed sets of knowledge are expected to be acquired within given periods of time, the treatment of content is likely to be superficial as the pace of teaching to a program or textbooks takes precedence over the time needed by individual students to master information.

It follows, then, that an instructivist approach to the teaching and learning of mathematics is strongly associated with student non-participation and disengagement in mathematics. Whilst some students may learn this way, others will not. Consequently, they are highly likely to disengage from the subject because the combined effects of its practices work to exclude them. These students are the particular concern of this study.

The Practices of Reform-based Mathematics Classrooms

Current reforms in mathematics education are predicated on two related assumptions. First, that teachers should develop and adopt new strategies and practices for teaching and learning mathematics (Drake, 2006). Second that active student involvement in solving complex problems provides the context for mastering the basics skills required in understanding and doing mathematics (Schoenfeld, 2006). Advocates argue that the necessary skills would
develop in meaningful problem-solving contexts, whether developed or adapted by teachers or in independent student exploration (Drake, 2006; Schoenfeld, 2006; Boaler, 2002).

Mathematics is to become more enfranchising and meaningful and less likely to “cause the documented problems of the traditional curriculum” (Schoenfeld, 2006, p. 16).

The implementation of mathematics reforms has been shown to lead to substantial improvements in student achievement across classrooms and year grades (Balfanz, MacIver & Byrnes, 2006). Reforms that focus on providing a rich and demanding curriculum, together with well trained teachers, and improved teaching and learning environments have been shown to contribute significantly to student gains (Balfanz, et al., 2006; Senk & Thompson, 2003). These gains were found to be achieved by combining evidence-based curriculum, professional development for teachers and reform practices into an integrated reform program (Balfanz, et al., 2006; Cohen & Hill, 2000).

In reform mathematics classrooms, students are provided with opportunities for three-way interaction between teachers and students (Boaler, 2002). Through this process active student engagement in learning emerges. Opportunities are provided for students to develop a deeper understanding of mathematics that is transferable beyond the classroom. Here the focus is on providing quality learning experiences rather than the press for a fast pace and learning isolated rules and procedures to cover the required quantity of work before it is tested.

Developing mastery of the language of mathematics is crucial to this process. The reform mathematics classroom provides contexts in which students can safely express their thinking as they develop and apply mathematical understandings. It provides a stable social audience and an environment where reasons, justification and so on are shaped (Clark & Holquist, 1984). This is a two-sided act—the language used to communicate is a reciprocal
relationship between the speaker and the listener, here the student and teacher or other student. Thus, a point of view is given from the community—here a community of learners of mathematics—to which the students and teacher belong (Clark & Holquist, 1984). It is a bridge or territory shared by teacher and student. When they use language, they are not transmitting information, they are consciously engaging in simultaneous understanding. It is through this process of active, responsive understanding that meaning—here mathematical meaning—is realised (Volosinov, 1973).

In short, the practices of reform mathematics classrooms strongly support student participation in learning mathematics (Schoenfeld, 2006; Boaler, 2002). They are consistent with calls in such key documents as Learning for Tomorrow's World: First results from PISA 2003 (OECD, 2004) and The Adelaide Declaration on National Goals for Schooling in the Twenty-First Century (MCEETYA, 1998). These documents support the need to reform the practices of mathematics classrooms so that students actively participate in their learning. The preferred practices include an interactive teaching style, teacher and student interactions, student-oriented sources of authority, pace for reflective learning, challenging all learners with tasks and groupings; and assessment for learning. In what follows, their application in reform mathematics classrooms is addressed and supporting evidence provided.

**Instructional Style**

An interactive teaching style is characterised as an approach that is actively intended to involve students in lessons through the use of higher-order questions that seek to challenge and extend their mathematical thinking (Jones & Tanner, 2002; Kyriacou, 2005a; Kyriacou & Goulding, 2006; Schoenfeld, 1994). The students’ responses are built upon and elaborated by their peers and teacher through probing questions. This style of teaching takes the interplay between mathematical knowledge, teacher and learner as central to mathematical
investigations (Cobb & Yackel, 1998). In doing so, it considers the social process of teaching and learning and their relation to each other (Scherer & Steinbring, 2006). In short, it is the antithesis of the traditional didactic style of mathematics teaching.

The form and quality of an interactive teaching style are critically important for successful teaching and learning in mathematics classrooms (Jones & Tanner, 2002). Indications of quality include higher-order questioning, the provision of challenging tasks that require the students to think, explain and discuss their own mathematical ideas, and collaborative problem solving (Askew, Brown, Rhodes, Johnson & Wiliam, 1997; Denvir & Askew, 2001). Through these processes, students are expected to articulate and discuss their methods using the language of the context within a supportive classroom environment (Jones & Tanner, 2002). In doing so, interacting and thinking mathematically become more than just using mathematical techniques, although their mastery is an element of the process. They provide a way of making sense of and analysing mathematical information, and engaging in a mathematical community (Jones & Tanner, 2002). What was previously learned then becomes an explicit topic for further discussion and participation in mathematics discourse, thus opening possibilities for further mathematics learning (Cobb, Boufi, McClain & Whitenack, 1997).

Improving the quality of teaching styles to focus on effective communication has been shown to improve the quality of students’ mathematical understanding (Scherer & Steinbring, 2006). Here improvement focuses on communication with the students rather than communication from the teacher (Scherer & Steinbring, 2006). The challenge is to shift from teacher-focused communication to student-focused communication to improve the quality of the students’ learning and mathematical understandings.

In summary, an interactive teaching style is effective with supporting student learning.
It provides enhanced opportunities for students to inquire, think and explain their mathematical ideas. These ideas are articulated through discussions of their methods to solve tasks. By communicating their ideas with the support and encouragement of their teachers and peers, the quality of their mathematical learning is enhanced. They come to know mathematics as something that exists in everyday life and not just in a textbook—while it is complex and challenging it can be talked about to further conceptual understanding. These understandings are further enhanced by the kinds of interactions found in reform mathematics classrooms.

*Communication and Interaction*

An interactive classroom is the natural corollary to an interactive teaching style. The nature of classroom relationships—between teacher and students and student and student—is crucial to student learning in the reform classroom. An interactive classroom, then, is one in which, guided by the teacher, students find ways that allow them to interact, inquire and discuss their understandings about mathematics, and relate this to the world beyond the classroom (Cobb, Boufi, McClain & Whitenack, 1997; Schoenfeld, 1994, 2002). To address this process in more detail requires defining a teaching and learning of mathematics that reflects “finding out why given techniques work, inventing new techniques, and justifying assertions” (Romberg & Kaput, 1997, p. 5). As noted earlier, though, an interactive classroom is not a disorderly context, it is a work in progress that requires maintenance, and its focus remains on enabling students to acquire and apply mathematical understandings.

Thus, instructional activities have been found to contribute to effective interaction in classrooms, and the activities realised in such interactions have been shown to support the students’ mathematical development (McClain & Cobb, 2001). During interactions between teachers and students and students and their peers, students attempt to convey their
understandings and in doing so transform what they are attempting to convey (Thompson, 2001). In short, through classroom interactions, students’ understandings of what is mathematical are transformed.

This approach, learning mathematics through interaction with peers and teachers, has been advocated to encourage student participation and inquiry in mathematics classrooms (Goos, 2004; McClain & Cobb, 2001; Renshaw, 2002; Schoenfeld, 2002; Thompson, 2001). From this viewpoint, when students and teachers interact, discuss, and challenge their mathematical ideas, students were found to inquire and participate in their learning (Goos, 2004, McClain & Cobb, 2001). The use of language in this engagement provides teachers with indicators of the students’ confidence and competence in mathematics (Bills, 2003). In this process of evaluation, the teacher takes into consideration the language of the context, that is, of mathematics. In short, participation in the social learning of a community provides for ways of knowing, talking, presenting ideas, and procedures for communicating about mathematics (Goos, 2004).

Here, the twin processes of “replacement and interweaving” patterns of discourse (Brown & Renshaw, 2004, p. 135) in classroom talk assist students to make sense of the mathematics being presented to them. The term replacement refers to “the substitution of ‘everyday’ understanding with a more sophisticated conventionalized understanding”, whilst interweaving refers to the “maintenance of an interaction between the everyday and scientific concepts” (Brown & Renshaw, 2004, p. 135). These two processes focus on extending student participation in mathematics beyond presenting a single perspective to exploring how mathematics concepts may be used as a means to explain thinking and understanding.

More generally, however, the nature and quality of interactions during the teaching and learning process and the relevance of a mathematics curriculum to students’ lives have
been found to be crucial for successful learning (Gagnon & Bottge, 2006). For example, in studies of youth in short (several days to 4 weeks) and long (several months to a year) alternative schooling, a curriculum that focused on working on application problems was found to engage the students in learning. Students learned mathematics through working on problems that required building skateboard ramps and the graphing the performance of cars. Through this process, the students and teachers centred their focus on solving problems that were engaging and motivating for students.

In summary, the interactions between teachers and students in mathematics classrooms have been shown to affect significantly the quality of the learning experience for students. In these contexts, students are exposed to mathematics in ways that engage them in inquiry and questioning the mathematics to be learned. Throughout the interactions the teacher supports students in using the language of mathematics and to take risks when doing so. This process enhances the students’ conceptual understandings as they articulate their thinking through language in the social context of the classroom.

Source of Authority

In a reform-based approach, with its underlying assumption that knowledge, including mathematical knowledge, is a human construction, grounded in experience and open to challenge and revision, the sources of authority are multiple (Boaler & Wiliam, 2001; Schoenfeld, 1994; 2002). They are student-centred in the sense of building on or utilising the experience, interests or needs of a student or group of students. In these terms, mathematics education is situated learning (Boaler & Wiliam, 2001). Its knowledge is knowledge in context, it is activity-based as students use and develop knowledge in practice, through for example, open-ended projects, need-based or collaborative problem-solving (Fennema, Sowder & Carpenter, 1999; Sullivan, Mousley & Zevenbergen, 2006).
This is not to deny the authority of the teacher nor indeed the relevance of various other resources, whether books and digital sources of information, the local community or other students. Teachers’ authority resides in their content knowledge, their expertise in pedagogy, and their understanding of the students with whom they work—their background, their interests and their level of mathematical competence. Understanding and directing the pace at which teaching and learning occurs is part of that expertise.

Pace of Instruction

Pace for reflective learning refers to time provided for students to reflect on their learning and which promotes challenging and extending students’ thinking. It provides sufficient time for students to reflect on their thinking and respond (Henningsen & Stein, 1997; Jacobs & Morita, 2002; Kyriacou, 2005a; Sangster, 2006) and think about what they were doing and why (Clarke, 1997).

A clear preference for pace for reflective learning has been identified in reform mathematics classrooms (Kyriacou, 2005a, 2005b). The pace of such lessons promotes active engagement by teachers and students in the learning process (Denvir & Askew, 2001; Tanner, Jones, Kennewell & Beauchamp, 2005). Together, they are expected to provide the social conditions for thinking strategically (Tanner, et al., 2005). In this engagement, opportunities for students to reflect on, formalise and objectify their past and present actions are orchestrated by the teacher. This process leads to improved learning and achievement (Jones & Tanner, 2002; Tanner et al., 2005). Teachers were found to support students’ thinking by altering the pace of discussions appropriately. This process enabled students to clarify their descriptions of their solutions with their peers and their teacher (Fraivillig, Murphy & Fuson, 1999). It provided time for the teachers to engage with the students in their mathematical learning. It also enabled teachers to extend on the students’ knowledge and provide
demonstrations when and where necessary to support their thinking.

In a study of Indigenous and other school students in primary, secondary and tertiary levels of education learning to read across their curricula (Rose, 2004), scaffolding and reduced pace was found to support them with their learning. Scaffolding learners and their learning was shown to support students in “operating at much higher levels than they can independently” in learning contexts (Rose, 2004, p. 105). When the pace of the content curriculum was reduced, the “underlying literacy development curriculum” was accelerated through explicit instruction (Rose, 2004, p. 105).

In summary, pace for reflective learning provides time for students to think about what they are learning and why. It provides opportunities for teachers to promote further challenges for students to build on from their present understandings. In turn, this creates opportunities for students to communicate their ideas and in doing so, further develop their articulation of the language associated with mathematics with their thinking. Pace for reflective learning is also a necessary correlative of differentiated tasks and grouping.

**Grouping of Students**

The term, differentiation, has been identified as referring to different aspects of schooling (Brandstrom, 2003; Emanuelsson & Sahlström, 2006; Tomlinson, 2000). For example, organisational differentiation relates to ability grouping and pedagogical differentiation refers to the actions carried out in classrooms in different ways for and by students and teachers (Emanuelsson & Sahlström, 2006). Pedagogical differentiation is the focus here.

The intention of pedagogical differentiation includes challenging all students by providing them with tasks at different levels of difficulty. This provision means that the selection of tasks, the pace of the work and student interest are taken into consideration (Brändström, 2003; Brooks, Libresco & Plonczak, 2007). As a consequence, individual
student differences are provided for (Emanuelsson & Sahlström, 2006). For example, students have opportunities to work individually, as a group or with the teacher. Students less likely to speak to a class have opportunities to speak with the teacher or small group. Further, different textbooks and learning materials more suited to particular students’ learning styles are made available for the students to draw on when needed (Brändström, 2003). This has been found to be a useful tool for engaging students at different levels of mathematical understanding in a classroom (Hallam & Ireson, 2006). When differentiation is considered in this sense, flexibility on the part of the teacher and student is required to support further student learning and participation in mathematics.

Differentiation requires instructional clarity (Tomlinson & Kalbfleisch, 1998; Tomlinson, 2000). That is, teachers draw on what they know about students, their current readiness, their interests and learning styles, to present learning options at different levels of difficulty to ensure that the students are challenged at their readiness levels (Tomlinson & Kalbfleisch, 1998). Readiness in this sense refers to students who are the same age but differ in their readiness to learn, their learning styles, their life experiences and circumstances (Tomlinson, 2000). These differences are shown to influence what students know, what they need to learn, the pace at which they learn and the learning support needed from teachers and other. Teachers can present information for students orally, visually, and through demonstration. The intention of the teacher is to attend to individual learners as well as the whole class. In doing so, the goal of the teacher is to meet students at their beginning points and move them along a continuum of growth and learning as far as possible, with no end point or ceiling (Tomlinson & Kalbfleisch, 1998).

The actions of the teacher are crucial to providing differentiated tasks (Sullivan, Mousley & Zevenbergen, 2006). These actions require clear mathematical goals that
contribute to student achievement. The goals include careful considerations of the tasks that encourage students to inquire and engage in learning (Sullivan, et al., 2006). For example, open-ended tasks work to provide students with opportunities for extending their mathematical thinking, exploring a range of options and making decisions and generalisations as they work through the tasks. Consideration is required of how the tasks are sequenced and how the students engage with a succession of tasks to ensure they have the necessary experience to complete the task (Sullivan, et al., 2006). These considerations include the direction of the teaching and learning, the activities undertaken by the teacher and students and predictions of the students’ thinking and understanding that emerges through engaging in the task (Sullivan, et al., 2006).

As students engage in the tasks, teachers are required to consider how they will provide the necessary support that is, enabling prompts and tasks to extend thinking (Sullivan, Mousley & Zevenbergen, 2006). Prompts include those that allow students experiencing difficulties to engage in and with the activities related to the initial tasks, rather than pursuing goals different from the class. Tasks that extend thinking include those that are open-ended and thus allow the exploration of a range of solutions and generalised responses (Sullivan, et al., 2006).

Differentiation suggests that students can be challenged through multiple instructional groups (Tomlinson, 2000; Tomlinson & Germundson, 2007). That is, teachers can further encourage student participation in learning by altering the ways that students work. These ways include assigning students to groups based on similar-readiness, mixed-readiness, similar-interests, mixed-interests, similar-learning styles or mixed-learning styles (Tomlinson & Kalbfleisch, 1998). Teachers can work with students who are advanced on a particular topic to further their thinking and understanding. They can work with students who need
additional instruction and guided assistance with their learning and create mixed-readiness teams of students who work to solve a problem, defend their team’s approach and explain the reasoning behind the solutions (Tomlinson, 2000). Differentiation in this sense moves beyond covering the content or creating activities. It provides an alternative approach where students of varying backgrounds, experiences, interests and readiness levels are likely to experience appropriate challenge and make sense of powerful ideas (Tomlinson & Kalbfleisch, 1998).

Through these various groupings, a class can be kept as a unit or a learning community. In doing so, the teacher can respond to the different learning needs of students (Linchevski & Kutscher, 1998). The idea is not to bring all students to the same achievement level. Rather, the intent is to enable students to progress fully in their achievement, through a combination of shared topics for all students and differentiated activities for students according to their achievement level (Linchevski & Kutscher, 1998; Sullivan, et al., 2006; Tomlinson, 2000). In this way, students are more likely to learn mathematics effectively in and with their class, as collaborators with their peers and with their teachers, feeling confident about their progress.

In summary, differentiated tasks and groupings challenge all students because of the provision of tasks at different levels of difficulty. The students’ interests and readiness to learn combined with the choice of tasks and the pace at which they are expected to learn are considered. This consideration means that the individual student differences are recognised and supported, thus enhancing their opportunities to engage in learning for mathematical meaning and understanding. However, this requires instructional clarity on the part of the teacher. That is, clear goals for learning need consideration to encourage student achievement and the kinds of support they require.

The ways that students work and their particular learning styles are well supported by
the use of differentiation of instructional groups. This approach provides an alternative to ability grouping by recognising the particular backgrounds of students, their experiences, what they bring to the learning context and their readiness to learn. Groupings may include mixed-readiness teams, mixed-interest groups and mixed-learning style groups. These groupings provide opportunities for students to experience appropriate challenges and make sense of mathematical ideas. The task for teachers is to find out about their students, their learning styles, their interests and readiness to learn. One way this can be achieved is by using assessment that focuses on learning and provides students with feedback and insights into their current and future learning.

Assessment

An important characteristic of reform mathematics classrooms is a continuous process of assessment derived from information on student achievement throughout mathematics lessons (Even, 2005; Skalicky, 2005). In this way, assessment becomes a routine part of the ongoing teaching and learning of mathematics rather than interrupting that process (National Council of Teachers of Mathematics, 2000). In an ideal sense, instructional tasks and assessment occur simultaneously, thus advancing and assessing the students’ learning (Even, 2005) and informing the teaching process (Skalicky, 2005).

Thus assessment provides evidence from which to make decisions about what students know, where they need to go and how to get there through the processes of learning. It moves from a concentration on summative assessment, where judgements are made about pieces of evidence to a given point (Taras, 2005) and formative assessment, where judgement is based on pieces of evidence about any gaps “between the actual level of the work being assessed and the required standard” (Taras, 2005, p. 468), to assessment for learning. It does this in order to help students to know and to recognise the standards of achievement they are aiming
towards (Black & Wiliam, 1998; Broadfoot, et al., 2002b) and to assist the teacher in identifying areas for improvement. The marks or remarks on traditional modes of assessments may tell students about success and failure, but they may not indicate how students are to make progress in their learning (Broadfoot, et al., 2002b). Assessment for learning however is a process for “seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there” (Broadfoot, et al., 2002a, p. 2).

Assessment for learning uses a range of methods that provide a rich and comprehensive account of what students know and understand. They include observing how students explain their mathematical reasoning, using open-ended questioning that invites students to explore and inquire into their ideas and reasoning, providing tasks that require students to draw on their skills and to apply ideas, and providing opportunities for students to communicate their thinking through drawings, artefacts, actions, role play, concept mapping, writing and mathematical language (Broadfoot, et al., 2002b). The use of these methods requires that teachers make informed judgements about the next steps in learning and action in assisting students to take these steps and act on these judgements (Black, Harrison, Lee, Marshall & Wiliam, 2002; Broadfoot, et al., 2002b). The evidence is that the more students are involved in decisions about their learning and the next steps to be taken, the greater their understanding of how to extend their learning (Broadfoot, et al., 2002b). This approach to assessment for learning actively involves students in feedback on their learning, and in doing so, provides them with a view of what they should be aiming for and the benchmarks against which they can compare themselves. The role of the teacher in this instance is to provide the skills and strategies for students to be able to take the next step in their learning.

Assessment for learning then, prioritises the promotion of student learning in design
and practice (Black, Harrison, Lee, Marshall & Wiliam, 2002). It serves as a set of informative instructional tools to guide future planning, teaching and learning (Even, 2005; Shepard, 2001; Van den Heuvel-Panhuizen, 2003). The techniques and or strategies used to assess students play an important role in guiding these processes. They include comment-only marking, sharing criteria with learners, student peer-assessment and self-assessment (Wiliam, Lee, Harrison & Black, 2004b). These techniques are grounded in constructivist and social constructivist ideas of mathematics and mathematics teaching. They provide rich information about students’ thinking abilities and how they apply their knowledge (Van den Heuvel-Panhuizen, 2003).

Teaching practices have been found to be a significant part of the instructional decisions made as a consequence of assessment (Cooper, 2006; Pegg & Panizzon, 2004). The types of questions asked of students during classroom interactions and on assessment tasks, and the provision of greater opportunities for students to talk, were shown to assist teachers in understanding their students’ learning and higher-level thinking (Pegg & Panizzon, 2004). Consequently, teachers’ practices were enhanced as was their understandings of what students knew and understood.

However, this enhancement is contingent on the teacher’s ability to use assessment data to improve instructional decisions. It was found to be related to the teacher’s sense-making of what students said, did and wrote (Even, 2005). Hence teachers who use assessment for learning methods need to move from an evaluative mode of listening to an interpretive mode to understand their students’ knowledge, their ways of learning mathematics, their misconceptions, and to present relevant tasks that require students to inquire and justify their solutions (Even, 2005).

In summary, assessment for learning significantly influences the teaching and learning
process. In particular, it provides a comprehensive view of student achievement. It provides information that requires teachers to make decisions and informed judgements about the directions they take students in terms of their learning. It informs students of these decisions and judgements through the provision of feedback on their learning. Students then have useful information about their learning, how to further extent this learning and aim for particular standards against which they are compared. The role of teacher is to provide the skills and strategies that enable students to take the necessary steps in their learning.

The Case for Reform Mathematics Classrooms

The practices of reform mathematics have been shown to provide quality teaching and learning in mathematics classrooms. Each requires and presumes the other. An interactive teaching style implies an interactive classroom. An interactive class requires an appropriate pace for reflective learning. Adjusting pace for reflective learning implies pedagogical differentiation to challenge all learners with tasks at appropriate levels of difficulty. This in turn is matched by assessment that contributes to learning. All of these require an interactive classroom and an interactive teaching style.

In and through their interplay, these practices significantly support student participation and engagement in mathematics learning and the language of such contexts. However, this is not a laissez-faire or ‘anything goes’ process, as earlier critiques from direct instruction assumed. The teacher is central to this process. She or he is the one who considers how students are supported with their learning, how they are informed of their learning, and how they need to build on and extend their learning. She or he has the means and the opportunities to enable this to occur. The teacher provides clear instructional goals to the students so that they are aware of their learning and where they are heading. In turn, students are required to actively participate and engage with teachers through the teaching and learning
process. The enabling practices of reform mathematics classrooms when combined make provisions for this engagement and participation to occur.

The Case against Reform Mathematics Classrooms

Opponents of reform mathematics present a wide-ranging critique of its limitations and failures, much of it evidence-based. At the level of practice, it is highly criticised as inefficient and ineffective, whether in acquiring basic facts and skills or advanced concepts and processes (Klein, 2007; Kozloff, 2003b; Rowe, 2006). There are several contributing factors to this situation, for example, the assumption that students can construct knowledge whilst under tutelage of a more capable adult. Whilst the support of an adult is reasonable and to be expected, knowledge construction is far more complex and difficulties may arise when the student is unable to construct this important knowledge and the teacher does not have the necessary mathematical knowledge to impart to the student (Heward, 2003). A student-centred approach is difficult to manage and organise at best because students cannot be held constant and can be unpredictable, whereas instruction can be carefully controlled and constant (Engelmann & Carnine, 1991).

Again, students who do not initially acquire the basic mathematics skills necessary for solving problems are likely to find acquiring these skills increasingly difficult as they progress through their secondary education (Farkota, 2003). A further problem arises when learning tasks are not supported with explicit teaching, or indeed when they replace it, because it is assumed that students “have adequate knowledge and skills to efficiently and effectively engage” with these tasks (Rowe, 2006, p. 105). Without such a foundation, students are unlikely to master more complex concepts such as the integral calculus. More, while effective instruction and use of curriculum materials can make a difference, all this depends on the extent of the teacher’s understanding of the subject matter. Teachers who
“lack preparation in instruction of mathematics can hardly be expected to play the role of effectively facilitating students’ active engagement in the direction and the progress of instruction” (Rumph, et al., 2007a, p. 10). Indeed, “how teachers know mathematics is central to their capacity to use instructional materials wisely, to assess students' progress, and to make sound judgments about presentation, emphasis, and sequencing” (Ball, 2003).

Ironically, opponents of reform education argue that the diverse needs of students are not being meet in the reform classroom (Hempenstall, 2004; Heward, 2003; Kame'enui & Simmons, 1990; Kaufmann, et al., 2005). At the centre of this argument is the reform claim that the inclusion of all students is the thing to do because anything else disenfranchises them (Kaufmann, et al., 2005). However, while education policies advocate such mandates, under the “surface of many of these policies, we find that they exacerbate inequities and confusion. The rhetoric of full inclusion simply does not support a rational and humane policy” (Kaufmann et al., 2005, p. 3). Rather, it is argued, consideration should be given to differentiating instruction and standards for students with diverse abilities and needs. Explicit instruction and homogeneous grouping as opposed to heterogeneous grouping is presented as a more rational approach (Heward, 2003; Kauffman, et al., 2005).

The progressive approach is said to have “failed to consider the long-term effects of its practices” (Rumph et al., 2007a, p. 35). Many argue that this approach and its related practices have been found to contribute significantly to failing literacy and mathematics in schools (Bessellieu, Kozloff & Rice, 2001; Hirsch, 2002; Kozloff, 1999; Rumph, et al., 2007a; Rumph, et al., 2007b). Data from significant studies that have shown the detrimental effects of progressive practices have been ignored (Rumph, et al., 2007a).

Contributing further to this opposition is the progressivist view that mathematics is not so much about pre-existing truths, but that meaning is constructed and able to be negotiated
with a group of students (Kozloff, 2003b). In this situation, the teacher’s role apparently is not to transmit knowledge but to assist students with constructing their own mathematical knowledge (Kozloff, 2002). The difficulty here is that students are expected to attempt to solve problems and engage, discuss and construct their mathematical knowledge and ideas with limited or no mastery of basic skills (Kozloff, 2003a).

The question then follows as to whether it is better for students to receive implicit instruction while they work to solve mathematical situations that simulate real life or for them to be immersed in explicit instruction that focuses on managed steps that are isolated from the real life task. Given that the working memory is apparently limited, step-by-step explicit instruction has been found to be advantageous for students learning new concepts and before they solve simulated real life tasks (Hirsch, 2002). It has also been shown to benefit students experiencing difficulties with learning mathematics (Hempenstall, 2004; Rowe, 2006). Low-performing students are claimed to learn more quickly if instructions and explanations are clear and concise and they know what they are doing and what is to be learned (Kauffman, et al., 2005; Snider & Crawford, 2004). However, when instructions are not clear, students have been found to make up their own incorrect mathematical rules (Snider & Crawford, 2004).

A substantive critique of progressive education here relates to its top-down approach (inferring basic skills from complex tasks) to learning in contrast to the bottom-up approach (from basic to complex skills) of explicit and direct teaching. That is, students begin with a complex task and are expected to discover the basic skills required to find a solution (Slavin, 2003). The “prerequisite knowledge for the skills to be taught” (Rumph et al., 2007a, p. 31) is neglected. Implicit instruction fails to provide the necessary gradual progression from structured to independent learning (Snider & Crawford, 2004, p. 211). Consequently, students are likely to acquire misconceptions that have an impact on their later learning (Snider &
A further criticism of the pedagogical approach advocated within a progressive approach is that it appears to assume that teachers are not to teach, show or tell, or transmit knowledge, but to facilitate learning (Kozloff, 1999; Rumph, et al., 2007a), be a guide on the side (Raimi, 2004), or lead from behind (Jones & Southern, 2003), yet it is apparently acceptable for a student peer to show and tell (Rumph, 2007a). The unfortunate inference then is that “teacher-centred instruction is bad. Student-centred instruction is good” (Kozloff, 2003a, p. 5). With a progressive approach it seems that students are allowed to discover their own individual knowledge and share their meanings with others.

Understandably, then, progressive mathematics programs are condemned as “dumbed-down”, and or “fuzzy math” where students do discovery group work at all grade levels and work on aimless and ineffective projects (Klein, 2007). There is a perceived focus on statistics and data analysis at the expense of algebra and more advanced topics such as mathematical definitions and proofs for higher grades (Klein, 2007).

Heterogeneous grouping is rejected for a number of reasons. Most importantly, few students receive the most appropriate instruction from which they would benefit (Kozloff, 2003). Consequently the students who require the most instruction fall behind. Because all students receive the same or similar instruction regardless of their differences, it is claimed to lower self-esteem and discriminate (Kozloff, 2003a).

A final stinging rebuke has been reserved for the progressivist rejection of a subject-centred and grade-by-grade curriculum for a student-centred approach:

Rejecting … emphasis on formal subject matter, the progressives began to worship at the altar of the child. Children [they said] should be allowed to grow in accordance with their needs and interests. … Knowledge is valuable only as it is acquired in a real
situation; the teacher must be present to provide the proper environment for experiencing but must not intervene except to guide and advise. There must, in fact, be “nothing fixed in advance” and subjects must not be “set-out-to-be-learned”. … No reference was ever made to the curriculum or its content. … The full weight of the progressive attack is against subject matter and the planned organization of a curriculum in terms of subjects. (Kandel, cited in Hirsch, 2007, p. 22)

Comparing the Practices and Forms of Participation in Instruction-based and Reform-based Approaches to Mathematics Education

Table 2 summarises the pedagogic practices of instruction-based and reform-based approaches to mathematics education. As indicated previously, for both, the classroom remains the field of pedagogic practices, whose participants are teachers and students. They share also a commitment to mathematics education. Where they differ is in what that

Table 2: Comparing practices of the two major approaches in mathematics education

<table>
<thead>
<tr>
<th>PEDAGOGIC PRACTICES</th>
<th>INSTRUCTION-BASED</th>
<th>REFORM-BASED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form of instruction</td>
<td>direct instruction, rehearsal, memorisation, homework</td>
<td>discovery/enquiry</td>
</tr>
<tr>
<td>Type of communication</td>
<td>didactic, top-down transmission</td>
<td>interactive</td>
</tr>
<tr>
<td>Source of authority used</td>
<td>textbook/teacher</td>
<td>student interest/project/problem-solving</td>
</tr>
<tr>
<td>Pace of instruction</td>
<td>whole group, fast</td>
<td>regulated to learner</td>
</tr>
<tr>
<td>Ability grouping</td>
<td>streamed/homogeneous</td>
<td>heterogeneous/differentiated learnings</td>
</tr>
<tr>
<td>Type of assessment</td>
<td>objective</td>
<td>assessment for learning</td>
</tr>
<tr>
<td>Student participation</td>
<td>passive</td>
<td>active</td>
</tr>
</tbody>
</table>
education is and how it should be undertaken. Thus, as the review in this chapter has made clear, they differ in the ways in which they deploy instruction, communication, authority, pace, ability grouping and assessment upon that field of practice. Similarly, as has shown in this review, they differ in the forms of participation constructed by these practices.

Hence in instruction-based approaches with their underlying behaviourist and instrumental assumptions and their associated discursive practices, students are constructed as the objects of mathematics education who are to be trained by continued practice and positive or negative reinforcement to produce appropriate (that is, correct) responses (that is, answers) to prescribed problems using the correct (that is, prescribed) method. This is indeed a transmission model in both content and process. In the focus on whole class or whole group instruction there is no provision for individual interests and little for individual instruction. Power and authority are vested explicitly in the teacher. In these approaches student participation is passive and engineered and while the focus is on the whole class, each student remains effectively a cipher.

Reform-based approaches, however, assume and require much greater and more active student participation. This is implicit in their shared assumption that students can construct their mathematical ways of knowing and that the knowledge, attitudes and interests they bring to the learning situation provide the basis on which their learning is built. In this process teachers are knowledgeable mentors and facilitators of mathematics learning who actively assist learners by scaffolding appropriate experiences and material to build on and extend their existing knowledge and abilities. This may extend to reconstructing the discursive practices of the classroom so that teacher and students together constitute a community of learners. More effective participation by those who would otherwise be disadvantaged by gender, indigeneity, ethnicity, socioeconomic or cultural background, is supported through a
commitment to socially just, equitable and inclusive practices. Though the authority of the teacher remains, the relations of power between teachers and students are fairer and more transparent.

Postscript

During the final revisions to this study, the final report of the [U.S] National Mathematics Advisory Panel (2008) came to hand. As with the Australian review (Rowe, 2006) it rejects what it describes as the “two extreme positions” of “teacher-directed instruction” and “student-centred instruction”, claiming “a mixed and inconclusive picture of the relative effect of these two approaches to instruction” (p. 45). It did however give provisional support to “cooperative and collaborative learning”, “peer tutoring” and “formative assessment” (Rowe, 2006, p. 46). There was similar qualified support the use of “‘real world’ contexts” for certain types of “problem-solving” (pp. 49-50). On the other hand, it called for “explicit systematic instruction” for “low achieving students and students with learning disabilities” (p. 48) and “differentiating the mathematics curriculum” and “supplemental enrichment programs” for “mathematically gifted students” (Rowe, 2006, p. 52-53). It called for further research that identifies

1) effective instructional practices and materials, 2) mechanisms of learning, 3) ways to enhance teacher effectiveness, including teacher education that focuses on learning processes and outcomes, and 4) item and test features that improve the assessment of mathematical knowledge” (Rowe, 2006, p. 63).

Significantly, the basis for evaluating appropriate prior and future research was highly empiricist and couched in terms such as “larger-scale randomized experiments”, “basic research”, “randomized trials”, “causal mechanisms of learning”, “explicit predictions” and testing “hypotheses”, all of which are “underemphasised in current research in mathematics
education” Rowe, 2006, p. 63). In such a framework, qualitative studies such as most of those supporting reform-based approaches to mathematics education and this study itself would be excluded. That such a report would nonetheless conclude that there was “a mixed and inconclusive picture of the relative effect” of teacher-based and student-based approaches to “instruction” (p. 45) is, to say the least, interesting. However what this report does indicate, along with that of Rowe (2006) and others (cf. Ellis, 2005; Farkota, 2003; Rowe, Stephanou & Hoad, 2007b), is the possibility of a third, pragmatic and intermediate position between explicitly instruction-based and reform-based approaches to mathematics education. That possibility will be revisited in the analysis and conclusion of this study.

Contested Terrain

At this study’s inception, the arguments advanced by proponents of reform or progressive mathematics education seemed to hold sway. As this study has progressed, a countervailing position which claims to resolve the deficiencies of traditional mathematics teaching and is growing in prominence and support has had to be acknowledged. It is now apparent that this thesis is situated on an increasingly contested terrain in what—paralleling the ‘literacy wars’ and the ‘history wars’ now well under way in Australia—has been characterised elsewhere as the mathematics wars (cf. Farkota, 2003; Hirsch, 2002; Rowe, 2006). This in turn has meant that this chapter is now necessarily much larger and broader in scope than its initial formulation.

Certain observations are in order. First, there may be considerable discrepancies between ‘best practice’ as reported in instructivist research and actual classroom practice. It could be argued, for example, that if best practice had applied in the classrooms critiqued in reform-based research the results might have been substantially different. Second, whereas the evidence for instruction-based approaches and practices depends substantially upon
quantitative studies, the evidence against them draws much more on qualitative studies. Indeed as the review to date suggests, instructivist and reform approaches might seem to hold differing constructions of what counts as ‘research evidence’. Third, the issue of practice remains itself unproblematised. This issue is addressed in chapter 3. Fourth, instruction-based approaches and practices find their justification in behaviourist ‘science’ and in varying degrees also from perennialist or essentialist assumptions about the nature of knowledge, that reform-based approaches reject. To sum up, fifth, there are two dimensions to this debate: an ideological or theoretical divide between behaviourist and progressive assumptions, and an evidential debate as to which approach produces better outcomes and how those outcomes should be defined. Yet, finally, whether or not these contrasting positions can be resolved, what is evident is that each presumes and implies the other; they compete, as Table 1 indicates, on the same epistemic field and each practice in Table 2 has its countervailing alternative. For example, the alleged failure of traditional mathematics constitutes an integral aspect of the justification of reform mathematics and vice versa. Hence also the difficulty of representing one without taking account of the other.

At this point, some sort of resolution might be expected. Rowe’s (2006) conclusion, for example, may well hold:

the relative utility of direct instruction and constructivist approaches to teaching and learning are neither mutually exclusive nor independent. Both approaches have merit in their own, provided that students have the basic knowledge and skills (best provided initially by direct instruction) before engagement in ‘rich’ constructivist learning activities. The problem arises when learning activities precede explicit teaching, or replace it, with the assumption that students have adequate knowledge and skills to efficiently and effectively engage with constructivist learning activities designed to
generate new learning. In many instances, this assumption is not tenable, particularly for those students experiencing learning difficulties, resulting in disengagement, low self-esteem, dysfunctional attitudes, and externalising behaviour problems at school and at home. (p. 105)

This chapter attempts no such conclusion. What can be done, however, is to apply these contrasting perspectives to the participants’ accounts of their experiences of mathematics education in secondary classrooms and the Youth Reconnected Program in TAFE. At issue are how traditional and reform mathematics are constructed in their accounts and what stance they take towards them.

The Gap in the Literature

The gap in the literature is the need for an alternative and comprehensive framework for understanding and addressing forms of student participation in mathematics classrooms, and the processes that inhibit and support participation. In this instance, a more effective approach is provided by articulating critical discourse theory with a social theory of learning. From within such an articulation, a framework that reveals and explains the discursive and social mechanisms that shape and form the processes of student participation and the contexts in which they operate is presented in chapter 3.
CHAPTER 3: A SOCIAL THEORY OF LEARNING AND CRITICAL DISCOURSE

THEORY

The previous chapter addressed the first and preliminary research question by reviewing and critiquing the research literature on a range of instruction-based and reform-based approaches to mathematics education and the claims and counter-claims over their effectiveness in teaching and learning in the classroom setting. Particular attention was given to their practices and forms of participation and the consequences for mathematics learning. This chapter presents two complementary theoretical frameworks, a social theory of learning (Lave & Wenger, 1991; Wenger, 1998) and critical discourse theory (Chouliaraki & Fairclough, 1999; Fairclough, 1995, 2001, 2003), to provide an effective conceptual basis from which to address the remaining research questions. In combination, they provide a lens through which powerful insights into the forms of student participation in mathematics classrooms can be gained.

A Social Theory of Learning

That learning is or can be a social process is acknowledged in such frameworks as Vygotskian socio-cultural theory (1930, 1934), social constructivism (Cobb & Yackel, 1998) the social construction of reality (Berger & Luckmann, 1966), Bandura’s (1962) work on social learning theory and critical discourse theory (Chouliaraki & Fairclough, 1999; Fairclough, 1995, 2001). However, for this study, where the aim is to develop a richer understanding of the complexity of forms of participation in mathematics classrooms and the discursive mechanisms that influence participation, a social theory of learning (Lave & Wenger, 1991; Wenger, 1998) is foregrounded because of the centrality it places upon the experiences of social processes of participation for learning and knowing.

There are four components (see Figure 1) that are intrinsic to this process: meaning, practice, community and identity. The following definitions, which are applied in the
discussion that follows, are appropriate to a social theory of learning:

1. **Meaning**: a way of talking about our (changing) ability—individually and collectively—to experience our life and the world as meaningful.

2. **Practice**: a way of talking about the shared historical and social resources, frameworks, and perspectives that can sustain mutual engagement in action.

3. **Community**: a way of talking about the social configurations in which our enterprises are defined as worth pursuing and our participation is recognisable as competence.

4. **Identity**: a way of talking about how learning changes who we are and creates personal histories of becoming in the context of our communities. (Wenger, 1998, p. 5)

*Figure 1. Components of a social theory of learning*


As figure 1 indicates, these components need to be understood relationally and in terms of their contributions to the social process of learning. Practice involves learning through action in the social setting of the community. Identity is a process of learning through becoming a member of the community. Meaning is learned through experience in and with community. Community in turn involves learning to become a member, to assume an identity.
as a member, and to make meaning of that experience. Each presumes and requires the other, and learning is central to each. These processes of the social bring learners together so that, for the purposes of this study, they can identify themselves as mathematics learners. The construction of an identity in this sense becomes a social process that is influenced by the interactions of the classroom and what is valued and considered appropriate in it. In short, a social theory of learning provides the foundations for a richer understanding of the social processes of mathematics classrooms, where learners are situated in ways that shape their identities, that is, who they are, what they do, and how they interpret what they do (Wenger, 1998). These four components of a social theory of learning are addressed in more detail in the sections that follow.

However, in contexts such as classrooms, not all identities have equal status; some have more recognition and value than others and it is this differential in power and position that can be theorised and addressed through critical discourse analysis [CDA] (see for example Fairclough, 1995, 2001; Chouliaraki & Fairclough, 1999). While Lave and Wenger (1991) explicitly denied that learning communities were necessarily egalitarian, they did not elaborate further on this point. This study attends to this issue more expansively by focussing on the relations of power and issues of struggle and conflict in such communities, and the forms of identity constructed in that process.

**Meaning: Learning as Experience**

As figure 1 indicates, learning is not a process conducted in isolation, it is related to a person’s practices in a social context, their ability to negotiate meaning in that setting and to formulate an identity in the process (Wenger, 1998). Learning becomes a social matter in which experience and its social interpretation inform each other. Through this process negotiation of meaning becomes a necessary condition for mathematics learning as described
in chapter 2 (Voigt, 1994). When students’ interpretations differ from the teacher’s, negotiating meaning is crucial. As students negotiate and communicate in that context and articulate their thinking socially, their developing conceptual understandings are increasingly reified, that is, they take a reality of their own because they are made more explicit within the social context. Through this ongoing interplay of social participation and reification learners give shape to their experiences and meaning for their learning (Eckert, 2000; Goos, 2004).

Learners’ ideas are given form through social interaction. It takes participation in a social learning context, the negotiation of meaning, knowing what to do and how to perform a task, for these ideas to become transparent. Coming to know and understand is an effect of interaction between a speaker and a listener (Clark & Holquist, 1984) or, in this study, a learner and a teacher (Brown & Renshaw, 2004). As explained in chapter 2, through such interactions students are assisted by their teachers to make sense of the mathematics that is presented. Thus, for teachers to understand a learner’s ideas, they need to orient themselves with respect to those ideas and the context within which they arise.

In this dialogic framing, interaction, meaning and understanding are intrinsically relational (Clark & Holquist, 1984). These experiences and the knowledge formulated from them serve as a basis for further construction and negotiation of meaning, here, mathematical meaning. They provide a purpose for a learning community, allowing learners to participate in the activities of that community. In short, for this study, learning becomes a process of social participation, social interaction and membership in a social group or community, here the mathematics classroom.

_Identities: Learning as Becoming_

For this study, identity has been defined as who and what people think they are in particular social contexts or communities, what they do in consequence, and how they interpret what
they do (Wenger, 1998). Identities are learned and acquired in and for social contexts; that is, they are social constructions (Pierce, 1995; Pietikäinen & Dufva, 2006). Since such social contexts are multiple and varied (family, school, work, play and so on), people develop a repertoire of identities appropriate for the variety of social contexts in which they operate (cf. Gee, 1996; Goffman, 1972; Hogg, Martin & Weeden, 2004). The relevance of any particular identity is thus in some degree a function of the social context in which a person finds themselves (McNamara, 1997; Pietikäinen, & Dufva, 2006). None of this is to simplistically infer that identities exist in a one-for-one correspondence to particular social contexts. They do not. Indeed, as Gee (1996) suggests, social actors have multiple and conflicting identities. The boy who is a local legend with his mates does not necessarily leave that identity at the classroom door, nor does the teacher who has won a medal at the Games.

In what follows, however, the concern of this study is with how particular identities are constructed and enacted in social relationships in two particular contexts, the Youth Reconnected Program and instruction-based mathematics classroom. It is acknowledged, as will be evident in the accounts in chapter 7, that students coming to the program from instructivist mathematics education bring particular identities, typically of failure or rejection (see for example, Boaler, William, & Zevenbergen, 2000), to the program setting. Developing more positive identities as successful learners of mathematics is not as simple as discarding the school uniform, along with that the various identities they bring from past contexts and experiences.

This construction of identities is a work in progress. Identities develop through and over time as people participate in and learn the practices and processes of particular contexts or communities (Fairclough, 2001). As they internalise the language, the gestures, interactions, and routines of their social setting, identities are constructed, maintained,
modified, and or reshaped (Berger & Luckmann, 1966). For example, changing schools, moving from primary to secondary school, even the commencement of a new school year, with an altered social context—a new teacher, new rules and so on—may require change or transformation of social identities for the changed or different social context (McNamara, 1997).

Thus, to understand learning requires an understanding of the identities and relationships of the learners. This in turn requires an examination of the social contexts in which learning takes place and the historical background from previous learning experiences that students bring to these contexts (Henriques, 1998). Since learning occurs through participation in social interactions, changes in these contexts and relationships may affect students’ identities as learners (Dudley-Marling, 2004).

These identities, as they develop and are expressed in the social relationships of the classroom, may be crucial to what counts as success and what is regarded as failure in classrooms (Sfard & Prusak, 2005). As before, this is not to deny that learners bring other identities to these contexts, rather the focus of this study is necessarily on the development of an identity of some form or degree of participation in the Youth Reconnected Program or traditional instruction-based mathematics classrooms.

Here success or failure in learning may be contingent on several related factors such as the differences in relations of power, the practices of the classroom context, teacher evaluations and expectations of students’ potential for learning (see for example, Berry, 2005; Lubienski, 2002; Zevenbergen, Mousley & Sullivan, 2004), and their social positioning (Fairclough, 2001; Klein & Saunders, 2004; Nasir & Saxe, 2002b). Therefore, questions about who is learning what, and how much is learned (or how little), are in some degree questions about the relations of power implicated in the learning context. Hence, for this
study, it is crucial to investigate and compare how identities are shaped or influenced by the social relationships, including relations of power, in the Youth Reconnected Program and mathematics classrooms and what this means for learning mathematics (cf. Pierce, 1995).

In the conceptual framework elaborated thus far, active engagement in classroom interactions is presumed necessary for students to learn effectively and construct an identity as a successful learner. This process requires teachers to employ practices that encourage identity construction and collaboration (McDermott, 1996; Rogoff, Bartlett, Turkanis Goodman, 2002). However, such contexts not only run counter to teacher and student interactions in traditional classrooms (Schoenfeld, 2002, 2006), they may also present difficulties for students who are less engaged in the social interactions of the classroom (Berry, 2006, p. 492).

Chapter 2 described how engagement in the language of a mathematical learning context provided teachers with indicators of student competence and confidence (Bills, 2003; Smith & Higgins, 2006). Students as learners of mathematics are defined by the forms of competence that classroom membership necessitates (Cobb & Hodge, 2002, p. 1). For example, a study of learning, identity and statistics (Cobb & Hodge, 2002) found that through taking part in the learning of statistics, students developed a strong sense of personal agency with respect to the investigative tasks involved. That is, their identities were compatible with who they wanted to become. The students’ focus was more on their own activities in relation to the investigation than those of the teacher. They perceived themselves and other students as “substantial contributors” (p. 6) to class discussions. Their identity in and membership of the classroom was strengthened by active engagement and their consequent developing competence in mathematics.

Thus, how students construct their identity as competent mathematics learners is
linked with the manner in which they engage and participate in the subject (Nasir, 2002a). In this process, the opportunities provided for them to take part in decision-making, the pace of learning, method, and working through tasks to completion, are critical (Gresalfi & Cobb, 2006). Where agency is distributed broadly between students and teachers who together determine “the legitimacy of one another’s contributions by relying on mathematical justifications” (p. 51), active participation is linked with increasing motivation to learn mathematics (Cobb & Hodge, 2002), which in turn leads to students engaging in mathematical investigations of increasing complexity (Gresalfi & Cobb, 2006). However, where authority is distributed solely to the teacher, who then determines both the legitimacy of responses and whether student contributions are acceptable, student agency is restricted to “applying an established method” in solving tasks (p. 52).

In short, the centrality of identity to the work on learning and social contexts such as classroom communities underlines the significance of the social dimension of mathematics learning. It is crucial to exploring how forms and degrees of participation and non-participation affect the learning opportunities of students in classrooms.

**Participation: A Tripartite Model for Understanding**

The overlap between participation, participation of peripherality and non-participation of marginality has been recognized by Wenger (1998) and Lave and Wenger (1991) leading to the point that all the aspects of participation are “indispensable in defining the others and cannot be considered in isolation. Its constituents contribute inseparable aspects whose combinations create a landscape . . . of community membership” (Lave & Wenger, 1991, p. 35). Put succinctly, participation implies social inclusion (Hill, Davis, Trout & Tisdall, 2004). It is described more broadly as "the social experience of living in the world in terms of membership in social communities and active involvement in social enterprises" (Wenger,
1998, p. 55). It requires the necessary skills of communication, negotiation, and decision-making. It is the means by which students construct and shape their identities as members of a community (Wenger, 1998).

Here a useful distinction may be made between forms of participation. Active participation infers that students have reason to believe that their involvement can make a difference. Passive participation relates to being listened to or being consulted (Sinclair, 2004, p. 108). Both forms afford students a wide range of opportunities to engage in the language of their context and become active members of classrooms. Processes such as collaboration, the importance of learners contributing to the agenda, and “a common and clear but flexible ethical basis” (p. 91) are important for contributing to this inclusion. This point is emphasised in Lardner's (2001b) model of participation, with six dimensions of participation, each laid out on a continuum “according to who holds power”:

- Initiation of the method – who’s [sic] idea was it?
- The agenda – who decides what’s discussed?
- Decision-making – who makes decisions about how to proceed?
- Information – who holds the information necessary for decision-making?
- Implementation – who takes action on the decisions?
- Structure of participation – how formal or informal is it, does it replicate adult ways of doing things. (p. 1)

A number of models seeking to explicate the effectiveness of participation have been developed (see for example, Arnstein, 1969; Lardner, 2001b; Shier, 2001). However, Treseder’s (1997) model of participation, presented in Figure 2, best articulates with Lave and Wenger’s (1991) and Wenger’s (1998) views of the range of different forms of participation in a situation involving students and adults.
Adapted from Research and resources about participation by the Commission for children and young people (NSW) (2004), p. 6 Commission for children and young people

Five dimensions to participation are presented in this model: assigned but informed, consulted and informed, adult-initiated but shared decisions with students, student-initiated but shared decisions with adults, and student-initiated and directed (Treseder, 1997). Within each of these dimensions, students’ attitudes and views are regarded as important components of their participation and learning. As a minimum, students should see that they are valued, listened to, and respected. However, as with the previously cited work of Lardner (2001) on dimensions of participation, this model also raises the question of the extent of power sharing between those in classrooms. This issue is addressed more fully later in this chapter by critical discourse theory, which provides the means for more comprehensively addressing and analysing issues of power.

The different forms of participation possible in learning communities proposed by Lave and Wenger (1991) and Wenger (1998) provides a useful adjunct to Treseder’s model.
As already mentioned, there are overlaps with the forms of participation (Wenger, 1998; Lave & Wenger, 1991). It has been argued previously (cf. Lave & Wenger, 1991) that the relationship between participation, participation of peripherality and non-participation of marginality can be best understood when each is considered to have its own unique set of relatively specific characteristics, in addition to a core set of characteristics shared by each group.

For example, the shaping of identities involves a combination of forms of participation, peripheral participation, and non-participation. Partial participation of students does not mean they are “disconnected” from the learning of the classroom (Lave & Wenger, 1991, p. 37). Peripherality when it is enabled, provides an opening or a way of gaining access to the practices and resources for learning through developing involvement in a classroom community (Lave & Wenger, 1991). The initial experience of participation therefore does not necessarily lead to an identity of non-participation. As Lave and Wenger (1991) further explain, “peripherality suggests that there are multiple, varied, more-or-less-engaged and -inclusive ways of being located in the fields of participation defined by a community” (p. 36). “Peripheral participation is about being located in the social world” (p. 36). Changing locations are part of developing learning trajectories, identities and forms of membership (Lave & Wenger, 1991).

Peripheral participation can be a source of power or of powerlessness (Lave & Wenger, 1991). It is implicated in social structures such as classrooms and involves relations of power. For example, from the periphery of a classroom the newcomer is exposed to the practices of that community and the manner of its articulation, and hence over time, engages with it, ultimately participating more fully (Lave & Wenger, 1991). Lave and Wenger (1991) have described this as “legitimate peripherality” (p. 36). As a student moves towards
becoming more intensive participatory member of a community, peripherality can be empowering. Here, newcomers are “granted enough legitimacy to be treated as potential members” (Wenger, 1998, p. 101). They are provided with access to the community’s members, their negotiated enterprise and their repertoire of resources:

Granting the newcomers legitimacy is important because they are likely to come short of what the community regards as competent engagement. Only with enough legitimacy can all their inevitable stumblings and violations become opportunities for learning rather than cause for dismissal, neglect or exclusion. (Wenger, 1998, p. 101)

For example, on entry into an existing mathematics classroom or with the introduction of a new process—Algebra for example—some students may find much that is different and poorly understood. At this point, there is a degree of participation of peripherality as they are new to that classroom or that process. However, as they engage in their learning and interact with their teacher, their peers and the learning resources, they move inwards from the periphery to greater participation and success with their tasks. Knowledge and success increase with continued exposure to and participation in the learning of that community. As they develop an “identity of participation” (Wenger, 1998, p. 67), the mathematics classroom becomes an inclusive community for them.

This initial degree of participation could end in exclusion, however. If over time, a student is kept from participating more fully in a community, it becomes disempowering. When a student is unable to make sense of the mathematics to which they are exposed they are less likely to develop or obtain effective explanations of what is going on. If they cannot negotiate meanings or receive adequate support for their learning—and this will be particularly the case as mathematics becomes more complex and abstract—their lack of understanding and their ineffective participation becomes a “relation of marginality”
Consequently, and because of the practices of that classroom, they may remain in marginal positions. This experience becomes so dominant that “conceiving of a different trajectory within the same community” (p. 167) becomes difficult or impossible. When such an identity of “non-participation of marginality” (p. 167) is constructed, students are either ultimately excluded or exclude themselves from participation in the mathematics classrooms. They are excluded from the social world of the mathematics classroom.

In short, the initial relations of participation can be either enabling or problematic (Wenger, 1998). Figure 3, a tripartite model for understanding participation, represents this issue more fully. In doing so, it indicates the level of participation across the three aspects addressed above—identity of participation, identity of participation of peripherality, and identity of non-participation of marginality. These forms of participation are combined with Treseder’s model to provide a framework for understanding participation in mathematics classrooms. When students have opportunities to initiate and direct their learning they are more likely to participate and construct their identity as a member of that community. When new to the community, they are more likely to experience participation of peripherality while they learn how to become a member of the group. Learning is more likely to be organised by the teachers, with students consulted. Decisions are shared between the teacher and students. However, when teachers assign the required learning and the students are not informed or consulted, they are more likely to experience marginalisation and are less likely to participate in their learning.
Figure 3. Tripartite model for understanding participation

**Tripartite model of participation**

- Participation is a source of power;
- Participation involves more equal relations of power and these can be a source of learning;
- Active participation in learning.

**Identity of participation**

- Students learn and know that they are a member of a community;
- Student access to learning is sustained and maintained by teachers and themselves;
- Students have ready access to the practices and resources for learning through their continual involvement;
- Students have an awareness of their location in the social world of the classroom and that their contributions are important for learning;
- Students know they can contribute to their learning agenda.

- Learning is an evolving form of membership;
- Learning involves talking about mathematics and knowing when to be silent;
- Learning involves sharing ideas with others and discussing them;
- Learning style of students is considered;
- Learning involves a more equal level of power sharing between teachers and students;
- Students are active participants in their learning.

**Identity of peripheral participation**

- Peripheral participation can be a source of power;
- Peripheral participation involves relations of power;
- Peripheral participation initial access to learning.

- Students learn how to become a member of a community;
- Students are provided with an opening or a way of gaining access to the practices and resources for learning through developing involvement;
- There are multiple more-or-less engaged and inclusive ways of being located in the fields of participation in a community;
- Students are located in the social world of the community;
- Students as newcomers to a community are exposed to the practices of that community and the manner of its articulation;
- Students engage over time and participate more fully;
- Student movement towards participation means that peripherality can be empowering.

- Learning is not merely a condition for membership, but is itself an evolving form of membership;
- Learning to become a legitimate participant in a community involves learning how to talk and be silent in the manner of full participants;
- Changing locations are a part of developing learning trajectories, identities and forms of participation;
- Learning organised by teachers with students consulted;
- Decisions about learning are shared between the teacher and student.

**Identity of non-participation of marginality**

- Non-participation becomes disempowering;
- Non-participation involves unequal relations of power;
- Non-participation becomes a relation of marginality.

- The practices deployed in classrooms work to marginalise students;
- Students are excluded or exclude themselves from learning;
- Students lack an understanding of what is happening in the classroom;
- Students are unable to make sense of the mathematics they are exposed to;
- Students are unable to negotiate meaning;
- Students are unable to receive adequate support for learning;
- Students are disconnected from learning;
- Students’ ideas and opinions are not taken seriously.

- Learning opportunities are closed by the practices used in some mathematics classrooms;
- Opportunities for conceiving different learning trajectories are less likely;
- Learning is organised by the teacher with no consultation or discussion with student;
- Decisions about learning rest solely with the teacher;
- What students are expected to learn is largely via transmission of information from teacher to student—being talked to rather than opportunities to talk about mathematics.
An examination of the different forms of participation in Figure 3 indicates potential barriers to student participation in classrooms, each having serious implications for student learning (see for example, Commission for Children and Young People NSW, 2004; Rajani, 2000). When students are told what to do without really knowing or understanding why, a barrier exists between the teachers and the students, with some students withdrawing into passive indifference (Rajani, 2000). Their opportunities are closed by the practices used in some mathematics classrooms.

Ideally, however, a classroom should support learning in such ways that it becomes a transformative experience rather than an alienating one. In such contexts, learners are more likely to develop an identity of non-participation of periphery, from which they move to full participation in the classroom. They learn that they can contribute to, and engage with others in the enterprise of that classroom (Rogoff, Bartlett & Turkanis Goodman, 2002). In this instance, the practices of Figure 3 become an enabling feature of mathematics classrooms in such a way that engagement and participation are encouraged. The next section provides an explanation of how practice is understood in this study.

**Practice: Learning as Doing**

In the literature on mathematics education, practice has been subsumed under the heading of pedagogy, focusing on epistemological understandings of teaching (see for example, Lerman & Zevenbergen, 2004; Schoenfeld, 1994; Sierpinska, 1998). In the sociological literature, it has been defined in different theoretical perspectives, such as the cultural anthropology of Bourdieu (1990) and Lave and Wenger (1991), de Certeau (1984) cultural studies, Turner’s (1994) social theory of practice, Fairclough’s (2001; 2003) critical discourse theory and Bernstein’s (1990) theory of pedagogy and practice. To understand and apply practice in this study, a toolbox approach—taking what is useful for the job at hand (Foucault, 1974)—has
been adopted, that is, ideas or aspects of relevant conceptual frameworks have been drawn on
where necessary to develop a more useful and effective understanding in practice of practice.

Practice has been described as learning by doing and participating in social
involvement with people who already embody the practices (Spinoza, Flores & Dreyfus,
1997), as part of the belief in institutions that are a driving force behind social order—the way
a game produces its own reality (Bourdieu, 1977). Bourdieu proposes that the ritualisation of
practices, in classifying and assigning them a time, that is a moment, a tempo or duration,
confers an “arbitrary necessity which specifically defines cultural arbitrariness” (p. 163).

The reason why submission to the collective rhythms is so rigorously demanded is that
the temporal forms or the spatial structures structure not only the group’s
representation of the world but the group itself, which orders itself in accordance with
this representation. (Bourdieu, 1977, p. 163)

These arbitrary cultural classifications order practices that are seen as natural and taken-for-
granted by groups who join a sense of reality and its limits to how they negotiate their world.
However, those who challenge more powerful systems and their practices can do so by
controlling its consumption or the way it is used (de Certeau, 1984). For example, members of
creative popular culture who seek out new or different ways of operating serve their own
interests, but at the same time acknowledge the interests of the more powerful group. Much of
this can be subversive, with members “making over” (de Certeau, 1984, p. xx) the offerings to
their own ends. Subversion can operate through practices such as the misuse of the
mathematics textbooks and student exercise books whose function is to serve as a sign of
student immersion in mathematics. However, they also operate as a battleground with
students testing and challenging authority by creative modifications to their books. Whilst
institutional structures are organised strategically to control the meanings they produce, they
can also be used to produce subversion.

The term practice could then be described as the relationship that an individual has with the “world, activity, meaning, cognition, learning, and knowing” (Lave & Wenger, 1991, p. 50), and the social negotiation of meaning (Lave & Wenger, 1991). It emphasises the “socially negotiated character of meaning and the interested, concerned character of the thought and actions of persons-in-activity” (p. 50).

Participating in practice requires “transparency” of the artefacts engaged in practice (Lave & Wenger, 1991, p. 91). Transparency implies that artefacts are available for a learner to explore, but greater understanding of their use is significant. Transparency also implies access to practice, that is, it refers to “the way in which using artefacts and understanding their significance interacts to become one learning process” (p. 103). This transparency of access to practice requires access to a range of ongoing activities, teachers, students, information, resources and opportunities for participation. It includes the explicit and the tacit, what is said and unsaid and what is represented and what is assumed (Wenger, 1998). This description of practice emphasises the social and negotiated character of knowledge and involves the learner in acting, knowing, theorising and understanding meaning in a classroom (Wenger, 1998). These processes are not static, but continually changing as a consequence of participation, learning by doing, and social energy. The next section elaborates the concept of community with emphasis upon its participative aspects. In particular, it focuses on three understandings of community.

Community: Learning as Belonging—a Tripartite Model

The intention of this section is to discuss what is understood by the term, community, and its relation to a community of practice, a community of inquiry, and a community of learners. In doing so, this discussion will elaborate the key ideas of each form of community. The
intention is to see what these communities have in common and how each might further develop teaching and learning in mathematics classrooms. Once again a tripartite model is used to elaborate the different understandings of community.

Community, as the term is understood here, describes a social group with common interests located in a common context and whose members develop an identity as members of that group as they participate in its activities (cf. Dewey, 1916; Wenger, 1998; Williams, 1976). Its use is widespread in education today (see for example, Pardales & Girod, 2006). Community of practice (Wenger, 1998), community of inquiry (Pardales & Girod, 2006; Seixas, 1993), and community of learners (Matusov, 1999; Rogoff, Matusov & White, 1998), all play a central role in such educational discussions. Their use indicates the current thinking about how and why a classroom might become a community.

A Community of Practice

A community of practice has been described as “a kind of community created over time by the sustained pursuit of a shared enterprise” (Wenger, 1998, p. 45), “an ongoing collective negotiation of a regime of competence, which is neither static nor fully explicit” (Eckert & Wenger, 2005, p. 583). Ethnographic studies of apprenticeships provided the basis for its initial description by Lave and Wenger (1991). Their intention was to establish what these studies might contribute to understanding how learning takes place. Primarily, their interest was with the ways in which meanings, beliefs and understanding were negotiated and enacted in practices, such as those of tailors, butchers and midwives. Subsequent work by Wenger (1998) built on this early work to include the key concepts of identity of participation and non-participation and the term, communities of practice. Through participation in communities of practice people build a sense of their place, their identity, and their possibilities in society (Eckert, 2000). The link between an individual’s experience and their
place in the social order is the structure of participation in communities of practice. Since learning is central to a community of practice, studying such communities affords insights into the socially embedded nature of learning—insights that, in turn, can be systematically utilised to enhance learning in various social contexts.

Three key characteristics—mutual engagement, joint enterprise and shared repertoire (Wenger, 1998, p. 73)—define a community of practice. The first, mutual engagement of all participants, is an essential component of practice. Inclusion in what matters is a necessary prerequisite for engagement in a community’s practice, and “what it takes for a community of practice to cohere enough to function can be very subtle and delicate” (Wenger, 1998, p. 74). This form of coherence requires continuing work or community maintenance (p. 74). For example, Wenger identified the activities of claims processors such as arriving, talking and interacting while they work as important features of a community. Similarly, in the context, talking by phone, email or radio are all constitutive of mutual engagement. Hence a community of practice is not simply a social category defined by a network of associations or geographical proximity. It requires interaction, diversity and sustained interactions centred on participants’ involvement in what they do. It presumes their possession of the language of the community with its shared systems of meaning and understanding. In short, a community of practice “can become a very tight node of interpersonal relationships” (Wenger, 1998, p. 76) that exist through engagement in practice.

The second component that keeps a community of practice coherent is joint enterprise. It is the result of a collective process of negotiation that reflects the full complexity of mutual engagement.
It is defined by the participants in the very process of pursuing it. It is their negotiated response to their situation and thus belongs to them in a profound sense, in spite of all the forces and influences that are beyond their control.

It is not just a stated goal, but creates among participants relations of mutual accountability that become an integral part of the practice. (Wenger, 1998, pp. 77-78)

Here joint enterprise does not necessarily mean that all participants agree, because it is a process and not static. Indeed, disagreement can be a productive aspect of the enterprise. The participants are not expected to believe and agree on the same things, but rather, such things are communally negotiated. When participants negotiate in a joint enterprise, relations of mutual accountability follow. Such relations include what matters for that enterprise and what does not (Wenger, 1998).

Wenger’s (1998) third characteristic is shared repertoire. As participants engage in joint enterprise, drawing on their language and the language of their community to participate and communicate with one another, resources for negotiating meaning and understanding are created. Such elements of a repertoire include,

- routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or concepts, that the community has produced or adopted in the course of its existence, and which have become part of its practice. The repertoire combines both reificative and participative aspects. It includes the discourse by which members create meaningful statements about the world, as well as the styles by which they express their forms of membership and their identities as members. (p. 83)

These elements gain their coherence through belonging to the practices of a community engaged in joint enterprise. They are developed and shared through interaction and sustained engagement in a community.
The understandings of community are moving beyond research into application. For example, an ethnographic study of situated learning in the funeral industry (Carden, 2005) in which the researcher became a mortuary assistant, evidenced the transition from legitimate peripheral participation to full membership of that community of practice. Another study (Willis, 2005) examined a group of postgraduate educational researchers to determine to what degree it demonstrated the features of a community of practice. An insightful study of implementing radical change in a tertiary curriculum development team (King, 2005) in which its members became “novice practitioners” again, demonstrated the need for “understanding the role that emotions play in the reconstruction of learning, meaning and identity” (p. 101). In a major South Australian project for transformational school leadership, principals and designated change leaders from groups of schools met in learning circles twice a term with university staff and departmental curriculum officers (Peters & Le Cornu, 2005). A “degree of congruence” (p. 107) was found between these learning circles and communities of practice, in particular the key concepts of “community, meaning, practice and identity” (p. 107). Finally, a study of designing and facilitating learning communities in formal courses identified seven key components of a community—shared goals, safe and supportive conditions, collective identity, collaboration, respectful inclusion, progressive discourse towards knowledge building, and mutual appropriation (Wilson, Ludwig-Hardman, Thornam & Dunlap, 2004). These characteristics were seen as essential qualities “which should be considered when attempting to establish or support such communities in courses or programs” (p. 6).

However, the complexity of creating such communities, or incorporating such a perspective into existing research and practice activities, must be taken into account:
Bringing together a diverse group of people to establish a new community can be a daunting undertaking, particularly if the learning needs and the task are not perceived as legitimate by all participants. Viewed through an anthropological lens, a community of practice is not actually created, but rather emerges based on mutual interests, shared goals, understandings, and common practice (Lave & Wenger, 1991). The challenge lies in recognizing the opportunities to move existing groups closer to a community of practice perspective. Once these opportunities have been identified, the key to transforming groups into practice communities is not merely to enlarge the group or extend the tasks, but to give members a legitimate role in society by linking their ideas with those of the broader educational community. (Buysse, Sparkman & Wesley, 2003, p. 274)

A further concern was raised in a review of Wenger’s (1998) work which indicated that it offered insufficient information about pedagogy and education and how it might be applied for empirical work (Ernest, 2002). Two possible explanations could be suggested here. First, as noted earlier, Wenger’s (1998) work was not conducted in classrooms but in organisations of work and training such as claims processing. In these contexts, a concrete process exists and gives a focus for joint enterprise, one that the community and its members move towards. The concern of the community is about the links between members and how such links work towards and or away from a group identity. Membership is determined by the endeavours that bring people together (Eckert & McConnell-Ginet, 1995). Secondly, the people work to establish an “identity of relation” (Fairclough, 2003, p. 166)—the claims processors define themselves in relation to their employer as well as to claims processing (Davies, 2005). Thus, it is easy to identify the general enterprise that drives the people towards the need for mutual engagement. Further, Wenger (1998) does not explore the
specifics of the claims processors’ roles. However, a shared enterprise should “be reasonably specific and not very general or abstract” (Meyerhoff, 2001, p. 528). Questions have been raised as to whether, given Wenger’s, position as an outsider to the claims processing group, he could identify with the group and their specific shared enterprise and so decide whether the group of people met the criterion for shared enterprise (Davies, 2005).

These concerns about Wenger’s (1998) ideas are compounded by the types of groupings and the size of groupings to which the three characteristics of a community of practice can be applied. Davies (2005) argues that there is a question of “grain size” (p. 564), that is, “does the requirement of joint enterprise and mutual engagement mean by definition that communities of practice is a tool for micro-level analysis, or can the concept be articulated at more macro-levels of society?” (p. 564). While this issue cannot be resolved here, this study seeks to examine the three characteristics, joint enterprise, mutual engagement and shared repertoire to identify if they can be articulated at the micro-level of analysis.

A further limitation of the work of Lave and Wenger (1991) and Wenger (1998) relates to the question of who has access to participate and who in a community of practice endorses an individual’s access. Lave and Wenger (1991) note, but do not discuss extensively, the unequal relations of power in communities of practice, observing that learning and alienation from full participation are inherent in the shaping of the legitimacy and peripherality of participation in its historical realizations. (p. 42) They highlight how these relations potentially create “interstitial communities of practice” (Lave & Wenger, 1991, p. 42), that is, communities that are alienated from full participation, and reduce the possibilities for “identities of mastery” (p. 42).

Despite these caveats, the work on communities of practice has resulted in substantial further elaboration, modification and debate (see for example, Stehlik & Carden, 2005). The
two models of community, community of inquiry and community of learning, which are addressed below, build on and adapt the central features of communities of practice.

**A Community of Inquiry**

The previous section described a community of practice as it relates to people and work. In this section, a community of inquiry is discussed as it relates to classrooms. A community of inquiry has been described as a community that produces knowledge that leads from doubt to belief and to what is real (Pardales & Girod, 2006). Reality in this sense results from inquiry and is defined by rationality rather than by a person’s beliefs (Pardales & Girod, 2006). This kind of reasoning is inductive, that is, a person’s doubts move from uncertainty to action to producing knowledge that is believed. Here, as with Peirce (1878), doubt and belief begin with a question and its resolution.

Belief has three properties, it is “something we are aware of; second, it appeases the irritation of doubt; and third, it involves the establishment in our nature of a rule of action” (Peirce, 1878, p. 4). Doubt, the motive for thinking, is appeased when belief is reached (Peirce, 1878). Through this process, thinking is subjected to the community’s standards that allow doubts and beliefs to be corrected and revised (Pardales & Girod, 2006). A community of inquiry serves as an arbiter of standards for producing reliable knowledge. It frames the establishment of relationships between individuals and the social interactions that occur as a consequence of such relationships. The exchange of opinions, beliefs, and experiences guides to more reasonable beliefs and a more rich experience in the future (Planas, 2003-2004).

In mathematics education, a community of inquiry views mathematics as an evolving human construction (LaFortune, Daniel, Pallascio & Sykes, 1995-1996). The role of the teacher is significant in transforming a classroom to a community (LaFortune, Daniel, Pallascio & Sykes, 2003-2004). Through inquiry, teachers are viewed “less as the infallible
experts” (p. 82) and more as people who talk and think about mathematics through interaction with their students. They encourage and engage in discussions with students, scaffolding their interactions and participation in the inquiry. In doing so, the students are expected to listen to one another, build on ideas, challenge these ideas, provide reasons for unsupported opinions, and identify one another’s assumptions (Lipman, 1991). There are three preconditions for these processes to occur in a community of inquiry:

1. Readiness to reason;
2. Mutual respect (of children towards one another, and of children and teachers towards one another);

Here readiness to reason is cultivated and transformed through the teaching of formal and informal logic (Pardales & Girod, 2006). Through this process, the teacher, who is considered to have more background knowledge and techniques of inquiry, assists students in following their own paths of thinking. The teacher must stop however “at the point of legitimising or delegitimising particular points of view” (p. 304). The reason is that for the creation of a community of inquiry and the mutual respect by which it continues, the teacher must not expect that beliefs and opinions must always meet. Here indoctrination is challenged through a pluralistic stance (Pardales & Girod, 2006). The mechanisms by which the three preconditions of a community of inquiry can be sustained include:

1. Group solidarity through dialogical inquiry;
2. The primacy of activity and reflection;
3. The articulation of disagreements and the quest for understanding;
4. Fostering cognitive skills (e.g., assumption finding, generalization, exemplification) through dialogical practice;
5. Learning to employ cognitive tools (e.g., reasons, criteria, concepts, algorithms, rules, principles);

6. Joining together in cooperative reasoning (e.g., building on each other’s ideas, offering counterexamples or alternative hypotheses, etc);

7. Internalization of the overt cognitive behavior of the community (e.g. introjecting the ways in which classmates correct one another until each becomes systematically self-corrective)—‘intrapsychical reproduction of the interpsychical’ (Vygotsky);

8. Becoming increasingly sensitive to meaningful nuance of contextual differences;

9. Group collectively groping its way along, following the argument where it leads. (Lipman, 1991, p. 242)

These mechanisms provide a way for understanding how teachers and students become a community of inquiry. While there are similarities to the characteristics of a community of practice—group cooperation, mutually engaging in building on ideas, and sharing in the enterprise of the community—a community of inquiry provides more detail about the specific processes of inquiry in a community. That is, the community forms by being inquisitive, reflective, articulate, cognitively adept, and sensitive to context and investigative (Pardales & Girod, 2006). There is a commitment to action by all members of the community (Planas, 2003-2004). When students and teachers engage over topics of interest, internalising the language of the community in the construction of knowledge, they become the arbiters of legitimate and illegitimate forms of inquiry. The classroom becomes a place where teachers and students inquire into topics of mutual interest and where such interest would become the curriculum, rather than teachers alone dictating what and how things are learned (Pardales & Girod, 2006). It is not a place where information is given and exchanged, but rather a community where information is analysed, contrasted and evaluated.
This section has built on the earlier discussion of a community of practice, with its focus on employment contexts and the collaborative engagement of employees in the enterprise of such a community, to provide more specific detail about the characteristics of a community that is inquiry focused, with particular emphasis on classrooms where teachers and students collaboratively engage in inquiry. The next section describes a third type of community, a community of learners, and how it relates to classrooms and the process of collaboration.

A Community of Learners

The previous section described the conditions required for inquiry to take place. In this section, a community of learners is described, with particular emphasis on an ideal situation (Matusov, 1999; Rogoff, Matusov & White, 1998). Here learning is situated in collaboration and collaboration is situated in learning in contexts such as classrooms (Matusov, 1999). Within such an ideal community, all participants play an active role, with no one having all the responsibility, while the integration of students’ contributions affords opportunities for negotiating meaning with other learners and teachers (Matusov, 1999; Renshaw & Brown, 1997; Rogoff, Matusov & White, 1998). Through these experiences, students and teachers develop relations that are supportive of learning, much like that of a community of inquiry and practice (Matusov, 1999). The identity of a learner is constructed through the practices utilised by teachers in classrooms as discussed earlier. These practices include the teacher providing the support necessary to encourage engagement (Renshaw & Brown, 1997) and the shaping of an identity of participation in that community. Where there is effective interaction between students and teachers, the students are more likely to identify themselves as mathematics learners, participating and negotiating mathematical meaning with other students.
and their teachers.

In a community of learners the “tasks and teaching responsibilities are divided between students, . . . by social scaffolds such as collective argumentation” (Renshaw & Brown, 1997, p. 210). The teachers’ role in classrooms is to link students’ actions and representations with the “knowledge community of mathematicians” (p. 210). In an ideal community of learning,

building the classroom community and learning the curriculum are the same thing; members of the classroom learn through building a community and at the same time build a community through their learning. (Matusov, 1999, p. 163)

Here, students and teachers are active participants, and learning involves the transformation of participation through collaborative endeavour in their community (Matusov, 1999). The role of teachers, in such a situation according to Renshaw and Brown (2004) is to provide opportunities for student voice, where they draw on their interpretative procedures to generate understandings of their experiences. Through this process teachers can provide the types of conditions whereby students are supported in sustaining a collaborative community of learners (Renshaw, 2002). The teachers assume some responsibility for guiding the process, while students learn how to participate and manage their learning (Rogoff, Matusov & White, 1998).

This kind of community is different from a traditional mathematics classroom as described in chapter 2, where students attempt to learn in isolation mathematics tasks demonstrated by the teacher to the whole class. Such a classroom is more likely to be a site for contestation and struggle because students are unable to access the mathematics taught because of its disconnectedness from other parts of their learning and experiences outside the classroom. Practices, such as those identified in chapter 2 and described in this chapter, that
do not maintain a strong focus on active engagement, participation, identity and membership in classrooms, sustain this struggle with the classroom likely to become a battleground where students subvert authority by modifying their participation in learning.

The work of Dewey (1916) on community-relevant and democratic schooling and that of Beane and Apple (1999) on democratic schooling exemplifies desirable forms of classroom communities of learners. They emphasise that knowledge emerges for students and teachers when connected with their social experiences. When this occurs, students use their knowledge to understand real life problems and issues, which in turn are connected to “communities and the biographies of people’s lives” (p. 119). When such explicit connections are made between teachers, students and their communities, social learning and the construction of knowledge are based on the questions the students and teachers ask (Brodhagen, 1999). Success with learning follows from working together on common goals and issues.

In the next section the previous discussions of communities are reviewed to identify particular characteristics that will assist in understanding the accounts of their experiences of learning mathematics provided by the students in this study.

Understanding the Students’ Accounts

To this point, a social theory of learning has been elaborated, with particular attention to the significance of learning as a social activity, along with issues relating to identity, forms of participation and non-participation, and community. The critical importance of identity for success or failure in learning of mathematics has been shown to be contingent on the quality of relationships in the social context—here the TAFE program or the secondary mathematics classroom—in which learning takes place, along with the background that students bring to learning in that context. The investigation of the relations of power in social contexts for learning and their influence on the identities of individuals is central to this study. A learning
community is now presented as the natural concomitant of a social theory of learning.

Adopting a tripartite model has enabled the investigation of three related types of communities, a community of practice, a community of inquiry, and a community of learners. Similar features in all three include the significance of collaboration and active engagement in the tasks, activities, and language of the communities. All three emphasised the importance of sustained interactions focused on those involved in the community. A community of practice and its three defining characteristics, mutual engagement, joint enterprise and shared repertoire, provide useful explanations of how learning occurs in social contexts. A community of inquiry underlines the role of the teacher as leader and participant in the collegial adventure of learning, the need for openness and dialogue in investigation, and the importance of learning activities that are relevant to learners’ interests and concerns. A community of learners with its focus on effective teaching practice that develops supportive relations, engagement to learn through collaboration, and the negotiation of meaning between students and teachers, provides a useful basis for an examination of the students’ accounts of their learning experiences. Its combined focus on the individual and the social context is needed to make adequate interpretations of learners’ experiences in such communities.

However, access is a necessary prerequisite for students to engage and participate in learning in communities (Davies, 2005; Lave & Wenger, 1991). Prospective members do not have open access to membership based on their wanting to be a part of a community and its practices (Davies, 2005). As described earlier in this chapter transparency is critical. That is, to have such access they need to know the prerequisites for membership, which they should either possess, be able to acquire and or be assisted to acquire. If transparency is to be comprehensive, they need also to know who possesses the authority to make such judgements and what guarantees they offer to ensure effective access and sustained participation in the
community (Davies, 2005). As chapters 5 and 7 will demonstrate, this transparency was evident in the initial encounters between newcomers to the Youth Reconnected Program and the program manager and coordinator; it was continued by its teachers and tutors, and manifest in turn in the frank observations of the students themselves. Potentially, then, an individual’s choice to mutually engage in joint enterprise and share their repertoire is constrained or enabled by those who have the power to allow access to occur (Davies, 2005; Lave & Wenger, 1991).

As Schoenfeld (2006) and Boaler (2002) explain, access to and increasing participation in a specific grouping is a necessary prerequisite for students to engage and participate in mathematics learning in classrooms. That is, in classrooms where access is provided and authority is distributed between the teacher and students, students can exercise a high degree of agency. Agency in this sense refers to students taking part in mathematical discussions, decision-making, and learning to choose methods to work on tasks until completion.

Applying the elements of participation, participation of peripherality and non-participation of marginality, foregrounds the significance of students’ experiences. These elements in turn imply the need to address issues of access and inclusion and exclusion in classrooms. When applied to students’ accounts, they enable the researcher to further understand identity, the individual and the social context. However, as stressed earlier, what can be further illuminated are the issues of power relations and struggle as they relate to identity, forms of participation and non-participation and the social context. Critical discourse theory provides the means for an examination of these issues in the participants’ accounts.

Critical Discourse Theory
This section presents critical discourse theory [CD theory] as a significant tool for examining
identity, participation and non-participation and social context as students account for their mathematics learning experiences. CD theory and its elements, discourse, language, power, ideology, subject positioning, struggle and discursive practice, allow a critical understanding of the issues of the working of power and its contestation, and the processes of inclusion and exclusion from social contexts such as mathematics classrooms. It provides the means by which the processes of a social theory of learning and its elements can be understood and applied to mathematics classrooms. It enables the four central characteristics of a community, mutual engagement, joint enterprise, shared repertoire and access, to be identified in and through the participants’ accounts. This is done by examining how these characteristics are represented in and through discourse.

Discourse

In the approach to understanding discourse taken in this study, Fairclough’s (1995, 2001, 2003) adaptation of Foucault’s (1972) ideas of discourse for critical discourse analysis [CDA] is central. Cognate approaches by other significant discourse analysts (see for example, van Dijk, 2001) or from critical theory (see for example, Hall, 2001a, 2001b) are drawn on where appropriate, thus using a toolbox approach to explain ideas. The work of Bakhtin (Clark & Holquist, 1984; Emerson & Holquist, 1986) and Volosinov (1973) is drawn on for its development of a “dialogical theory of language” (Fairclough, 2003, p. 42) and the contingency of meaning on social context. Apart from occasional reference, however, social psychological perspectives (see for example, Wetherell, 2001) are not deemed appropriate to the purposes of this study because their focus is more on the content of texts, ignoring the texture, form and organisation of texts (Fairclough, 2003), and conversation analysis would extend it beyond reasonable limits.

For CD theory and for this study, then, discourse is “language as social practice
determined by social structures” (Fairclough, 2001, p.14). Following Foucault (1972), a discourse is a group of statements that provides a language for representing knowledge about a particular topic at a particular historical moment; indeed it constructs the topic. That is, as a social practice, discourse constitutes situations, objects of knowledge, the social identities of, and relationships between, people and groups (Fairclough & Wodak, 1997). It is about knowledge defined and produced through language within a particular context and history (Hall, 2001a). In short, discourse constructs meaning through social practice.

Discourse then is not simply a linguistic concept: it is the social practice of language and its consequences (Fairclough, 2001; Thomas, 2006). It is “a complex of three elements: social practice, discoursal practice (text production, distribution and consumption), and text” (Fairclough, 1995, p. 74). Here social life is made up of social practices, “habitualised ways, tied to particular times and places, in which people apply resources (material or symbolic) to act together in the world” (Chouliaraki & Fairclough, 1999, p. 21). Discoursal practice and text comprehend the two ways in which discourse articulates with practice, so that while “practices are partly discursive (talking, writing, etc. is one way of acting) . . . they are also discursively represented” (Chouliaraki & Fairclough, 1999, p. 37). Further, “each practice is located in a network of practices” (Chouliaraki & Fairclough, 1999, p. 23), and these networks “are held in place by social relations of power” (Chouliaraki & Fairclough, 1999, pp. 23-24).

This conceptualisation of discourse removes the arbitrary distinction between “what one says (language) and what one does (practice)” (Hall, 2001a, p. 72). Here, as noted above, social practice entails meaning, and since “all practices have a discursive aspect” (Hall, 2001a, p. 72), meanings shape what an individual does, and how s/he conducts her/himself. That is to say, discourse governs how a topic or idea can be spoken about and put into
practice, it regulates how people conduct themselves (Hall, 2001a). Just as a discourse defines acceptable ways of talking and writing intelligibly about a topic and of conducting oneself, so by definition it also limits and restricts other ways of talking and writing “in relation to the topic or constructing knowledge about it” (Hall, 2001a, p. 72). Knowledge is put to work through discursive practices in social institutions as a way of regulating people’s conduct.

This understanding foregrounds the relations between discourse, knowledge and power (Foucault, 1972; Hall, 2001a). In and through discourse, knowledge is linked to practice and power (Fairclough, 2001; Foucault, 1972; Hall, 2001a; van Dijk, 2003) and its application can lead to the acquisition of power in society (Foucault, 1972; Hall, 2001a). It assumes the authority of “the truth” (Hall, 2001a, p. 76) and has the power to “make itself true” (p. 76). That is, once knowledge is applied in social contexts, Hall (2001a) argues it has effects, and consequently “becomes true” (p. 76). Knowledge in this sense has the power to regulate the conduct of others and in doing so involves “constraint, regulation and the disciplining of practices” (Hall, 2001a, p. 76). It is this construction of discourse that is applied in this study. In that construction, and as noted earlier, discursive practices are central to “the production, distribution and consumption” of discourse (Fairclough, 1995, p. 75).

**Discursive Practices**

Discursive practices are the elements of discourse that are used by individuals to give structure and coherence to daily practices and routines (Martín Rojo & Gomez Esteban, 2005). They can be said to be a group of rules that are inherent in social practice (Foucault, 1972); they guide people and order discourse (Fairclough, 2001). Earlier in this chapter, practices were described as part of the belief in institutions that are a driving force behind social order (Bourdieu, 1977). The discussion and critique in chapter 2 demonstrated that there were different theories of practice with instruction and reform-based approaches to
mathematics education. Such practices were identified as holding particular views about how mathematics should be taught and learned. However, what makes such practices discursive is the focus on talk in social contexts, or an action or actions done by an individual or a group in social contexts. Hence, discursive practices do not exist outside of discourse—they are associated with particular areas of social life (Hall, 2001a), in this study, for example, the classroom. They are carried out within broader social practices such as teaching. In doing so, they contribute to the ongoing process of organising and constituting social reality (Hardy, Palmer & Phillips, 2000).

If discursive practices are ways of interacting socially it follows that to learn such practices is a process of appropriating the voices of the relevant communities (Hirst, 2004). Through communication, such voices, that is, the personal and the social, construct the person and society. The construction of an identity emerges through “the point of articulation and suture between discourses and practices” (p. 40).

There can be many complex and often fine-grained layers of discursive practices that can be fine-grained. They can be said to be beneath the surface of words, ideas, and images that are produced socially (Baker, 2000). The more natural and taken-for-granted the discursive practices are, the more powerful they are in social and institutional life (Baker, 2000; Bourdieu, 1977). They guide people and order discourse. However, it is what people do during talk, their discursive practices, that can be subtle. For example, the discursive practices of a discourse maintain particular assumptions that directly and indirectly “legitimize power relations” (Fairclough, 2001, p. 27). This power resides in their everyday application and reinforcement of routine tasks that are viewed as practical and commonsense but which at the same time create a particular image of the subject in the classroom (Selander, 2003).

From all of this it follows that discursive practices are not only the product/s of a
discourse; they are equally constitutive of the discourse itself (Fairclough, 1992). Consider for example, the ways teachers and students produce the social in the classroom as outlined above. Through such social interaction, teachers and students produce social relations and identities. Discursive practices mediate their experiences and offer possibilities or constrain their learning in classrooms. They include the practices that follow with a discourse, such as methods for carrying out tasks.

Therefore, the manner that the discursive practices of a discourse of mathematics are drawn on will have substantial implications for the ways in which students shape an identity of participation in mathematics classrooms and the types of discourse in which they engage. This issue was discussed in chapter 2, emphasising that what is explicitly learned becomes opportunities for further discussion, making sense of the mathematics presented and participating in mathematics discourse (Cobb, Boufi, McClain & Whitenack, 1997; Brown & Renshaw, 2004). However, how discursive practices define a community and who determines and has the power to grant a learner access to a community, is in part dependent upon the exercise of power through discourse (Fairclough, 1995). Here critical attention can be directed to the assumption of the naturalness, indeed the inevitability, of such “asymmetrical relations of power” (Fairclough, 1995, p. 16) in classrooms. Such an assumption is ideological.

**Ideologies, Power and Discourses**

Ideologies are “the ‘common-sense’ assumptions which are implicit in the conventions according to which people interact” (Fairclough, 2001, p. 2). Thomas’s (2006) work describes ideologies as “frameworks of thought, manifested in material practices, which constitute or shape human subjects and the social world in different ways” (Thomas, 2006, p. 59; cf. Hall, 1982; 2001a). They “produce different forms of social consciousness, rather than being produced by them” (Hall, 2006, p. 397). Ideological structures are most effective when those
who use them are unaware they inform their claims and views about the world, believing rather that they are “simply descriptive statements about how things are (that is, must be) or of ‘what we can take-for-granted’” (Hall, 2006, p. 397). They work by constructing “for their subjects (individual and collective) positions of identification and knowledge which allow them to ‘utter’ ideological truths as if they were their authentic authors” (Hall, 2006, p. 397). “How we ‘see’ ourselves and our social relations matters, because it enters into and informs our actions and practices” (Hall, 2006, p. 397).

Since ideologies are frames of thought manifested in discursive practices, the significance of ideology for establishing and contributing to the maintenance of unequal power relations must be stressed (Fairclough, 2001). The effects of ideology are evidenced in discursive practices that are the site of social struggle (Thomas, 2006). Ideology then, as a site of struggle, potentially allows “for the possibility of multiple and competing ideologies, rejecting one dominant and one subordinate ideology as inadequate” (Thomas, 2006, p. 58). Hence ideologies are discursive and plural—they operate in discursive formations (Thomas, 2006).

When individuals or groups speak, they do not create their own language, rather, they use language and terms that are available culturally, historically and ideologically (Billig, 2001; Volosinov, 1973). They draw on ways of thinking and acting in a given society which make those ways seem natural and commonsense (Billig, 2001) and which are caught up in the interplay of knowledge and power in and through discourse (Hall, 2001a).

However, as will be elaborated later in this chapter, this process is dependent on those in more powerful positions in institutions or groups to define what is commonsensical, and which ideologies and discourse types are at issue (Fairclough, 2001). This exercise of power is what has the possibility of constructing and supporting social inequality (Hall, 2001a; van
Dijk, 2001). What comes to be commonsense is determined in large measure by the language used by those groups who exercise power in a society or social institution (Fairclough, 2001). As part of their power, they are likely to impose a discourse type and its discursive practices on others, pressuring them to occupy a particular position and to behave in a certain way (Fairclough, 2001; Hall, 2001a).

Power then involves control (van Dijk, 2001)—the power of one group over those of other groups may limit their freedom of action and influence their thinking. As mentioned previously in this chapter forms of participation are influenced by relations of power that are implicated in social structures such as classrooms. The effect of power means that it can either afford or prevent participation in a community (Lave & Wenger, 1991). The actions of others are controlled through legitimate authority—for example, that of a school principal—however, more effective power can be cognitive. This type of power is enacted through persuasion, dissimulation and manipulation to change the minds of others to suit the interests of those other than those on whom it is exercised (van Dijk, 2001). It can also be enacted through routines and day-to-day text and talk that appear natural and acceptable (Fairclough, 2001; van Dijk, 2001; Wodak, 2001). To exercise power is to control the context and to restrict, censor or ignore the talk of those groups in less powerful positions. In doing so, their discoursal rights are said to be restricted.

However, power is not only negative and does not always repress what it seeks to control. It can be productive (Hall, 2001a; Foucault, 1980). For example, those who challenge more power in social structures can do so by controlling its consumption or the way it is used, whilst acknowledging the interests of the more powerful group (de Certeau, 1984). This can be subversive, with members of groups “making over” (de Certeau, 1984, p. xx) what a powerful group offers. Subversion operates through the discursive practices of social
structures. In doing so, groups seek ways to operate and serve their own interests. Whilst social structures are organised strategically to control the meanings produced, they can also be used to produce subversion and or struggle through networks such as the orders of discourse.

**Orders of Discourse**

Orders of discourse are “sets of conventions associated with social institutions” (Fairclough, 2001, p. 14; cf. Foucault, 1972, 1980) such as schools or families. They provide “a particular social ordering of relationships amongst different ways of making meaning” (Fairclough, 2001, p. 2). An order of discourse structures relevant discourses in ways shaped by the “changing relationships of power at the level of the social institution or of the society” (Fairclough, 2001, p. 25). Here, power involves the capacity to control the orders of discourse, ensuring that they are “ideologically harmonized internally or (at the societal level) with each other” (Fairclough, 2001, p. 25).

A school for example, has an order of discourse that structures its social space into specific contexts where discourse occurs (Fairclough, 2001). Contexts include assembly, class, staff meetings and recess. In these contexts, people such as head teachers, teachers and students participate in a set of approved purposes—teaching and learning—within the school’s order of discourse. In such contexts however, participants are not equal. In this order of discourse head teachers and teachers exercise legitimate authority to direct or control the practices of that discourse (cf. Fairclough, 2001).

How the orders of discourse are shaped by those who have power is most productively thought of as a matter of ideology (Fairclough, 2001). That is, the orders that position teachers and students in relation to each other can be considered as representing the ideologies of those who control education. Learning a discourse becomes a matter of “acquiring the necessary skills or techniques to operate in the institution” (Fairclough, 2001, p. 76). Discourse
establishes the “interactional routines” (p. 81), that is, the ways and forms in which people—teachers and students—interact with each other. However, it is through these routines that struggle occurs. That is, struggle emerges from interactions between different groups. Conflict is evident because of the way discourse is used to exercise power and control as mentioned earlier in this chapter.

Discursive struggle. “Discourse is the site of power struggles” (Fairclough, 2001, p. 61). At any one time, a discourse may simultaneously be a part of a situational struggle, an institutional struggle, or a societal struggle (Fairclough, 2001). Struggle is evident in the ways discourse is used to interpret experience, meaning and evaluate or make judgments about what words and phrases are referring to (Maybin, 2001; Volosinov, 1973). Hence there can be ideologically competing discourse types that correspond to particular situations (Fairclough, 2001), and power is won, sustained and or lost in the course of struggle between them. In this struggle, those who hold power at a given time must reassert that power, and those who do not hold power must bid for it (Fairclough, 2001).

Issues of struggle between discourse types occur because of the “establishment and maintenance of one type as the dominant one in a given social domain, and therefore the establishment and maintenance of certain ideological assumptions as commonsensical” (Fairclough, 2001, p. 75). Individuals are constrained to operate within the subject positions set up in such discourse types. However, while such positioning implies constraint, it is through the tensions consequent on such constraint that participants are enabled to act as social agents and can be creative (Fairclough, 2001). Here, creativity emerges through the combinations of ways that discourse types are used to meet changing demands and the contradictions of social situations (Fairclough, 2001). This creativity is similar to de Certeau’s (1984) argument that individuals can subvert or make over what powerful groups can do, to
suit their own interests. Power in discourse then can constrain or enable the contributions not only of those in less powerful positions but also of those in powerful positions.

The issues surrounding the positioning of particular groups of students can give rise to problems associated with acquiring the knowledge that is tied to a discourse. How students are represented in classroom contexts is a matter of social significance (Fairclough, 2001). If the students are represented as subject to the actions of others, “the implication is that they are incapable of agency” (Fairclough, 2001, p. 222). Then, given the discussion to this point, the classroom becomes a site of discursive struggle. However, this struggle is diverse, competing and conflicting because of the many and varied discourse types. For example, teachers are not the only participants to have an authoritative position; students can also accept and or reject that authority. This issue was found to be the case in Zevenbergen’s (2004) study of interactions in two mathematics classrooms. In that study, students at Angahook were found to challenge the teacher’s authority and the content of the lesson. The study found that “the linguistic habitus of the student implies a propensity to speak in particular ways which, . . . works to exclude students from the mathematical content” p. 126). Because the student were identified as not as linguistically competent as their “middle-class peers” (p. 126), they were marginalised in their attempts to learn. Hence, it is the combinations of discourse types and their related discursive practices used in social situations such as mathematics classrooms to meet the demands and contradictions that contribute to diversity and struggle.

The effect of a discourse has implications for students’ lives and social prospects (Fairclough, 1995). That is, a discourse constructs particular viewpoints, concepts and values, but in doing so, it has the potential to marginalise viewpoints and values considered important to other discourses. It establishes who is an insider and who is not (Gee, 1996). As part of that power and through positioning in discourse, “struggles over identities” become “struggles
over difference‖ (Chouliaraki & Fairclough, 1999, p. 96). Further, when a discourse uses the first person plural we (p. 96) to construct a universal subject, this discourse is effectively constituting an identity which represses difference (Chouliaraki & Fairclough, 1999). In this regard, such discourses and the ensuing social struggles constrain the forms of participation and identities that can be constructed in classrooms.

However, in any institution, there are multiple discourses that provide social participants with choices concerning which discourses they draw on. Drawing on different discourse can be important for bringing about change (Hardy, Palmer & Phillips, 2000). Within a single institution or program, here for example, a TAFE Youth Reconnected Program, there are multiple, alternative, even ideologically competing discourses (Fairclough, 2001). Some discourses may be similar or overlap and share similar characteristics. Some may be alternative or oppositional to another discourse type.

_Hegemonic discourse._ The term hegemony describes “how the relations of power operate” (Lewis, 2002, p. 31). It indicates how groups maintain their power through processes of negotiation with subordinate groups (Gramsci, 1977; Hall, 1982). The maintenance of consensus is achieved by strategic management. That is, when subordinate groups have been included in the negotiation process, they are said to go along with their own oppression (Hall, 1982) however, this is not always the case as pointed out by de Certeau (1984). This usage of hegemony neutralises dissent and instils the values, beliefs and cultural practices of social structures (Hall, 1982).

A hegemonic discourse, then, is one that establishes and maintains particular ideological assumptions as commonsensical, maintaining its dominant position over the orders of discourse. Dominance in this sense refers to the exercise of power by an institution or a group that produces social inequality (van Dijk, 2001). This discourse includes the
products and conventions of social institutions such as secondary schools, TAFE colleges and an education system whose practices “embellish inequitable social relations” (Lemke, 1995, p. 54). The power to control discourse is seen as “the power to sustain particular discursive practices with particular ideological investments in dominance over other alternative (including oppositional practices)” (Fairclough, 2003, p. 2).

Learning a hegemonic discourse creates an image of reality that takes what is seen to be commonsense (Hall, 1982; Kenway, 1990). Its conventions embody particular knowledge, beliefs and relations shared by those who participate in a discourse (Fairclough, 1995; Hall, 2001a). It is accessible, exercised and constrained by power-holders (Fairclough, 2001). It is reproduced through forms of intricate social interaction, communication and discourse (van Dijk, 2001).

The hegemonic nature of the discourse of mathematics education is of particular concern for this study. It is the mathematics teacher whose specialised knowledge and legitimate exercise of power can constrain or enable student access to that discourse. The exercise of legitimacy here is more important than teaching. For example, when science or mathematics is treated as a technical discourse to be taught by the teacher and practised from a textbook,

someone must translate the language and semantics of the technical thematic formulations into more familiar terms . . . (Lemke, 1990a) . . . The opacity of technical discourse to the uninitiated . . . obliges the technocrats [or here, the teachers] to transform technical discourse into something that is comprehensible to a wider audience [here students]. (Lemke, 1995, p. 65)

The problem for students is when the technical discourse of mathematics is not recontextualised in such a way that they can understand, learn and apply it (cf. Bernstein,
From the students’ perspectives, this then implies that “they can be appropriated and transformed in diverse and unpredictable ways, and undesirable ways” (Chouliaraki & Fairclough, 1999, p. 45). The interactions between the teacher and student are crucial to students learning mathematics, shaping whether they inquire and discuss their learning about mathematics topics, and relate this to the world beyond the classroom (Cobb, Boufi, McClain & Whitenack, 1997; Schoenfeld, 1994, 2002). Barriers to understanding a technical discourse, addressed elsewhere in this chapter, relate to the negative influences of its discursive practices on these students.

A hegemonic discourse and its discursive practices are an “effective mechanism for sustaining and reproducing cultural and ideological dimensions of hegemony” (Fairclough, 1995, p. 94). For example, to establish “hegemonic relations” (p. 94) within a mathematics classroom, the hegemonic discourse and the discursive practices have to be constructed and accepted as commonsense and part of the natural order by those who are subordinate to it, that is, those who hold less powerful positions. This legitimising of particular power relations is what Fairclough (2001) calls “opacity” (p. 33). It is the invisible or hidden nature of this process that is opaque. In short, a major function of a hegemonic discourse is to manufacture consensus, acceptance and legitimacy of dominance (van Dijk, 2001).

Such forms of discourse can be unifying in that they uphold an “infinite continuity of discourse” (Foucault, 1972, p. 25) that isolates anything new “against a background of permanence” (p. 21). Permanence in this sense is propagated and transmitted through individuals, notions and theories. It makes possible their linking to the same “organizing principle, to subject them to the exemplary power of life” (p. 22). However, Foucault (1972) proposes to suspend tradition as an explanation for their apparent durability, arguing that “it is too easy to simplify the problem of successive phenomena through the levelling agency of
tradition” (p. 21). The appearance and reappearance of certain forms of knowledge is too persistent to be reduced to tradition (Cousins & Hussain, 1984). Rather, the conditions with which knowledge appears and reappears require reference to specific meaning rather than simply to tradition. Tradition and permanence can be contested as they are seldom complete or total. They may be contested through various forms of challenge and counter challenge (van Dijk, 2001; de Certeau, 1984). This contestation can take the form of an alternative discourse.

*Alternative discourse.* An alternative discourse presents different perspectives of the world to those that are implicit in hegemonic discourse (Fairclough, 1995). These differences are related to the different relationships that people have with one another, their positioning, and their social identity. Hence, such discourses may complement each other, compete with each other, or one may dominate the other.

An alternative discourse takes the hegemonic discourse and restructures it in the “course of hegemonic struggle” (Fairclough, 1995, p. 95). There may be overlap with each discourse having its unique set of discursive practices but also practices shared by both discourses. Fairclough’s (2001) description of creativity is useful here to understand alternative discourses. It is through their creativity that alternative discourses emerge as a consequence of changing demands in social situations. Put another way, hegemonic discourses could be said to be made over by individuals to subvert the maintenance of their dominant position whilst at the same time serving their interests (de Certeau, 1984). In doing so, the discursive practices of a hegemonic discourse are present but modified in particular ways to suit the interests of individuals.

*Oppositional discourse.* An oppositional discourse stands in a relationship of “opposition” to a hegemonic discourse (Fairclough, 2001, p. 75; cf. Halliday’s (1978) usage
of anti-language). That is, an oppositional discourse may be established and used in opposition to a hegemonic discourse (Fairclough, 2001). Its discursive practices may be consciously oppositional from the discursive practices of a hegemonic and or alternative discourse.

However, where discourses are oppositional, there is pressure to suppress, eliminate, or contain them since they oppose or reject the hegemonic discourse (Fairclough, 2001). For example, in the mathematics classroom a hegemonic discourse has constructed a particular version of reality that shapes and positions students. Hence, students who consciously engage in oppositional discourses are marginalised; they are either excluded or exclude themselves and perforce engage in a discourse of non-participation. From a range of possible ways of being a student—ways that “they are exposed to partly through learning to operate within various discourse types” (Fairclough, 2001, p. 85) and their related discursive practices—students come to be positioned as subjects.

The Subject and Positioning

Just as identities were defined previously in this chapter as who and what people think they are in particular social contexts or communities, what they do in consequence, and how they interpret what they do (Wenger, 1998), subjects are socially produced and positioned within discourse (Foucault, 1972; Hall, 2001a). The subject does not exist outside of discourse, that is, outside the way it is represented in discourse, produced in knowledge and regulated by the discursive practices of a particular social context (Hall, 2001a). It is subjected to the rules and dispositions of power and knowledge of that context. For example, institutions construct “their ideological and discoursal subjects: they construct them in the sense that they impose ideological and discoursal constraints upon them as a condition for qualifying them to act as subjects” (Fairclough, 2003, p. 39).
The power of the discursive practices of a discourse and how people are positioned through such practices is generated through their learning and use of particular social practices (Davies & Harré, 2001; Henriques, 1998). A subject position includes “the conceptual repertoire and a location for persons within the structure for those that use that repertoire” (Davies & Harré, 2001, p. 262). If a person takes up that position as their own, they view their world from that position in terms of the knowledge that is made relevant within the discourse and the discursive practices in which they are positioned (Davies & Harré, 2001). Like particular identities that are in some degree a function of the social context in which a person finds themselves, when individuals speak or act from a particular position they are bringing their history as one who has been engaged in multiple positions in different discourses. However, to identify with a position that a discourse constructs, they must subject themselves to the rules and become subjects of its power and knowledge (Hall, 2001a).

For example, subject positions are constructed within a discourse such as mathematics. Through occupying these positions, teachers and students are what they do—they become teachers and students (Fairclough, 2001). Individuals are constrained to operate within the subject positions set up in discourse. While in one sense they are passive, it is through being constrained that they are able to act as social agents and can be creative (Fairclough, 2001; cf. Zevenbergen, 2004). For this study, then, the constraints of a discourse include the social relations that teachers and students enter into through discourse, and their subject positions. It also includes the way things are done. These constraints are derived from the practices of the discourse type drawn upon (Fairclough, 2001), here, a discourse of mathematics. The practices utilised, such as those identified in chapter 2, may contribute to certain students, such as those in this study, contesting the discourse type and its related practices.
An understanding of the construction of the subject and positioning within discourse articulates with the discussions of identity, participation and the discussions of communities of learning in the first section of this chapter. Articulation refers to the bringing together of elements of both theories to examine discourse (Chouliaraki & Fairclough, 1999, p. 21). To illustrate, identities are shaped through participative experiences where individuals share in the joint enterprise and mutually engage with others in communities, that is, making sense and negotiating meaning contributes to shaping an identity (Wenger, 1998). This understanding links to previous discussions of the subject constructed and positioned within a discourse—to operate within a discourse the subject must take on the knowledge associated with that discourse.

Through participation, experience and its social interpretation inform each other. As individuals enact social relations with one another through the discourses drawn on, they construct an identity that “textures” (Fairclough, 2003, p. 102) and interweaves participative experience with the negotiation of meaning. In doing so, the theory of practice highlights the ways in which discourse works as an identity kit (Gee, 1996), where what matters are meaningful social roles, social membership, and an understanding of knowing how to engage and share in the enterprise in which members participate. To a socially meaningful group, others, that is, those who are not members, are positioned as being outside the discourse. Attaining membership then translates into the enactment of a particular identity as a form of competence (Wenger, 1998) so that one can identify oneself as an individual or as a member of a collective or group (Chouliaraki & Fairclough, 1999).

Conclusion

This chapter has provided an extensive discussion of the theoretical frameworks and their elements used in this study. They provide the basis from which the conceptual tools of critical
discourse analysis can be developed for the conduct of the research. Figure 4 at the end of this chapter summarises the frameworks, their elements and their contributions to the study. By combining a social theory of learning and critical discourse theory, the construction of identities of various forms of participation can be more fully understood. Explicitly connecting the two theories and their elements has articulated the connection between identity and learning.

In this formulation, a social theory of learning provides an overarching model for understanding how learning mathematics can be construed as a social experience. Here, through social interactions with teachers, tutors and their peers, students construct their mathematical knowledge and participate in the process of learning, shaping an identity of participation. Further, a social theory of learning implies a community in which learning takes place—a learning community. In such a setting the characteristics of mutual engagement, joint enterprise, shared repertoire and access highlight the opportunities that may be possible for students to participate in and develop a sense of belonging. An examination of the various forms of a learning community—a community of practice, a community of inquiry and community of learners—provides the means for defining the characteristics of a learning community deemed suitable for this study.

In turn, critical discourse theory offers a methodology for analysing students’ accounts of their experiences in mathematics at school and TAFE. CD theory and its elements, discourse, power, ideology, identities, subject position and discursive practice, allow a greater understanding of the working of power and its contestation. It becomes the means by which the operation of a social theory of learning and its various elements can be more completely understood. It provides the methodological scaffold for the analysis of participants’ accounts of their experiences in learning mathematics that follows in chapters 5 through 7. Critical
discourse analysis [CDA], as presented in chapter 4, becomes the central method for that task. Using CDA brings together the theoretical understandings of a social theory of learning and critical discourse theory to analyse the social context as well as the language of the accounts. It enables an understanding of how power, discourse, and ideology are realised in these accounts. It also provides the means for redressing these issues as they happen with students and in mathematics classrooms.
IDENTITY, PARTICIPATION AND NON-PARTICIPATION IN MATHEMATICS EDUCATION  

SOCIAL THEORY OF LEARNING  

CRITICAL DISCOURSE THEORY  

UNDERSTANDING IDENTITY, PARTICIPATION AND NON-PARTICIPATION IN MATHEMATICS EDUCATION

Figure 4. Map of the study

Student and teacher accounts of learning mathematics at secondary school and at TAFE college  

Deriving a methodology  

Constructing an identity  

Participation and non-participation  

Social aspect of practice  

Three forms of community:  
- community of practice  
- community of inquiry  
- community of learners  

Semi-structured interviews  

Qualitative NVivo analysis  

CRITICAL DISCOURSE THEORY  

Textual Features  
- classification scheme  
- modality and modal markers  
- deictic category  
- binary opposition  
- presupposition  
- declarative mood  

Discourse  
Discursive practices  
Ideenologies, power and discourses:  
- orders of discourse  
- discursive struggle  
- hegemonic discourses  
- alternative discourses  
- oppositional discourses  

Subject positioning
CHAPTER 4: METHOD AND CONTEXT

The previous chapter articulated a social theory of learning and critical discourse theory [CD theory] to enable a more effective understanding of the construction of student identities of participation and non-participation in mathematics education classrooms. That framework, as methodology, provides the basis for critical discourse analysis [CDA], the method used in the chapters that follow for analysing the accounts of the participants in this study. This chapter describes CDA and its various features in detail. It also presents the educational and social contexts which locate and define the study and indicates the means by which its accounts were obtained. It concludes with a justification of this research process and its outcomes in terms of its trustworthiness and ethical standards.

Critical Discourse Analysis

For the purpose of this study, then, CDA is defined as a method derived from CD theory to be applied in the linguistic analysis of the accounts on which this study is based. As described in chapter 3, CD theory considers language as social practice (Fairclough, 2003; Wodak, 2001), hence it also regards the context of language use to be significant (Fairclough, 2003; Wodak, 2001). It is concerned with the relation between language and power (Wodak, 2001). It provides, through CDA, a powerful way to explore the processes of organising, and the fragility of struggles within, organisational and institutional life (Hardy, Palmer & Phillips, 2000) such as schools and classrooms.

The field of CDA is diverse (Chouliaraki & Fairclough, 1999). Included in this field is Said’s (1978) analysis of the discourse of orientalism which draws on Foucault’s theory of discourse, but unlike Foucault includes “some analysis of texts, though without drawing on any linguistic theory” (Chouliaraki & Fairclough, 1999, p. 6-7). There are other poststructural and postmodernist critiques of discourse such Billig (2003). There is also a diversity of
positions within approaches that are defined as CDA (Chouliaraki & Fairclough, Chouliaraki, 1999; Fairclough & Wodak, 1997). However, as the previous chapter indicates, for the purposes of this study, the form of CDA associated with Fairclough has been deemed most appropriate.

There has been criticism of CDA (see for example, Hutchby & Wooffitt, 1998; Schegloff, 1997; Widdowson, 2000). Such criticisms suggest that CDA applies sociological categories to discourse when it does not need to do so, “imposing its own preoccupations on the discourse” (Chouliaraki & Fairclough, 1999, p. 7). Critical discourse analysts are said to use the terms that they are preoccupied with to describe, explain and critique the texts that they are attending to (Schegloff, 1997). Hence, from a critical position, the danger could be that the analyst may not be surprised by the data (Wetherell, 2001). That is, “the world is already known, and is pre-interpreted in light of the analyst’s concerns” (p. 385). It has also been claimed that they are “not being sensitive enough to the more basic sense of context . . . the local . . . sequential context of talk in which utterances are produced” (Hutchby & Wooffitt, 1998, p. 164).

In response, it is asserted that CDA “begins from some perception of a discourse-related problem in some part of social life. Problems may be in the activities of social practice” (Chouliaraki & Fairclough, 1999, p. 60). It chooses the perspectives of those who suffer most (van Dijk, 2001; Wodak, 2001). In doing so, it “critically analyses those in power, those who are responsible and those who have the means to solve such problems” (Wodak, 2001, p. 1). It focuses on issues of social importance, in particular, those that contribute to reducing harm and promoting social justice (Wodak, 2001). CDA seeks to critically investigate social inequality as it is expressed, constituted and legitimised by language use or in discourse (Wodak, 2001). It is concerned with finding ways of redressing these issues
(Martin, 2000). This approach is seen as positive in that it gives voice to those in less powerful positions (Martin, 2003; Maybin, 2001; Pietikäinen, & Dufva, 2006).

As mentioned above, the context of language use is significant for CDA and this includes its social, psychological, political and ideological components (Meyer, 2001). It is understood in CDA as “something that requires a more comprehensive theoretical explanation to allow an analysis of discourses” (Weiss & Wodak, 2003, p. 21). To do this, an interdisciplinary approach is proposed (Meyer, 2001; Weiss & Wodak, 2003). That is, CDA integrates theoretical approaches—here CD theory and a social theory of learning—to produce new holistic approaches (Weiss & Wodak, 2003).

In this process, discourses are not investigated for their immediate use alone. Rather, their ideological history is examined to identify how history shapes and continues the local practices (Billig, 2001). CDA seeks to investigate what has been taken-for-granted as commonsense, noting that “ideology embraces the common-sense of each social period” (Billig, 2003, p. 220). The analyst, in seeking to investigate the patterns of discourse, observes not only the issues being challenged by speakers but also how those challenges are discursively affected, and those that are left unchallenged (Billig, 2003). This is important in this thesis in unravelling the interviews and their context.

Thus, the task of CDA is to provide a detailed analysis of accounts from a social context, here the mathematics classroom, and in doing so, to attempt to theoretically and empirically connect these accounts to understandings of power and discursive struggle and to broad social conditions. This involves examining the social conditions of the production and interpretation of discourse. There are three levels of social conditions: the level of the social situation or immediate environment in which the discourse occurs; the level of the social institution that constitutes a wider matrix for the discourse; and the level of the society as a
whole (Fairclough, 2001; Rogers, 2004). These conditions shape what people bring to production and interpretation. They shape the manner in which the accounts that are resources for understanding what is going on, are produced and interpreted (Fairclough, 2001, p. 20).

Accounts are constituted by their social context (Fairclough, 1995, Lazar, 2005). In this thesis, constitution applies in this sense to the meaning-making through spoken and written text, and which contributes to understanding the social context (Lazar, 2005). The accounts, therefore, provide an understanding of the social effects of discourse, in particular the constraints on knowledge and how it is represented, how social relations and identities are constructed, and how identities of participation and non-participation are constructed in mathematics classrooms.

Critical discourse analysis is applied to an examination of the participants’ accounts relating to mathematics education. This entails being aware that the participants’ accounts may draw on different discourses about the same discursive practice or practices. In doing so, they are likely to choose the one they see as most appropriate to their own interests at a given moment and in a given context (Caldas-Coulthard, 2003).

The analysis in this thesis will occur in two parts. The first part draws on Fairclough’s (2003) three dimensions of discourse, representations, relationships, and identities. These dimensions enable a broad description of the discourses of mathematics as traced in the participants’ accounts in the program. The second part of the analysis involves a fine-grained analysis of sixteen student accounts using the identities dimension to trace how identities of participation are constructed through discourse.

The representation dimension focuses on the happenings and relationships in the world; the people, animals and objects involved in the happenings and or relationships. It includes the ways the happenings occur and their “spatial and temporal circumstances”
It considers what processes and participants predominate (Fairclough, 2001). In doing so, it focuses on representing a real or imaginary action, event, or relationship textually (Fairclough, 2001), that is, as a particular version of reality of what is occurring.

The relations dimension of discourse focuses on how the choice of a text’s wording creates social relationships between participants (Fairclough, 2001). Its interest is in examining particular ideologies that are common ground for the speaker and other participants (Fairclough, 2001; Thomas, 2006). In particular, this dimension considers the relationships of power set up and enacted in particular versions of reality.

The identities dimension involves the “commitment that people make in their texts and talk which contribute to identification” (Fairclough, 2003, p. 162). The “process of Identification” (Fairclough, 2003, p. 159) refers to how people identify themselves and how others identify them in talk and texts (Fairclough, 2003). It is a complex process because it arises from the distinctions between personal and social aspects of identity. The construction of an identity is associated with discourse as discussed previously, however, “people are not only pre-positioned in how they participate in social events and texts, they are also social agents who do things, create things, change things” (p. 160). Identity construction then is a textual and social process and involves the constitutive effects of discourse. Such processes therefore, are dialectical, as discourses are inculcated in identities.

Although described individually, in practice, the three dimensions of discourse are not discrete they co-occur and overlap. It is useful, however, to distinguish among the three for analysis. They serve as a framework for employing particular textual features to trace particular elements of discourse.

**Textual Features**

The following textual features have been identified as central to the analysis employed in this
study.

- classification schemes;
- modality and modal markers;
- deictic categories;
- binary oppositions;
- presuppositions; and
- declarative mood.

Each feature will be described in turn and the focus for analysis explained. The features will be selectively applied in the analysis as not all the features will be relevant to all the data.

**Classification schemes**

A classification scheme is a systematic means of organising, classifying and evaluating people, practices and things. Social groups impose meaning on their world by ordering things into classification schemes (Douglas, 1966). Classification schemes work to emphasise the differentiation of people and practices from one another, how they are placed in opposition to one another, and how they are placed as equivalent to one another (Fairclough, 2003; Laclau & Mouffe, 1985). Classification schemes in different discourse types allow for an understanding of the wording of particular versions of reality to “different degrees, with a larger or smaller number of words” (Fairclough, 2001, p. 96). They work to show “how people think and act as social agents” (Fairclough, 2003, p. 88). They also work to indicate “equivalence and difference” (p. 88), that is, the tendency for creating and proliferating particular differences between groups of people and “collapsing or ‘subverting’ differences by representing” (p. 88) groups of people as equivalent to one another. Binary oppositions, which are discussed later, are considered crucial for classification schemes because a clear difference
between things must be established in order to classify them (Hall, 2001b). The following account indicates how some students are classified in opposition to school.

A lot of these children I think they’ve been in big trouble at main stream schools. A lot of them find great difficulty in sitting still and I can imagine that they’d spend a fair bit of time in isolation in the classroom where they— because they’re disruptive and they talk to each other—which in a classroom situation is untenable for a teacher.

(Interview, Joan, Program Tutor)

This account is from a tutor in the Youth Reconnected Program. Ostensibly, the statement is about a particular group of students who reject schooling. However, the account carries many meanings, all of which may be plausible, for example, the students have been in trouble at school, the students have been excluded from class because of their disruptive behaviour, and the teacher may find the students difficult to work with. What is important, though, is that this account classifies a particular group of students as different to another group which is not included in the account. That is, the members of this group are in trouble, have difficulty sitting still, are placed in isolation, and are disruptive and talkative. This classification places the students in opposition to other groups of students in the classroom and in doing so gives rise to “negative feelings and practices” (Hall, 2001b, p. 230).

What is seen to cause negativity is when something is in the wrong category or does not fit any category (Douglas, 1966; Hall, 2001b) but floats ambiguously in an unstable in-between zone, for example, social groups who are mixed-raced and who are neither “black” nor “white” (Hall, 2001b; Stallybrass & White, 1986). Stability requires everything to be ordered and in place. However, what unsettles stability is when something is out of place and the rules are being broken. Things that are out of place are seen as a “sign of pollution, of symbolic boundaries being transgressed” (Hall, 2001b, p. 330). Things that are out of place
are removed, to restore order. Classifications of difference can lead to a closure of ranks and the stigmatisation and expulsion of anything that is defined as impure (Hall, 2001b). However, difference can be powerful because it is forbidden and threatening to social order (Hall, 2001b). Difference then creates social divisions, whilst equivalence subverts existing differences and divisions. In doing so, they continue the process of social classification (Fairclough, 2003).

A classification scheme can be identified through the use of “overwording—an unusually high degree of wording, often involving many words which are near synonyms” (Fairclough, 2001, p. 96). Overwording may be used when there is a preoccupation with an aspect of reality that may cause ideological struggle (Fairclough, 2001). When it occurs, that particular version of reality is likely to be “a focus of ideological struggle” (p. 96).

Alternately focusing on the text and the discourse type enables a better understanding of “meaning relationships” between the words used in the text, the discourse types underlying the words, and the ideologies on which they are based (p. 96). Two forms of meaning relations, synonymy and antonymy, are significant here. The first term refers to words that share a similar meaning. “Generally, such words do not overlap, but rather as far as one meaning goes, they mean the same” (Halliday & Hasan, 1989, p. 80). The second term relates to “oppositional wording” (Fairclough, 2001, p. 94), as when an existing and dominant wording is replaced by another in opposition to it, for example, the words “subversive and solidarity belong respectively to ‘right’ and ‘left’ ideological frameworks” (p. 95). How either of these words tends to occur, will “ideologically ‘place’ a text” (p. 95). In this study, these terms are extended to include phrases that in repetition emphasise the same theme.

*Modality and Modal Markers*

Modality refers to the stance or attitude taken in a text or statement, a judgement made about
someone or something (Fairclough, 2003, p. 165). As a textual feature it identifies what people commit themselves to, what is desirable or undesirable. It enables the analyst to trace the processes by which such identification proceeds. Here identificational meanings presuppose representational meanings, that is, “the assumptions on which people identify themselves as they do” (p. 160). Examining modality in the analysis makes apparent what people commit themselves to through different types of exchanges, either in terms of their authority to make that statement, or their evaluation of the issue in that statement (Fairclough, 2001). Although there are other forms of exchange, participants’ statements about commitment will be used for this analysis.

Modality is used in the analysis because it emphasises the “stance” that people take towards their representations (Hodge & Kress, 1988, p. 122). It expresses the speaker’s judgement on the reality of the representation in a statement (Kress & van Leeuwen, 1990, p. 49). Of importance is how social participants, contexts and relations are categorised and described. Descriptions of particular versions of events are descriptions of the relations of social participants to the social context. The descriptions represent social construction, contestation and struggle. Through the descriptions, discourses and the processes of power that contribute to such construction and contestation can be traced. Modality is realised by the use of modal markers—verbs such as may, might, must, modal adverbs such as probably and possibly, and modal adjectives such as possible and probable. Modal markers have a strategic role in discourse (Baker, Francis & Tognini-Bonelli, 1993). They are used by a speaker who wants to make their interpretation of the situation stand out from others’ interpretations or more common consensus views. It is a common emphasiser that serves to express that “what is being said is true” (Quirk, Greenbaum, Leech & Svartik, 1985, p. 583) and that there is a degree of unexpectedness and surprise (Lenk, 1998).
Modality is concerned with the speaker or writer’s authority and the direction of that authority. There are two dimensions to modality, relational modality and expressive modality, each depending on the direction in which authority is orientated (Fairclough, 2001). Relational modality exists if it is a case of the “authority of one participant in relation to others” (Fairclough, 2001, p. 105). Expressive modality refers to the “speaker’s authority with respect to the truth or probability of a representation of reality” (Fairclough, 2001, p. 105).

An important feature of relational modality is an understanding of the implicit authority and power relations in the accounts, authority and relations that are not made explicit but yet impose obligations on subjects. The following account from a program tutor illustrates this aspect:

Well that’s the way I work, others may not work, but I prefer to get to know the student really well, look for their good points and empower them and praise them wherever I can. (Interview, Joan, Program Tutor)

In this account, the textual feature relational modality is identified. This feature shows the authority of the tutor to speak about their knowledge of what they would do and the relations with others. The relational modal auxiliary verb, may, signals a possibility, but with the negating adverb not, the meaning suggests that there is the possibility that others do not work in the same way as the tutor. Of interest in this account are the speaker’s authority and the power relations to withhold what others do, that is, not make explicit what others do. The implicit claim and power relations are a matter of ideological interest because “ideology is most effective when its workings are least visible” (Fairclough, 2001, p. 71). Such an invisibility is achieved when it is brought to discourse as background assumptions that lead the speaker to “textualize the world in a particular way, . . . and yet leads the interpreter to interpret the text in a particular way” (Fairclough, 2001, p. 71).
Expressive modality, that is, the speaker’s evaluation of a particular representation of a version of reality and the basis of her authority to make that evaluation, can also be expressed using modal markers such as may, might, must, should, can, can’t, and other similar terms (Fairclough, 2001). Evaluation refers to the explicit or implicit ways that speakers or writers commit themselves to values (Fairclough, 2003). Claims about experience, other people, and relationships for example are value judgments that are used in conjunction with an “evaluative accent” and conveyed using expressive intonation (Volosinov, 1973, p. 93). Evaluative statements are about desirability and undesirability, and or what is good or bad; for example, mathematics is good or mathematics is bad. The desirability of anything is socially constructed (Graham, 2003). Evaluative statements are realised as relational processes, with the evaluative element the attribute, which can be an adjective—good— or a noun phrase—a good example.

Explicit evaluative statements about desirability generally contain words such as good, bad, hate, and love. The perceived desirability of something is socially mediated (Graham, 2003). Within a discourse, the evaluative dimensions that propagate desirability for something, suggest significance. Evaluative statements evaluate by importance and usefulness where desirability is concerned (Fairclough, 2003). What is taken as self-evident as important or useful is considered desirable, for example, the textbook is useful.

One implication of evaluation for analysing discourses of mathematics learning is that it allows for the identification of the possibilities for student learning. Another is that it reveals the existing problems that produce exclusion and isolation from mathematics learning. Evaluation allows for consideration of what exists that causes struggle in and through discourse, and the possibilities that might lead to social change which could decrease the struggle and enhance student access to discourses of mathematics learning. For example,
Well let’s go back and look at this, you can see at a glance that it is not right. I then go back, then take them through, and say to them, you can’t, [you] must take the bottom number from the top number, and what you do is borrow from next door. (Interview, Louise, Program Tutor)

In this account expressive modality is identified. This modality shows the speaker’s commitment to the “truth of the proposition” (Fairclough, 2001, p. 107) of how to solve a subtraction task. The modal auxiliary verb, must, marks expressive modality and is associated with certainty “you must take the bottom number from the top number”. The ideological interest is in the authenticity of the speaker’s claims to knowledge, with the steps used to solve a subtraction task represented as fact without any intermediate modalities (Fairclough, 2001).

Deictic categories
Deictic categories refer to the terms used to organise socially what and who is present or absent in a text (Smith, 1990, p. 57). For example, the terms now, then, here, there, the verbs come and go, and the personal pronouns, we, I, they, them, us and you, work to socially locate and organise by “time and distance and the positions and arrangements of participants with reference to the ‘position’ of the speaker” of a text (p. 56). What the speaker refers to can only be identified “when the position of the speaker and the context in which they are used is known” (p. 56). Using these categories enables an understanding of the social organisation of participants in a text. Its concern is with the ideological significance of participants and their relations (Thomas, 2006).

Deictic categories work to locate how participants are included and excluded from a discourse (Thomas, 2006). A participant may be a social actor, although this is not always the case; a physical object, for example, a textbook, can be a participant (Fairclough, 2003).
Deictic categories such as the personal pronouns, I, we, you, they, them, and us, can be tied to relations of solidarity (Fairclough, 2001). Because social actors are classified and rarely named (Fairclough, 2003), understanding we as the first person plural pronoun is crucial to the identification of groups and how accounts represent communities. Such groups and communities “are elusive, shifting and vague” (Thomas, 2006, p. 86). The use of they suggests knowledge of the group in a them and us way, rather than making reference to the previously used noun (Fairclough, 2003). For example,

The teacher like say they would not explain the whole subject to you. They just explain parts of it. (Interview, Aderley, Program Student)

Deictic categories were identified in this account. This textual feature shows two groups of people, the teacher, identified as the personal pronoun, they, and the student or students identified as the personal pronoun, you. These two groups are mutually exclusive. It is not possible, in this account, to be both. This categorisation is constructed around “the whole subject”. The teacher, identified as they, has the ability to explain the whole subject. The student, identified as you, expects this response, but it is only partially fulfilled. Here the teacher has power, and the student does not. This construction works to indicate who is included and excluded from the discourse of mathematics. Further, it shows how such a construction positions some students outside that discourse.

In this example, deictic categories work to produce an opposition between two social actors around power and control and inclusion and exclusion. There are two types of exclusion of social actors, suppression, and backgrounding (Fairclough, 2003). Suppression is when the actor is not evident in the account at all. When an actor is mentioned in the account, but has to be inferred in one or more places, it is a case of backgrounding (Fairclough, 2003). The reasons for exclusion can be varied, for example, as irrelevant or politically or socially
When social actors are constructed in and by discourse they are either initiators or controllers of actions and events. There are those who do things and make things happen, while others are constructed as affected or beneficiaries, the objects of action or control (Fairclough, 2003). In discourse they said to be either “activated” or “passivated” (p. 145).

**Binary oppositions**

A binary opposition is composed of two mutually exclusive terms (Thomas, 2006, p. 91), for example good, bad; white, black; man, woman. In making sense of language, the word choices and patterns of repetition used by a speaker are generally organised around binary oppositions (Gee, 1996). An opposition can be a contrast of feeling and belief on the one hand and rational evidence on the other. That is, one side wins out over or “subordinates” the other (Gee, 1996, p. 100). Oppositions are not always “explicitly stated in texts” (p. 101) but implied by the language used. Therefore, the way an opposition is functioning in a text can be arguable. When an opposition is not resolved, paradoxes, and contradictions emerge as a consequence of a speaker’s attempts to make sense in the first place.

Binary oppositions enable the identification of the Other as the source of problems (Thomas, 2006, p. 91). This identification, or “meta-contrast principle” (Meyerhoff, 2001, p. 67) predicts that a group of people will be classified and treated as members of an “outgroup, when the difference between all of them and all the members of another group is greater than the difference between themselves” (p. 67). The meta-contrast principle locates prominent identities in changes in the way the ratios of ingroup and outgroup differences are evaluated (Meyerhoff, 2001). Evaluations can be based on “anti-languages (opposed subcultures)” (Halliday & Hasan, 1989, p. 40), languages established for a particular purpose. When such evaluations are made, positive or negative representations of the groups are made. Here
“negation” (Hodge & Kress, 1988, p. 263) is useful for the positive that it rejects—signifying a positive term.

Binary oppositions have been criticized as reductionist and over-simplified in their two part structure (Hall, 2001b). However, there are few neutral binary oppositions—one pole is usually dominant and there is always a relation of power between the poles (Derrida, 1981; Hall, 2001b). Such differentiations reflect sharp divisions within a society. In doing so, they are used to uphold and sustain existing unequal relations of power “by emphasising the typicality or normality of the positive model and the deviance of the Others” (Thomas, 2006, p. 92). They also reflect struggle between discourse types (Fairclough, 2001). The struggle is with the establishment of one discourse type in a social context and the establishment of particular ideological assumptions viewed as commonsense (Fairclough, 2001) as mentioned earlier in this chapter.

Presuppositions

What is implicit in a text is of social importance. This is because solidarity in a community depends on shared meanings that are taken as givens and that work to form common ground (Fairclough, 2003). However, the capacity to shape this common ground is equally significant. That is, the exercise of power and hegemony includes the capacity to shape the content of what is considered common ground. Implicitness and assumptions are significant when considering ideologies (Fairclough, 2003).

Making judgments about the meaning of what has been said varies depending on the social groups that people belong to and the languages spoken (Gee, 1996). In this instance, making guesses about the meaning are made easier because of similarities in the group and or the language spoken. The guessing principle (Gee, 1996, p. 74) refers to the judgments made about what others mean by a word or words used by “guessing what other words the word is
meant to exclude or not exclude” (p. 74). Making judgments is also about building theories, testing them by how “well they make sense of past and future experience” (p. 75) and revising them when necessary.

**Declarative mood**

The expression of mood in clauses is described by Halliday and Matthiessen (2004) as consisting of a “Subject plus Finite” (p. 114) which realises the indicative feature. This feature is used to exchange information. Associated with this feature is the declarative (Halliday & Matthiessen, 2004). Declarative mood enables statements to be made that provide or give information (Halliday, 1990). It is the “order Subject before Finite that realises declarative” (p. 115). A declarative sentence is generally instigated by the person who has the knowledge, although it can also be initiated by a person who wants the knowledge, that is, the interviewer (Fairclough, 2003). Such statements are the most frequently used when speaking or writing.

In summary, using CDA brings together the theoretical understandings of a social theory of learning and critical discourse theory to analyse the social context as well as the language of the accounts. It enables an understanding of how power, discourse, and ideology are realised in these accounts. It also provides the means for redressing these issues as they happen with students and in mathematics classrooms. As a method for analysis, together with the three dimensions of discourse, representations, relations and identities, CDA provides a way of ascribing meaning to the participants’ experiences in this study. They enable broad descriptions of the discourses traced in the participants’ accounts. They also serve as a framework for employing the textual features described to trace the particular elements of discourse, and identities of forms of participation and non-participation.
Chapter 3 highlighted the significance of the social context and provided the methodology from which the methods and processes described in this chapter are drawn. Indeed, “society can . . . be understood as a vast argumentative texture through which people construct their reality” (Laclau, 1993, p. 341) in particular contexts. That context can include factors such as the material setting, the people present and what they know and believe, the language that is used, the social relationships of the people involved and their identities, as well as historical, cultural and institutional factors (Gee, 2004). This framing of context implies a correspondingly complex set of theoretically-based tools or methods suited for analysis of discourse (Chouliaraki & Fairclough, 1999; Poynton, 2000; Weiss & Wodak, 2003). CDA, as formulated in this chapter, attempts to theorise the mediation between the social and the linguistic in an interdisciplinary approach, and to operationalise the theoretical constructions of discourse into such tools and methods (Chouliaraki & Fairclough, 1999).

As noted above, the adoption of such an interdisciplinary approach necessitates the acknowledgement of the importance of the social context in which the accounts in this study are produced. That is, the students’ and TAFE staffs’ accounts are constituted in and by the social context, and that context can be understood through spoken and written accounts (Fairclough, 1995; Lazar, 2005). CDA, with its commitment to fine-grained analyses of accounts constructed within social contexts, has been chosen by the researcher to meet this requirement. Such an analysis ensures links are made between the accounts of participants and their social context. That is, the research needs to be sensitive to their accounts without losing sight of the contexts in which they occur (Chouliaraki & Fairclough, 1999).

In what follows, the social context in which the research occurs and the methods by which it proceeded are detailed in four sections. The first section discusses the social context
of the project: the program, the routine of the day, and the participants. The chapter then turns to a discussion of the data collection method and describes four stages in this process. The third section elaborates the semi-structured interviews and extends this description of the research process to describe the ways in which textual analysis proceeded. The fourth section addresses issues around ethics, reliability and validity.

The Social Context of the Research

This study examines students’ accounts of their mathematics learning experiences, in particular, evidence of the ways they participated in mathematics learning. Early school leavers were chosen for this study in order to examine their accounts of their experiences of mathematics learning at school and in the Youth Reconnected Program. These experiences have particular significance when considering recent research and policy developments as reviewed in chapters 1 and 2, and their contesting views on active student participation and inquiry in secondary mathematics. To conduct this project, a research site that provided access to students who had experienced both participation and non-participation in mathematics learning was required. Their experiences stemmed from their participation at a TAFE College and secondary schools. Their accounts illustrate the ways in which they participate or failed to participate in the social process of mathematics learning.

The Research Site

There were two main considerations for selecting a site. The first was finding students who had experienced contrasting types of mathematics education. The second consideration was pragmatic, finding an educational setting that would accept a researcher. The research site is a small campus of TAFE College located in Queensland, Australia. It offers education and training programs for a range of people wanting to access further education and or training. This campus offered the Youth Reconnected Program.
The Program

The Youth Reconnected Program was a Commonwealth funded program designed to support early school leavers who had not attained a Year Ten Certificate. The program aimed to improve their literacy, numeracy, and life skills. However, young people who achieved a Year 10 pass were also enrolled in this program as it provided them with access to further education and training. This information was confirmed at the TAFE College by the program coordinator of the Youth Reconnected Program.

It is a Youth at Risk Program and it is for students fifteen to eighteen years of age who have left school without attaining their Year Ten Certificate. . . . Basically, there are not any prerequisites; we take any kids who really want to continue their education. So this is really a second chance of going ahead and being able to access further courses. So I mean even if a young person comes in that has achieved a Year 10 pass we still put them in because from there they can access further education from this program.

Overall, the program aims to support young people who intend to progress to traineeships, apprenticeships, or further TAFE courses. (Interview, Tania, Program Coordinator)

At the time of the interviews, seventy-five students were enrolled in the Youth Reconnected Program. There were three classrooms comprising of one group of fourteen to fifteen year olds, and two groups of fifteen to eighteen year olds. The focus of this study was the fifteen to eighteen year old groups.

On entry into the program, the program coordinator assessed the students individually to establish their strengths and weaknesses in literacy and numeracy as she describes.

We start off very small, we take them right back to their primary school mathematics, just to see if there are any gaps that need filling in there and then we build on what
they know. Yes, we cover the basics in mathematics, and then we go on to try to give them hands-on mathematics, so there is a reason for them doing it. They are enjoying it you know. We try to give them real life experience with mathematics that covers all the curriculum requirements but in a fun way or in a way that kids can relate so that there is a meaning for it. (Interview, Tania, Program Coordinator)

Students were then grouped according to their age, with one group having younger students in comparison to the other two groups. The students remained in these groups for literacy, numeracy, and life skills. Different teachers took each subject area and volunteer tutors provided support for the teachers and students during the teaching day.

The Routine of the Day

The program was conducted over fourteen weeks, two days per week from 8:30 a.m. to 4:30 p.m. Numeracy and literacy were taught on Thursday and Friday. Six hours per week were allocated to each subject. Life skill subjects were taught for the remainder of the time.

The numeracy module (see Appendix 1) was developed by the then Federal Department of Employment, Training and Industrial Relations (Department of Education Science & Training, 2002) to address the Indicators of Competency in the National Reporting System [NRS] (Department of Education Science & Training, 2002). The NRS (2007) is a body created to:

- satisfy a variety of purposes, and the requirements of a range of prospective users;
- reflect and promote good educational practice;
- be fair to participants, valid and reliable; and
- be functional in practice. (p. 1)

Since literacy and numeracy development in adults is a complex matter, the mechanisms used to plan, teach and assess these areas have been limited, unreliable or not suitable for current
vocational requirements and changing industry needs (Department of Education, Science & Training, 2002). In this context, the Department of Education, Employment and Training (2002), developed the mechanisms for reporting the outcomes of literacy, numeracy in the vocational and training system. Such mechanisms included the NRS which provided a standard for educators and industry for reporting competency with literacy and numeracy.

The numeracy module was levelled from one to five and covered basic numeracy, as the Program Coordinator elaborated:

The teachers actually have benchmarks that they [use to] assess them at different levels. . . . So the first five booklets that they do are just the basic numeracy or mathematics things. We assess on that and when we are confident they can achieve that then we go onto the more varied forms of things for them. (Interview, Tania, Program Coordinator)

Each module was in the form of a booklet that was provided to the students to support them with their mathematics learning.

*The Participants: Mathematics Teaching Staff*

The program had two trained female teachers who specialised in teaching the numeracy component. They were required to deliver and teach the content of the five student workbooks and support the students when needed. Two volunteer female tutors supported the teachers. They provided one-to-one assistance and support to students when necessary. There was one program coordinator who oversaw the program at the annexe. Her role was varied. She conducted initial assessments of the young people enrolling in the program, ensured the overall program supported the students, and coordinated meetings to discuss the students’ progress.
I am leader or coordinator, I am sure that the students receive not only outcomes that are very achievable for them . . . we put in volunteer tutors so that we can give them one-on-one tutor support. Also, we have regular meetings where the teachers discuss students’ work and whether they are achieving those outcomes because they have to be supported in any way to meet their different learning needs. We do try to make it vocational based mathematics, so that gives them a meaning for it. (Interview, Tania, Program Coordinator)

The program coordinator taught literacy to the students in the Youth Reconnected Program. The program manager managed the Adult Literacy and Numeracy Department at the larger TAFE campus and three annexes. She coordinated the Literacy for Labour Market Program at one of these annexes. She also did the initial assessments of some of the young people enrolling in the Youth Reconnected Program. She explained her role:

I am the program manager of the adult literacy and numeracy department . . . of TAFE which is held on four campuses. . . . Also, I am a coordinator for the LANT program (Literacy and Numeracy Training) or the LLMP program (Literacy for Labour and Market Program). . . . So we have five coordinators. As I said, I’m the coordinator of LLMP, Tania is the coordinator the Youth Program. Mary is the coordinator of literacy. Anne is the coordinator of numeracy and Julie is the coordinator of disabilities. Overall, I am the program manager as well as the coordinator. (Interview, Denise, Program Manager)

The Participants: Students Enrolled in the Youth Reconnected Program

There were forty-three early school leavers who participated in the study. There appears to be no commonly accepted definition of an early school leaver or non-completer. This study draws on key studies of early school leavers from Ball and Lamb (2001) and Lamb, Dwyer
and Wyn (2000) to define early school leavers as young people who leave school before the school leaving age of fifteen or before, or on completion of Year 10. Students who left school before completion of Year 12 are defined as non-completers. These groups were selected as participants in this study rather than their counterparts in schools, as the research literature suggests they were more likely to experience difficulties with actively engaging and participating in learning in school (see for example, Ball & Lamb, 2001; Finn & Rock, 1997; Lamb, Dwyer & Wyn, 2000). Lamb, Dwyer, and Wyn (2000) reported that although the main indicators of early school leaving related to family background, gender, school type, and region, negative experiences of school are the reasons young people give for leaving school. Therefore, there is a need for a study such as this to examine students’ accounts of their experiences of mathematics learning.

The students’ reasons for opting out of school varied from not liking school, not achieving in school, moving from one school to another, behaviour problems, and wanting to work. The motivation for the participants to attend the program also varied. For most, it was their second chance at improving their education, wanting to access further courses, returning to school or to improve their employment prospects. Others were required to attend further training in order to get the Youth Allowance. Young people under the age of 18, and who had not completed Year 12, were required to attend full-time education or training to qualify for the allowance (Department of Human Services, 2007). The students’ accounts were used for some basic demographic information, such as their age of leaving school and their reasons for leaving. As Table 3 indicates, they left school at different ages. Of this group, the most frequently given reason for leaving school was difficulties with teachers (see Appendix 2: Reasons for leaving school). The second most frequently given reasons for leaving school were difficulty with peers and behaviour. A number of other reasons were provided including
truanting, school transition, personal difficulties and family difficulties, and not liking to be
told what to do.

Table 3. Age at which students left school

<table>
<thead>
<tr>
<th>Age of Students</th>
<th>Number of Non-Completers per Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>8</td>
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<tr>
<td>14</td>
<td>12</td>
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<tr>
<td>15</td>
<td>13</td>
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<tr>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
</tr>
</tbody>
</table>

*Only forty participants’ ages were recorded of the forty-three students in this study; two did not give their age of leaving school, and a taping error meant the loss of some data from one other.*

Data Collection

The data collection process consisted of four main stages:

1. Stage 1 involved the selection of a research site;
2. Stage 2 involved a visit to the research site;
3. Stage 3 involved the conduct of the semi-structured interviews; and
4. Stage 4 involved reporting to the Director of TAFE.

Each stage is described in more detail to show the steps taken in the study.

Stage 1: Selecting a Research Site

The selection of the research site and negotiating access to participants was the first stage of
the data collection process. In February 2002, contact was made with the TAFE College. This
education facility provided programs to support young people who were early school leavers
and non-completers of school. The aims of the project were explained to the Director, who
oversaw the management of the facility. He was provided with an information letter and
consent form permitting the study to be undertaken. The Director consulted with the staff at
the research site about the project. In March 2002, the Director granted permission to conduct the research (see Appendix 3).

Stage 2: Visit to TAFE (April to May 2002)

In April of 2002, the researcher met with the program coordinator to discuss the research project and the strategies that would be adopted to conduct the study. At this meeting, the researcher was introduced to the teaching staff and shown around the research site, the TAFE College. This meeting was used to consider and verify the intended aims of the project. This initial contact highlighted further issues to be clarified with the coordinator, for example, where the best place would be for the researcher to interview the students to ensure their privacy and that they were relaxed and comfortable.

At a subsequent meeting, further questioning took place with the program coordinator to clarify some aspects of the program. During this time at the TAFE College, the researcher met with the student participants to discuss the research project, and explain the information letter and consent form that they and their parents or carers were to sign if they wanted to participate in the study.

On the 25th April 2002, the signed and returned forms were collected. At this time, the researcher met again with the participating students and program coordinator. Discussion of the research project and any questions that arose from of the previous visit were addressed at this meeting.

Stage 3: Semi-structured Interviews

Data collection occurred in this stage. Conduct of the interviews was in a small partitioned area set aside for this purpose. The area was sectioned off from the main administration area by padded partitions. Taping the interviews without background noise was problematic. Furthermore, the noise proved a distraction for some students during the interview.
Nonetheless, this space was identified as the most appropriate given the limited quiet space available within the site. On the 2\textsuperscript{nd} May 2002, the interviews with the students commenced.

All attempts were made to ensure that the participants felt comfortable with providing accounts of their learning experiences in the interview context. At the commencement of each interview, the purpose and context of the interview were discussed, and why their accounts of their learning were important for the study. The interview questions were also read to the students (see Appendix 4) prior to the commencement of the interview. The participants prompted this process because they asked probing questions about whether the questions would be difficult and if they would fail. Such prompts worked to indicate in part how the students identified themselves, as students who may have experienced failure.

During the interview process other limitations to conducting the interviews were evident. For example, the interviewer was older, more educated, and possibly from a different social class and cultural background than the students she interviewed. In addition, the fact that the researcher was also a teacher may have presented some difficulties for the students particularly if they had negative experiences with teachers in the past. As the researcher was from an Anglo-Celtic background, cultural sensitivity to the dispositions of students from indigenous or ethnic backgrounds, demonstrating respect and a valuing of their views and acknowledgement of their experiences, was critical.

\textit{Stage 4: Reporting to the Director of TAFE}

At the completion of stage three, a thorough analysis of the interview data was conducted. In doing so, and as part of the criteria to conduct research in an educational setting, the Director of the facility was informed of the findings of the research. In October of 2003, he was sent an outline of the study and the findings (see Appendix 5). He responded accordingly, with a letter indicating his gratitude for receiving the information and that he would forward the
information onto appropriate staff members (see Appendix 6).

To this point the four stages of data collection have been described. The next section details the use of semi-structured interviews as a means for collecting the data.

**Semi-structured Interviews**

Semi-structured interviewing was chosen as the most appropriate way to obtain the information needed for this study (Minichiello, Aroni, Timewell & Alexander, 1995) on issues for which there were no correct responses (Holstein & Gubrium, 2002). Here the content of the interview focused on the issues central to the research questions. The questioning and or discussion allowed for flexibility in the interview’s development. In being able to pursue unexpected detail, the researcher could develop a more valid explication and a greater depth of understanding of the participants’ interpretations of their reality (Minichiello, et al., 1995).

Interview talk is considered to be active social interaction between groups of people which leads to negotiated and contextually based results (Fontana & Frey, 2003). The focus is on how people produce the social in everyday life, as well as what the activities of everyday life are (Fontana & Frey, 2003). It is a process of co-construction. In this process, the participants and the researcher contribute to the construction of a particular shared reality. The researcher tries to understand and interpret what the speaker is saying in order to clarify the meanings evident in the accounts (Fairclough, 2003).

A series of questions were asked that focused on the students’ experiences of learning mathematics—for example, “take me through a mathematics lesson in your school life”. These questions provided structure to the interview process and allowed opportunities for the researcher to probe and elaborate the participants’ responses of their experiences (Hitchcock & Hughes, 1995). One example of an account follows.
There was a shoot-out. You get up, there are two people and the teacher used to say what’s five plus five and the first one to go two five before they do, you win and you keep going through all the people and they get higher and higher and harder the times tables. . . . the teacher used to just give me a little maths sheet and we just had to do it, or a maths book and we just had to complete the maths book. That is it, and it is the same up here too. Just give you a maths book and you just work through it. (Interview, Peter, Program Student)

The interviews were structured in such a way that the researcher positioned herself as colleague or friend, so that the participants responded more openly and truthfully to produce valid accounts of their experiences (Baker, 1997). The results of interviews, therefore, could no longer be lifted out of the contexts in which they were gathered and then claimed as objective data “with no strings attached” (Fontana & Frey, 2003, p. 91). Rather, they were seen as negotiated accomplishments between two people shaped by the situation in which they took place (Fontana & Frey, 2003). In this regard, the researcher was aware of the issue of power in the interview context and took steps, such as indicating to students that if they did not want to participate they could opt out at any time, to reduce this issue as much as possible in the context.

Rapport and trust were identified as central to the successful conduct of the interviews. Rapport, “a necessary prerequisite for trust” (Stanton, 2000, p. 53), refers to the conveying of empathy and understanding without passing judgements to the person being interviewed (Patton, 2002). It is about demonstrating respect to and for the person being interviewed. In doing so, the researcher wanted to convey to the interviewee that their experiences, knowledge, and feelings were important and that what they had to say was important. Trust in turn implies that the person being interviewed is comfortable in the interview situation,
confident that the interviewer respects her and the information she provides and that it will be treated fairly and ethically (Stanton, 2000).

Before the commencement of the interview, preliminary discussions were held so that both the researcher and the interviewee were comfortable with each other to become familiar with one another’s “talk style” (Hesse-Biber & Leavy, 2006, p. 159). The primary responsibility for this process rests with the researcher who tries to maintain rapport throughout the interview.

The project manager indicated that some of the students had experiences whereby they did not trust outsiders. One student asked questions before the interview commenced to identify how the researcher belonged to the program community—for example, who are you doing this for? Do you work here? The interview was a balancing act between answering questions like this and sharing a little of myself in order to be responsive, yet little enough to “preserve autonomy of the participant’s words and to keep the focus of attention on his or her experience” (Siedman, 1998, p. 80).

**Audio-taping and Transcribing Interviews**

The participants’ accounts were captured using an audiotape recorder. This process provided detailed and accessible accounts of their experiences (Perakyla, 1997; Silverman, 1993). The audiotapes were considered a public record, and were available to be scrutinized by others (Silverman, 2003). The transcripts opened for analysis the “culturally rich methods” (p. 343), that is, the rich language used by the students to generate accounts of their mathematical experiences (see Appendix 7 for the full transcripts of this study).

**Anonymity of Participants**

The participants were promised anonymity at the beginning of the study. Each audiotaped interview was coded as shown in Table 4.
For readability in this thesis, a pseudonym was assigned to the first name, rather than referring to participants by alphabetical and numerical codes.

Establishing the Dimensions of Discourse

In an initial comprehensive survey of all forty-three transcripts, and drawing on a prior initial review of the relevant literature, the researcher identified clues, key words and phrases that occurred naturally in the text (Lofland & Lofland, 1995; Miles & Huberman, 1994). They were coded beside the text to be revisited to ensure the coding was accurate. Following this initial survey, NVivo (QSR International, 2001), a computer program designed for data coding and handling, was used by the researcher to check and record the preliminary written codes and recode if necessary, and to record their occurrences and frequency across all forty-three transcripts. The purpose of this process was to identify and locate all references to participation and discursive practices in these transcripts and to select those practices which received most mention. The relevant records and data have been retained and can be accessed on request.

Here a caveat is in order. While NVivo is software that has been widely used in social research, its development has been influenced by so-called grounded theory (Gibbs, 2002). However, because this study is qualitative, NVivo served two related functions. First, it enabled the researcher to easily access discursive practices and issues relating to participation.

### Table 4. Coding used to identify interviews

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>a, b, c…</td>
</tr>
<tr>
<td>Ordinal sequence of interview</td>
<td>1, 2, 3…</td>
</tr>
<tr>
<td>Gender</td>
<td>b or g</td>
</tr>
</tbody>
</table>
in the students’ accounts. Second, and related, it enabled the researcher to discount practices that received scant mention. While NVivo contributed to the identification of text for discursive analysis, this study is not predicated on grounded theory.

When the initial coding was completed, a further analysis of the data was conducted. As described in chapter 3, and drawing on new understandings generated from reading the literature, the theoretical framework, and fieldwork, the three dimensions of discourse—representations, relations and identities—were employed as a framework for the analysis of the participants’ accounts. Extracts from their transcripts were allocated to the three dimensions.

Throughout the data analysis period, the data were interrogated (Miles & Huberman, 1994) to reconfirm these dimensions of discourse. In this ongoing process, cues to the ways a participant’s experience of the social is represented through discourse were identified. Aspects of the social relationships constructed in the participants’ accounts and through discourse were examined, as were their representations of their reality and the identities that they constructed in and through discourse (Fairclough, 2001).

The following questions were asked of the data:

- How is this participant representing the social in their account of their learning experience?
- What social relationships are constructed in their accounts and how are they constructed? and
- How is a participant evaluated in discourse and how is their identity constructed through discourse?

These questions provided a guide to ensure that the examples selected for analysis were applied to their appropriate dimension and that the text could be coded for analysis.
However, this categorising of examples from the data was not always clear-cut. Some accounts could be classified as belonging to more than one dimension of discourse at the same time, for example, relations and identities. A similar ambiguity was found when coding and categorising extracts from the transcripts, in that clarity of meaning could not be found in the words alone; rather, they received their significance from the context in which they were used. Hence the need for the researcher to make careful and informed judgements about their “significance in a given context” (Miles & Huberman, 1994, p. 56). In analysing a particular selection, careful attention was needed to such textual features as classification schemes, modality and modal markers, deictic categories, binary oppositions, presuppositions and declarative mood. These features were applied selectively, as they became relevant to the data. Chapters five and six exemplify the processes described above. In the next section, the issue of ethics is addressed.

A Question of Ethics: The Issues

In academic institutions, researchers are required to adhere to strict codes of conduct and ethics. This means that the identities and location of individuals and places are not identifiable. The data collected should be labelled and held anonymously to secure confidentiality. In short, research participants should not experience harm or be identifiable in print because of results. The code of consent and ethics applied in this study provided guidelines that signified to the researcher the ethical dimensions of conducting research work. This is particularly the case prior to entry into the field (Punch, 1994).

Obtaining Consent and Ethical Clearance

The TAFE Director, program manager, program coordinator, teachers, tutors, students and parents and carers read and signed permission and consent forms that were written specially for them (see Appendix 8). Permission to interview the students was required from their
parents/carers. Permission to take part in the study was also required from the students themselves. Information letter and consent forms were written. Parents and students were requested to read, sign, and return the forms to the program manager. This process proved challenging as students forgot to take the forms home or misplaced or lost them. A further complication was that some students did not live with their parents but had carers, whilst others did not have carers, but lived with their friends. For the latter group, the program coordinator had authority to sign consent forms.

Prior to distributing the information letter and consent forms, they, along with the supporting documentation to conduct the study, were approved by the Griffith University Human Research Ethics Committee (Griffith University Human Research Ethics Committee, 2001). In developing the information letters and consent forms and planning the methods of field study, consideration was made of the ethical requirements to conduct this research. In the following section, the value of research is assessed. The issues of reliability and validity in qualitative studies are addressed.

Assessing the Value of Research in this Study

There is much debate in qualitative research about whether the empiricist orthodoxy (Guba, 1981; Schwandt, 1998), in particular the criteria of validity and reliability that are applied to quantitative experimentation and analysis, can and should be applied to qualitative analysis (Gibbs, 2002; Guba & Lincoln, 1998). It has been argued that these criteria are not appropriate to qualitative research because of the epistemological assumptions and the nature of the methods that promote the uniqueness of such research. Guba and Lincoln (1989) propose that the criterion of “trustworthiness” (p. 233) is more suited for assessing qualitative research than the validity of constructs in positivist or empiricist research. They initially defined trustworthiness in terms of:
utility—that a trustworthy account is one ‘worth paying attention to, worth taking account of’ (Lincoln & Guba, 1985, p. 290);

moral standing—where a trustworthy account is one that demonstrates ‘goodness, quality’ (Guba & Lincoln, 1989, p. 233).

However, these characteristics imply trustworthiness to be about representing “the adequacy of the conduct and reporting of qualitative inquiry” (Smith, 2000, p. 142). A more extensive set of criteria was developed by Guba and Lincoln (1998) which paralleled the traditional criteria of internal and external validity, reliability and objectivity to include:

**Credibility**—confidence in the ‘truth’ of the findings;

**Transferability**—showing that the findings have applicability in other contexts;

**Dependability**—showing that the findings are consistent and could be repeated;

**Confirmability**—a degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest. (Guba & Lincoln, 1989)

These aspects are addressed in turn.

**Credibility**

Credibility relies on the richness of the information gathered and on the analytical abilities of the researcher rather than the sample size of a project (Patton, 2002). It can be enhanced through triangulation of data. Patton (2002) identifies four types of triangulation: 1) methods triangulation; 2) data triangulation; 3) triangulation through multiple analysts; and 4) theory triangulation. However, given these types, triangulation “can produce at best only an expanded interpretive base in a study” (Smith, 2000, p. 135). When examining the difficulties of triangulating different types of data, Patton (1980) concludes that “there is no magic in triangulation” (p. 330). Other techniques for addressing credibility include making segments
of the raw data available for others to analyse. The language and interpretations can be checked by colleagues and the analysis written in such a way that the reader can also check the interpretations. In this research these two techniques will be applied.

In empirical research, internal validity refers to the extent to which the findings accurately describe reality. However, as Lincoln and Guba (1985) argue, "the determination of such isomorphism is in principle impossible" (p. 294), because the researcher would need to have knowledge of the "precise nature of that reality" (p. 295). If the researcher had that knowledge, then there would be no need to test it (Lincoln & Guba, 1985). Rather, what the empirical researcher does is hypothesize relationships and then tests them accordingly. The hypothesis however, cannot be proved, only falsified (Hoepfl, 1997). Wolcott (1990) asserts that “validity is essentially a test makers’ concept and is therefore best left to those who pursue that line of work” (p. 154). The qualitative researcher, however, assumes the presence of multiple realities and attempts to represent these multiple realities adequately. Credibility becomes the test for this.

Transferability

Transferring a working hypothesis to other contexts depends on the similarity between the original context and the context to which it is transferred (Lincoln & Guba, 1985). The transferability of findings cannot be specified by a researcher. Rather, Lincoln and Guba (1985) argue only sufficient information of use to the reader to determine whether the findings are applicable to the new situation can be transferred.

In empirical research external validity refers to making generalisations of findings across different contexts. Lincoln and Guba (1985) assert that making generalisations involves a trade-off between internal and external validity. To make generalizable statements that apply to many contexts, only limited aspects of each local context can be included. Whilst
generalisability is “an appealing concept” (p. 110) because of the appearance of predication and control over situations that it allows, the existence of local conditions “makes it impossible to generalise” (p. 124). As Cronbach (1975) argues when weight is given to “local conditions, any generalization is a working hypothesis, not a conclusion” (p. 125).

**Dependability**

Dependability is concerned with the “stability of the data over time” (Guba & Lincoln, 1989, p. 242). Guba and Lincoln (1989) propose one technique, “inquiry audit” (p. 317), for enhancing dependability of research. The inquiry audit relies on the extent that the research process is trackable and documentable. Dependability is parallel to reliability.

Issues of reliability according to Kirk and Miller (1986) “have received little attention from qualitative researchers” (p. 42) because they tend to focus on achieving validity in their research work. There are three types of reliability used in empirical research that include, “1) the degree to which a measurement, given repeatedly, remains the same; 2) the stability of a measurement over time; and 3) the similarity of measurements within a given time period” (Kirk & Miller, 1986, p. 41-42). Although these authors indicate how reliability might be applied in qualitative research, Lincoln and Guba (1985) refute these examples, pointing out that "since there can be no validity without reliability (and thus no credibility without dependability), a demonstration of the former is sufficient to establish the latter" (p. 316).

**Confirmability**

Confirmability in research consists of the degree to which the researcher demonstrates the neutrality of interpretations through “confirmability audits” (Lincoln & Guba, 1985, p. 320). Confirmability audits include raw data, analysis notes, synthesis projects, process notes, personal notes and preliminary developmental information.

It has been argued that quantitative research that relies on measuring to define contexts
is objective, detached and value-free (Kirk & Miller, 1986; Schwandt, 1998), while qualitative research that relies on interpretations and is admittedly value-bound, is viewed as subjective (cf. Denzin & Lincoln, 1998; Guba & Lincoln, 1998; Schwandt, 1998). Then there are the empirical researchers who argue that subjectivity leads to unreliable and invalid results (Kirk & Miller, 1986). However, Lincoln and Guba (1985) and Smith (2000) question the objectivity of statistical measures and, indeed, the possibility of ever attaining pure objectivity at all.

The criteria for trustworthiness allow for ways to assess the goodness of research. It is not a case of corner-cutting or sloppy evaluations. Rather a trustworthy account demonstrates goodness and quality and is worth paying attention to. It is about representing the adequacy of the conduct and reporting of the qualitative inquiry.

Conclusion

In summary, this chapter has described the research methods, the research process and its social and educational setting in which the accounts occur. It has taken into account the ethical considerations necessary when conducting this research project and argued for appropriate means of assessing the value of research. In the chapters which follow, CDA is applied to an examination of the participants’ accounts, making sense of their particular experiences.
CHAPTER 5: DISCOURSES ABOUT THE PROGRAM AND ITS DISCURSIVE PRACTICES

The previous chapter presented CDA as the method for analysis of the accounts in this study. It outlined the research design and data collection methods of this study. It also acknowledged the importance of the social contexts in which texts are produced. As noted in chapter 3, the relationship between the two is a dialectic one, that is, texts constitute and are constituted by the social context (Fairclough, 1995; Lazar, 2005). This chapter and the next address the second research question: What discourses, discursive practices and forms of participation can be traced in the student accounts and how do they relate to those previously traced in the literature and research?

The Discourse Community’s Discourses of Mathematics Learning

To answer this question, these two chapters apply the theoretical framework developed in chapter 3 to the accounts of the members of the “discourse community” (Fairclough, 1995, p. 227) in the Youth Reconnected Program. This chapter traces and describes discourses about mathematics learning in the context of the program; in the next, the same process is applied to ascertain the discourses about mathematics learning in secondary classrooms. Both chapters demonstrate how different discourses structure mathematics learning contexts differently. Chapter 7 then focuses on those discourses and their representations of mathematics learning to trace how the students’ identities of participation are constructed in and through those discourses traced and their related discursive practices.

The three dimensions of discourse described in chapter 3—representations, relations and identities (Fairclough, 2001)—provide the organising framework for the analysis in this chapter and the next. The representations dimension focuses on the particular versions of reality represented in discourse—its particular ways of looking at the world, for example, the
The relations dimension traces how relations, including relations of power, are constructed in and through discourse. It focuses on how an account’s wordings work to create social relationships between participants (Fairclough, 2001). The identities dimension focuses on the process of identification. It refers to how people identify themselves and how others identify them in and through discourse (Fairclough, 2003). They are reviewed for their relevant discourses in the discussion sections of this chapter and the next.

The textual features previously discussed in chapter 4 and drawn on in this analysis include classification schemes, modalities and modal markers, deictic categories, binary oppositions, presuppositions and declarative mood. Declarative mood provides information or facts—they constitute the greater part of the participants’ accounts. It is the order, subject before finite that realises declaratives (Halliday, 1990). Classification schemes organise and classify and hence evaluate people, practices and things. Such schemes can be identified by the use of synonymy. Synonymy is the repetition of the same or similar terms, and by extension similar statements, phrases or claims, in the text. Modality and its modal markers work to indicate the stance taken towards some issue or event; it implies evaluation and judgement as to what is desirable and what is not. Deictic categories indicate who is present and who is absent from a text and how they are positioned or related. Binary oppositions are mutually exclusive terms, usually standing in relations of dominance and subordination or approval and disapproval. Presuppositions are reasonable inferences that can be drawn from an account. These textual features reveal “how discourses are drawn upon and combined in texts” (Fairclough, 1995, p. 3). They provide insights about what is “‘in’ a text, and what is absent from a text” (p. 5).

This chapter draws upon this conceptual framework and applies its textual features to
identify the discourses of mathematics learning and the discursive practices in the participants’ accounts of their experiences of learning mathematics in the TAFE program while the next does the same for secondary mathematics classrooms. In doing this, the following four-step process of analysis is followed: the textual feature is identified; there is a brief discussion of what the feature shows; the textual feature is traced in the text; and its significance to the construction of the discourse is addressed (S. Thomas, personal communication, 31st January, 2008). In the discussion in chapter 6, the accounts about these two contexts are then compared with the tripartite model for understanding participation (Figure 3) in chapter 3. This comparison is followed by a discussion of the four characteristics deemed useful in chapter 3 for describing a community of learners.

A Significant Caveat

As described in chapter 3, discourse is about language and practice (Hall, 2001a). It is about the social practice of language—how a topic is spoken about and enacted in a social context. It also regulates how people conduct themselves in such contexts. In social institutions, discourses structure people’s social space into sets of situations where discourse occurs. The accounts of the participants in this study construct discourses about learning mathematics. Such discourses are the discourses of the Youth Reconnected community. They are situated by their location in the TAFE site. In it, and from that perspective, the participants, in particular, the students present their accounts of learning mathematics in the Youth Reconnected Program (the program) and in secondary mathematics classrooms.

Here a caveat is necessary. Critical discourse analysis of these accounts enables a comparison of the approaches to teaching and learning mathematics in terms of the discourses of this community of learners; that is, as these two contexts were experienced and reported by the participants, all of whom had withdrawn or had been withdrawn from secondary
mathematics classrooms. Hence it is not appropriate to find a program discourse—the
discourse of the program—or a secondary mathematics education discourse in their accounts.
Rather, what these accounts present are discourses about the program and discourses about
secondary mathematics classrooms. These accounts and the discourses about these two
approaches to mathematics education are constructed within the community discourse of the
Youth Reconnected Program context and conditioned by it.

Two Discourses about the Program

In what follows, two different discourses about the Youth Reconnected Program are
addressed. The first, held by most participants, was supportive of the program and its
practices. The second, presented by a small number of participants, was critical of the
program or of some of its practices. These discourses are reviewed in turn.

The Predominant Discourse about the Program

In the participants’ accounts, then, the program was identified as vocational in purpose and
content. For example, for the program coordinator, it provided mathematics that was
connected and relevant to the students’ lives, was meaningful to them, and supported them
with further education and training such as traineeships, apprenticeships and other TAFE
courses.

I think they are very responsive to this program. We have a great success rate with the
Youth program. To date we have put through about 2000 young people and we
probably have about a 70% success rate where the young people actually go on, with
our help into traineeships, apprenticeships, or further TAFE courses. The remainder,
they will come back to us because they’ve had a good taste of education and they
think okay, we enjoyed ourselves at TAFE and some time they do come back. It might
be six months later, it might be two years later. But eventually they do come back. But
because it is a package deal, we find they are succeeding. I think it’s mainly due to the small numbers, we only have fifteen in the classroom usually, and you know with the one on one support. That makes a big difference. I find that most of these kids probably missed out something in primary school and have never been able to grasp it. They’ve missed out on those basics. Once we can go back and take them to the basics then they just go pat with everything then.

In this account, a particular version of the program was presented. Composed largely, though not completely, in the declarative mood, its statements represented what the program coordinator saw as the facts about the program and its members. It described specific social actions and discursive practices that constituted the program as being vocational. The actions included giving the students real life experiences, making it fun and or teaching it in a way that the students could relate to the mathematics. The practices included one-to-one support and providing small class sizes which were identified as significant by the program coordinator. It was identified as covering the same curriculum content but presented differently—it was student-centred, work-oriented, practical and relevant. From these claimed characteristics, it would seem that learning was an “integral and inseparable aspect of social practice” in the program—it enabled an initial legitimate peripheral participation in a community of learners (Lave & Wenger, 1991, p. 31). That is, the program suggests an opening, a way of gaining access to resources for learning and understanding, to be in a “place” where students can move toward more-intensive participation, with “peripherality an empowering position” (Lave & Wenger, 1991, p. 36). It affords the articulation and interchange among a community of learners.

The use of figures—“about 2000 young people”, “a 70% success rate”—to evaluate the success of the program provided added weight to the persuasive claims for its success.
Their use signalled an exactness that reinforced the program coordinator’s version of the program and its effectiveness in assisting students’ future opportunities. The modal marker, actually, worked strategically in the account to emphasise her perspective of the situation and that what she said, that is, “probably have about a 70% success rate where the young people actually go on” to further education and training, was “true” (Quirk, Greenbaum, Leech & Svartik, 1985, p. 583). What was also emphasised was the claim that “the remainder”, that is, six hundred students out of “about two thousand” represented, found their way back to TAFE education. Just as significant was the contribution that small class sizes and one-to-one support provided by the teachers and tutors were claimed to make the program a success. These two significant features of the program reinforced it as an alternative discourse to secondary school mathematics learning.

The use of the deictic category I in the modal marker, mental process clause (Fairclough, 2003, p. 170) “I think”, worked to show that the strength of her claim to her particular version of reality was related to a positive evaluation of the program and the students’ responsiveness to it. This clause prefaced the entire statement, and indicated not only that this was the program coordinator’s view, it underlined her status and authority to make the claim that followed. For the rest of the account, the deictic category we was used, as in “we have a great success rate”, indicating once more a team approach to the success of the program. This team approach, the small numbers of students in any group, and the “one-on-one support” available clearly differentiated between the program and secondary mathematics classrooms, thus reinforcing a discourse about the program and how its particular practices were supportive of student learning.

As noted above, the success of the program was predicated on the positive response of its students. Expressive modality is evidenced in the account. The program coordinator’s
authority to represent her evaluation of her particular version of reality was emphasised by the use of modal markers. The students were “very responsive”, the program had “a great success rate”, the students “actually go on”—implying this could not happen elsewhere—but “with our help”, it could happen in the program. As for those who did not succeed, “eventually they do come back” because of the “good taste” they had from the program. This association of meanings were traced as ideologically determined. That is, they were relative to the particular ideology of remediation created in the account and the discourse community’s discourse about the program.

As the program coordinator’s account above indicated, the program was seen to provide students with a context for participating in learning mathematics. The emphasis seemed to be less on giving information and more on observing what the students were doing and shaping their learning from that point forward through interactions that directed the students’ attention to what was to be learned. Its focus was seen to be on identifying what mathematical knowledge the students had and building on that knowledge.

we put in volunteer tutors so that we can give them one-on-one tutor support. Also we have regular meetings where the teachers discuss students’ work and whether they are achieving those outcomes because they have to be supported in any way to meet their different learning needs. We do try to make it vocational based mathematics, so that gives them a meaning for it. (Interview, Tania, Program Coordinator)

This commitment to assisting students to make progress with their mathematics learning was identified as a major emphasis in the accounts of the teachers and tutors. Here the use of the deictic category we was significant. The word, we, was used four times in the account. Each time it was related to a positive evaluation of the program and the need to provide the support to students. It also implied inclusivity—that all staff were involved in
providing this support. Here we, linked to the modal marker, do, in the verb, do try, underscored the intensity of effort made by the whole staff to ensure that the mathematics was vocational, relevant and connected to the students’ lives and future prospects in education, training and work. Its use worked to lead the reader into a position of agreeing with the coordinator, thus reinforcing the authority of a discourse about the program. The positive response of the students and the success of the program were stressed by the program coordinator. The program manager’s account represented the program further.

I see it [the program] as more relevant to their lives because I have my own kids studying maths at school and the stuff they do, half the time I don’t even know what it is about. . . . A lot of it just doesn’t seem relevant and it is a lot slower here I guess. There’s not as much to be covered and there is more time for people to spend with kids to actually work things through. That’s what they need. . . . It’s the pace, it is the content, it’s not the pressure on them to really whiz through, or feel that they are not in the successful class. They’re just in the class here and they work with people. We try and match people up so they can help each other. Better kid with another kid if that’s possible. I just don’t think there’s the stress on them and the stigma again at the same time. (Interview, Denise, Program Manager)

The program manager’s authority to speak about the truth (Fairclough, 2001, p. 107) of her representation of the program was evidenced in the expressive modality of this account. This evaluation was evidenced in the phrases that it was “more relevant”, and allowed “more time” “to actually work things through”, because “there’s not as much to be covered” and “it is a lot slower here”. These evaluative phrases justified her conclusion that “I just don’t think there’s the stress on them”, and “it’s not the pressure on them to really whiz through”. On the other hand, secondary mathematics “just doesn’t seem relevant” and “I don’t even know what
it is about”. By implication, there is too much to cover, the pace is too fast, there is not
enough time, the pressure is too great, and it promotes stress. Here the modal terms in the
phrases such as “more relevant”, “just doesn’t seem”, “not as much”, “a lot slower”, and
“really whiz through”, acted as markers to emphasise both contexts. The evaluations above
allowed for the identification of possibilities for student learning. It revealed the existing
problems associated with mathematics learning in some contexts that produced exclusion and
isolation from learning.

The modality identified in the program manager’s account above highlighted the
discursive practice of pace, emphasising the existence of what caused struggle in and through
discourse and the possible changes that could be made to decrease the struggle and enhance
student access to discourses of mathematics learning. In chapter 2 pace was identified as
contributing to student exclusion. Reasons given included a “one-size-fits-all curriculum”
(Kalantzis, 2006, p. 17) where students worked through the same curriculum at a common
pace. This practice was shown to have implications for student success in the subject because
conceptual understanding varied for individual students. When the focus was on speed during
mathematics lessons, some students were found to watch, copy and or guess the answers
rather than think more deeply about the questions asked (Kyriacou, 2005b). As Muller (2004)
points out, when the “requirement to absorb curricular content proceeds in advance of the
reading levels of non-middle-class pupils” (p. 8), the obvious is ignored. That is, that the
curriculum is paced to “the level of middle-class learners” (p. 8) who have had experiences
with reading, not to those who have not. Consequently, students who can keep pace are more
likely to access the discourse of mathematics and its associated practices. Those who cannot
are less likely to be afforded such access and experience isolation and exclusion from
learning.
Two major contexts were represented in this account. In the first, the program manager used the circumstances of her personal life to contrast secondary school mathematics with the program. This contrast signified the difficulties with doing secondary school mathematics, thus creating a further contrast. The second contrast used a negative evaluation of secondary school mathematics to construct a positive view of the discursive practices used to teach mathematics in the program. In this account, positive teacher and student interactions, levelled textbooks, slowed pace, mixed-ability grouping, peer assistance, assessment for learning and interactive teaching style were identified.

The program manager’s account was seen to represent the program as inclusive, that is, as assisting students to experience reconnecting with learning mathematics. It was also seen as counteracting student rejection of the way they were taught mathematics in school, and removing the stigma of failure with which they had been identified. Here the deictic use of the pronoun, we, in “we try and match people up”, indicated the collegial and inclusive approach taken in the program, whereas the modal verb, try, and the modal phrase, “if that’s possible”, modified the verb, match, to indicate a degree of difficulty in implementing aspects of that process.

A particularly significant emphasis about secondary mathematics that combined several textual features for its effect was the statement, “half the time I don’t even know what it is about”. Here the deictic category, I, emphasised the authority of the speaker to make authoritative judgements about the subject, so by presupposition, ‘if I, as knowledgeable teacher don’t know, nobody else can’. Further emphasis was provided by the phrase “half the time” and the combination of the modal adverbs not and even in “don’t even know” to indicate the highly unlikely probability that this work could be understood. The construction of a discourse about secondary school mathematics in contrast to the discourse about the
program is elaborated further by the classification schemes discussed below.

Classification schemes worked to further emphasise differences between secondary mathematics and the program. The use of synonymy for repetition of similar positive claims about the program was important in this regard. These claims about the program included, “it is a lot slower here”, “there is more time for people to spend with kids”, “it’s the pace”, “it’s not the pressure on them to whiz through”, “they work with people”, and “we try and match people up” in the program. This repetition served to set up a common-sense meaning about the program and its related discursive practices, which, in turn, classified it as different to the implied or repeated negative claims about secondary school mathematics learning.

In short, elements of the program manager’s account embodied particular knowledge, discursive practices, relationships and identities that sustained the program as supportive of students’ mathematics learning. That account provided an appropriate introduction to the more detailed analysis that now follows of how the program’s key discursive practices were constructed in the discourse of this study’s participants. This analysis begins with the interactive teaching style of the program.

*Instructional Style*

In most accounts about the program, an interactive teaching style was identified as encouraging student engagement and participation in learning. In the practices of reform-based teaching and learning of mathematics discussed in chapter 2, this practice was found to be critically important for successful teaching and learning in mathematics classrooms (Jones & Tanner, 2002). Higher-order questioning by the teacher and the provision of challenging tasks that required students to think and discuss their mathematics were found to be crucial (Askew, Brown, Rhodes, Johnson & Wiliam, 1997; Denvir & Askew, 2001). What was learned then became explicit discussion topics with students engaged and participating in
mathematics discourse in the reform approach, which in turn opened further possibilities for learning (Cobb, Boufi, McClain & Whitenack, 1997).

Again in chapter 2 a direct instruction style was contrasted with an interactive style. Significantly, however, the program coordinator’s account below contained elements of both practices. The acknowledgement of the need to shift teaching approaches from a direct approach to a more interactive approach suggested an understanding of teaching and how to adjust teaching styles to support learners. This recognition indicated the adoption of a balanced approach as described by Farkota (2003) and Rowe (2006) in chapter 2. That is, different instructional styles might be more appropriate in different parts of a lesson. As was noted,

We direct teach probably for about half an hour and then each student works at their own particular level. After the direct teaching then each student works at their own particular pace with whatever aspect of the program they are doing. That can be achieved by having small numbers in the classroom and then having the support. Once the kids start achieving there is no stopping them, they’re ready to tackle the next level. . . . We don’t use textbooks. We start off very small, we take them back to their primary school mathematics, just to see if there are any gaps that need filling in there and then we build on what they know. (Interview, Tania, Program Coordinator)

In this account declarative mood was used to affirm and emphasise that different approaches to teaching style were applied and why and how they were applied. It showed the information that the speaker was providing (Halliday, 1990), that is, the program coordinator drew on a range of teaching approaches to support the students in the classroom. This information provided some weight to the point in chapter 2, that while a student-centred approach was supportive of student learning, appropriate use of direct instruction was also
needed (cf. Farkota, 2003; Rowe, 2006). As was pointed out in that chapter, both approaches required that teachers had to have a deep understanding of mathematics if they were to instil a deep understanding in the students they taught. There is the suggestion in the above account that combining both approaches was more likely to promote successful outcomes for students. In short, in the discourse constructed here about the program, aspects of direct instruction are combined appropriately with a more interactive approach to ensure effective learning and student support. An interactive approach was emphasised in the following student account as beneficial for learning.

It’s different because I’m actually getting taught something, like the teachers actually have time for each student, um, the teachers explain things the way I could understand um . . . teach you . . . which is really good . . . I love that. (Interview, Suzanne, Program Student)

This student’s interpretation of her experience indicated that through the interactions with her teacher she was “getting taught”. Here the student was included in the learning in an interactive way. The mathematics was explained in a way that she could understand. This aspect was identified by the use of classification schemes in the account. These schemes worked to organise, classify and evaluate people and practices or, in the account, the program from school—“it’s different”. The use of synonymy as a classification scheme, that is, the repetition of similar meaning or same phrasing, worked to evaluate teaching style as a discursive practice. This repetition underlined a teaching style that was established as different to her experience at school—in the program “the teachers actually have time for each student”, “the teachers explain things the way I could understand”. The significance of classification schemes in the account allowed for the identification of a discourse about a particular context, here the program. The discursive practice, interactive teaching style, was
represented in this discourse as was the relations between the student and teacher in the program.

The expressive modality identified in the account worked to reinforce this practice as desirable. This evaluation was particularly evident with the modal markers, good and love, in the phrases “which is really good”, and “I love that”. It was further reinforced by the modal marker, actually, which was used to emphasise a degree of surprise and unexpectedness that the student was getting taught something. The evaluation is significant because it shows one consequence of this practice on the student. In particular it shows how the construction of an identity proceeds through the articulation between a discourse and its practices (cf. Hirst, 2004). A similar evaluation was reinforced in the following account.

they come around and they show you how to work it and which way is easier to work it out and afterwards . . . like now, like after you’ve just started to do it they call people up and they come up and show you how they work it, and then we show how we worked it out on the board. And if it’s wrong they show the proper way to work it out. . . . Yeah, like TAFE is better because they treat you, they don’t treat you like a kid. I was here last year with Patricia and they just treat you the same. (Interview, Peter, Program Student)

This account emphasises how the student was included in learning. Here, declarative mood and expressive modality converged to identify such inclusion. Declarative mood allowed for the identification of information that is related to the discursive practice, teaching style. It is the “order, Subject before Finite, that realise declarative” (Halliday & Matthiessen, 2004, p. 115). For example, the phrases “they come around”, “they show you how”, “they come up”, “we show how”, “we worked it out”, “they show the proper way”, “they don’t treat you like a kid”, worked to show who was being held responsible for the interacting event—here the
teacher and the student as the subjects in the phrases. This information provided evidence of an interactive teaching style in which the teacher mentored and scaffolded student learning. It confirmed the discussion in chapter 2 where this style of teaching was found to be an enabling practice that improved students’ participation and engagement in mathematical learning for understanding (cf. Scherer & Steinbring, 2006). Scherer and Steinbring (2006) found that through students articulating their ideas and their methods for solving tasks, they were granted enough legitimacy to be treated as students who participated in learning mathematics. Becoming a legitimate participant in a classroom community requires learning how to talk and engage in the discourse of that community as part of legitimate participation (Lave & Wenger, 1991). As noted above and in chapter 2, however, the place of the teacher as a significant member of the classroom community in guiding and enabling learning was acknowledged. This form of participation was about being located in the social world—belonging in the mathematics classroom as a condition for learning. It was through this participation, in which the teacher was seen to play a critical role that this student came to learn the discourse about mathematics and in doing so, construct an identity as learner.

A further evaluation of an interactive teaching style using expressive modality was identified in this account. This modality allows for the identification of how the discursive practice was evaluated by the student. Here, an interactive teaching style was evaluated as “easier” and “better” than, by inference, secondary classroom mathematics. To further clarify, “people come round and show you how to work it and which way is easier to work”, after which “we show how we worked it out”. Then, “if it’s wrong they show you the proper way”. This sequence of evaluations led to the student’s positive conclusion, that “TAFE is better because . . . they don’t treat you like a kid”. In this discourse about the program, an interactive teaching style was closely linked to teacher and student interactions.
Communication and Interaction

In the discussion of reform mathematics in chapter 2, and as indicated in the previous analysis, teacher and student interaction was found to be a natural corollary of an interactive teaching style. Defined as a three-way social process, teacher and student interaction was shown to be crucial to student learning in mathematics classrooms. In such contexts students were found to be included in their learning when the teachers interacted and actively supported students in their learning (Cobb, Boufi, McClain & Whitenack, 1997). The classroom was a work in progress with its focus on enabling students to apply their mathematics knowledge.

Throughout the accounts of the teachers, tutors and students in the program, with some exceptions, interaction as a practice was found to endorse student access and inclusion in learning about mathematics. Such access to a learning community and its practices is crucial for students to engage and participate in learning in communities (Davies, 2005; Lave & Wenger, 1991). Here transparency, that is, knowing who or what is required for access and membership, is critical. If students are to have access they also need to know who has the authority to offer effective access and to sustain it in a classroom community (Davies, 2005, Lave & Wenger, 1991). It requires constant maintenance of this type of interaction on the part of the teacher and the student. When this occurs students were more likely to represent and interpret their experiences of learning mathematics positively.

I reckon it’s heaps easy here, like the teachers show you what to do and they come and help you do it. They actually come over and see if you need any help or anything. They come over and help you do it, like work you through it. (Interview, Stephen, Program Student)

Here, relational modality worked to reinforce the degree of authority claimed by the
student in relation to the teachers in the program. It was found in the way the student explained what the teachers did to support and include him in his learning. It reinforced the significance of teacher and student interactions as crucial to student engagement and participation in learning mathematics. The modal marker, actually, worked to emphasise his stance and indicated a degree of surprise and unexpectedness that such support was provided. This finding was significant because it worked to construct a particular discourse about the program. More specifically the importance of the discursive practice teacher and student interaction was identified as crucial to his learning. Its use in the program provided structure and coherency to the teaching and learning process (cf. Martin Rojo & Gomez Esteban, 2005) therefore guiding students with their learning (cf. Fairclough, 2001).

In this account, a classification scheme was traced that organised and evaluated the participants and practices it described. The detailed sequence of the phrases, “the teachers show you what to do”, “they come and help you do it”, “they actually come over and see if you need any help”, and finally, “they come over and help you do it” with the explanatory, “like work you through it” provided the detail to justify this student’s particular version of reality in the Youth Reconnected Program. The process of classification is continued as the phrases worked to classify him as in agreement, not in opposition to the teacher (Fairclough, 2003). The phrases also work to show stability, that is, the student works with the teacher and the learning was orderly (cf. Hall, 2001b).

As before, expressive modality was evidenced in this account also. An explicit evaluation of the program was identified by the use of the modal adjective and intensifier, heaps, in the phrase “it’s heaps easy”. This modal marker worked to emphasise the student’s authority to speak about their particular version of reality. The modal marker, actually, as an emphasiser, also worked to express that what was being said was “true” (Quirk, Greenbaum,
Leech & Svartik, 1985, p. 583) from this particular version of reality—that the program provided support and assistance with his learning. It also worked to indicate an unexpectedness (Lenk, 1998) and surprise that the program provided such support. In short, this account of the discursive practice, teacher and student interaction, drew on the discourse about the program in ways similar to previous accounts.

Where the above account indicated that the interactions between the teacher and student assisted the student, this practice was classified more explicitly in the next account.

It’s different because I’m actually getting taught something, like the teachers actually have time for each student um the teachers explain things the way I could understand um . . . teach you . . . which is really good . . . I love that. (Interview, Suzanne, Program Student)

The use of expressive modality, that is, the evaluations of this student’s experiences, was evidenced through the use of the adjectives “really good”, and “love”. These adjectives worked to indicate a desirability of the interactions between the student and teacher in the program, thus suggesting their significance for her. They also worked to show that the desirability of the practice is socially constructed and a relational process. This evaluation of the interactions between the teacher and student allowed for possibilities for student access, inclusion and engagement in learning. In chapter 3 these possibilities were identified as crucial to participation (Davies, 2005; Hill, Davis, Trout & Tisdall, 2004). This relational process required the skills of communication, negotiation, and decision-making. When students were granted access and enough legitimacy to be treated as students and members of a community they were more likely to participate in the enterprise of that community. As a student moved towards more intensive participation in learning, it could become empowering (Lave & Wenger, 1991).
Further identification of expressive modality was evidenced by the phrases “actually . . . taught something” and “the teachers actually have time for each student”. These phrases worked to establish the student’s authority to speak about the program. This authority was further reinforced by the repeated use of the modal marker, actually, which worked to emphasise that what was said was “true” (Quirk, Greenbaum, Leech & Svartvik, 1985, p. 583) from this student’s version of reality. Its usage served a strategic role (Baker, Francis & Tognini-Bonelli, 1993) in this account to make her perspective stand out with respect to the unexpectedness or surprise with the interactions between the student and the teacher, a surprise also noted in a number of accounts. The extent of such interactions was amplified by the modal adjective, each. It extended to “each student”, which again seemed cause for unexpectedness and surprise. The identification of expressive modality in this instance, worked to reinforce a discourse about the program and how through this discourse the relations of power, that is, between the teacher and student were not constrained. Rather, there appeared to be a shared understanding that the teachers were there to assist the students as much as possible with their learning.

A shared understanding of the program as responsive to the students’ learning needs was traced in the previous accounts. This understanding worked to show that the students had effective access to the program through such discursive practices as teaching style and teacher and student interactions. It was confirmed by the patterns of repetition traced in the accounts thus far. This structured repetition worked to show the centrality and critical significance of this practice for student learning. It was identified further by the program tutor.

It’s more of a support system and the maths comes second. . . . I prefer to get to know the student really well, look for their good points, and empower them, and praise them wherever I can. . . . Yeah, it is more relationship building and then once that’s built
you can have really big break-throughs. . . . Well the relationship builds while you’re working on the maths with them originally and then once the relationship is established it becomes much more mathematics in the tutoring side, but the relationship is never lost, it’s there. (Interview, Joan, Program Tutor)

Relational modality was evidenced in this account. This feature worked to show a particular version about the reality of the program and its social context from the tutor’s representation. It also indicated the speaker’s authority in relation to others, here the students—“I prefer to get to know the student” and “you can have really big break-throughs”. Here the relational meaning of obligation expressed by the modal auxiliaries, to and have is significant. These modals represented the authority of the tutor to perform the obligation based on an external need, for instance the expectations and rules for tutors established by the TAFE. This obligation was not based on “say-so” (Fairclough, 2003) but in an unspecified way based on the TAFE program which was made more specific by the accounts of the program manager and program coordinator earlier in this chapter.

Evidence of expressive modality elaborated the relational modality further. Expressive modality refers to the speaker’s authority with respect to the probability of an evaluation of a representation of reality. It was traced in the evaluative statement prefaced by the first person singular pronoun, I, as in “I prefer”. Here the tutor assumed responsibility for the processes she employed, that is, “I prefer to get to know the student”, suggesting interaction with the student. That the tutor wanted to know students “really well” was further emphasised by the evaluative terms “good points”, “empowers” and “praises” them, with the qualifier, “wherever I can”. The ideological interest was in the authenticity claims or claims to knowledge as evidence by expressive modality. The tutor reported the facts without the use of intermediate modalities—showing a view of the program as “transparent” (Fairclough, 2003,
A classification scheme was traced in the account that organised and evaluated the interaction between the tutor and student. “Relationship building” and the shift to focus on mathematics was emphasised by the use of synonymy. The initial stance was presented, then elaborated and reinforced by a further repetition, which introduced the link to the second stance—“once that’s built you can have really big break-throughs”. Here the compounding effect of expressive modalities in the modal adverb, really, modifying the modal adjective, big, while both qualify the noun, break-throughs—really big break-throughs—underlined the tutor’s understanding of the critical importance of the sequence. An explanation followed, in that, though the balance gradually shifted to become “much more mathematics”, from the beginning—originally—relationship-building was always a means to that end. Even there, however, that shifted balance, the “much more mathematics” received a final qualification, “but the relationship is never lost, it’s there”, indicating that it was sustained, interactive and positive.

To sum up, the expressive modality evidenced in the evaluative statements in this account with its emphasis on words such as well, good, praise, empower and break-throughs, which were socially mediated, indicated the desirability and significance of the tutor and students interactions represented in this account. It was significant that the relationship and interactions between the tutor and student needed to be established and sustained as positive before learning could occur. This key point was described and elaborated in chapter 2. In that chapter success in mathematics was shown to be contingent on several related factors including the practices of the classrooms and the relations of power between teachers and students (see for example, Zevenbergen, Mousley & Sullivan, 2004) and the students’ social positioning (Nasir & Saxe, 2002b). Further Lave and Wenger (1991) make clear that learning
is not simply situated in practice and located somewhere, it is an integral part of “generative social practice in the lived-in world” (p. 35).

The previous account reiterated previous references to the support and types of interactions constructed between teachers, tutors and students and which were considered crucial for student learning in the program. These interactions were also evident in the account of a second program tutor.

To be with the students and to help if they need help. Not to interfere, but to encourage them to keep working because they loathe it, because they’re not good at it. The students that I have are usually the lower achievers and because they’re not good they’re loath to do it. So there needs to be encouragement and [the tutor needs] to be there to help them. (Interview, Louise, Program Tutor)

Expressive and relational modality were both identified in the way that the tutor explained what she did with the students. The modal marker, usually, suggested a tentative assertion that the tutor worked with the “weaker students”, indicating an expressive modal meaning of possibility, which was tentatively worded. This meaning gave the impression of “self-effacement which is in marked contrast with predominately authoritative modality” (Fairclough, 2003, p. 152). There was then the shift from expressive modal meaning of possibility to truth expressed by the present tense—“to help if they need help” and “to encourage them to keep working”. This modality placed the tutor in an authoritative position with respect to what must be done in the program to assist students with their mathematics learning. The students in turn were positioned not so much as passive—after all they loathed mathematics and were “loath to do it”—but as reacting positively to the interactions with tutors and teachers. This point is elaborated in the following account.
But the teachers are different, I think here’s easier to learn because the teachers actually come around and show you what to do, they sit with you and actually show you how to do it when you know it, make sure you know after they leave. That’s different to Caballaria where I went to school and they would show you so you would know, yeah, it’s easier. . . . Yeah, probably a more sense of belonging here than was school. . . . I can learn easier, the teachers help you more and you just feel like the teachers respect you and you respect them and that. (Interview, Damien, Program Student)

Expressive modality was central to this account. The authenticity of the claims, claims to the knowledge that were evidenced by modal markers in the phrases “are different”, “actually come around and show you what to do”, “they actually show you how to do it”, “make sure you know after they leave” were phrases about desirability. Such phrases worked to evaluate in terms of importance and usefulness where desirability was assumed (Fairclough, 2003). This evaluation was further emphasised in the phrases “easier to learn”, “a more sense of belonging”, and “can learn easier”. The modal marker, actually, reiterated this evaluation emphasising that these events were experienced by the student.. Such an evaluation allowed for understandings of what the student considered important—that learning was an inclusive experience.

The consistency of this evaluation with previous student accounts demonstrated the socially mediated nature of the discursive practice, teacher and student interactions, in their discourse about the program. This identification allows for considerations of the possibilities for students to be included in their learning in communities of learners. In chapter 3 a community of learners was described as a community where learning was situated in collaboration with others. In an ideal community, all participants play an active role, with the
responsibility for learning shared by community members through effective interactions (Matusov, 1999; Renshaw & Brown, 1997). It is through these interactions that students’ understandings of what mathematics is and could be are transformed.

Participants in a community can be positioned socially as active and included or passive and excluded as a consequence of discursive practices such as teacher and student interactions. As discussed in chapter 3, the one who is activated is identified as the one who through processes, does things and makes things happen. One who is passivated is the one who is affected by or the beneficiary of such processes (Fairclough, 2003). These terms construct particular social positions, for example as initiators and controllers of actions and events, while others are constructed as affected or beneficiaries, the objects of action or control. The student account that follows provides a useful example to understand such positioning and the influence of teacher and student interactions.

Here I get help whenever I need it. I can put up my hand, and they would be over to me, and help and actually sit down with me and talk me through it until I actually get it. They sit with me just for long enough to make sure I am doing it right. If I like have a mistake they’re right next me so they can help me. Back when I was in high school it wasn’t like that at all. . . . Classes aren’t as big. Like not as many students and that. That probably helps a lot, don’t get as distracted as much. (Interview, Courtnay, Program Student)

Relational modality was evidenced in this account. The modal marker, actually, worked to emphasise what occurred in the program and that the student was positioned as an included and interactive participant with the teacher. Indeed, relationally, the interaction was initiated by the student with the teacher responding—“I can put up my hand and they would be right over”. This interaction was further emphasised by the use of the deictic order terms,
down, through and next. For example, teachers “sit down with me and talk me through it until I actually get it”, and “if I like have a mistake they’re right next me so they can help me”. The effect of this phrasing positioned the student as an authoritative speaker about the support provided by the teachers in the program.

The claims about experiences—“here” and secondary school which “wasn’t like that at all”—worked to construct a classification scheme. In this scheme the wording was seen to order, organise and evaluate the program and school. In doing so, the scheme also worked to differentiate the program and school—“here I get help whenever I need it” but “back when I was at high school it wasn’t like that at all”. The significance of this classification scheme allowed for an understanding of the wording of the student’s particular version of reality.

Focusing on the text and the discourse drawn on, here a discourse about the program, enabled a better understanding of “meaning relationships” between the words used in the text, the discourse types underlying the words, and the ideologies on which they were based (Fairclough, 2003, p. 96). However, the explicit evaluation of the two contexts was moderated by the declarative mood that here “classes aren’t as big” and the intermediate modal adverb, probably, in the phrase “that probably helps a lot”.

In summary, this section explicated the discursive practice, teacher and student interactions, from student and teacher accounts. The significance of this practice for student inclusion in learning has been identified as crucial if students are going to actively participate in learning mathematics. When students are provided with opportunities to talk and discuss their mathematics learning with teachers and their peers, they are talking within (exchanging information, negotiating meaning and understanding necessary for progress in mathematics) and about the discourse of mathematics (stories about their mathematics learning). Both forms of talk work to “fulfil specific functions: engaging, focusing, and shifting attention, bringing
about coordination” (Lave & Wenger, 1991, p. 109) and participation in learning on the one hand; “and supporting communal forms of memory and reflection, as well as signalling membership on the other” (Lave & Wenger, 1991, p. 109). The purpose for students to be included in learning in mathematics classrooms then is to not only learn from talk for legitimate peripheral participation, but to “learn to talk as key to legitimate peripheral participation” (Lave & Wenger, 1991, p. 109). Another practice to assist with learning identified in the discourse about the program is the use of worksheets or a textbook to support learning.

Source of Authority

The use of levelled workbooks as a discursive practice was traced as mediating the students’ social learning experiences in the program. That is, from the accounts of the teachers and tutors, the use of workbooks levelled appropriately to student achievement in mathematics was identified as contributing to the students’ success and the interactions with teachers and their peers. They were defined by the teachers, tutors and students in various ways, including a set of booklets, and or books that explained how to do the mathematics, with exercises for the students to work through, workbooks, booklets that go up in stages from Level 1 to 7 and worksheets. They were also described as having a student record sheet on the front cover where students could record, document and see their progress. A whole class textbook was not used in the program. How these workbooks were used is elaborated below by a program teacher:

Well first they get, usually they get the workbooks and their workbooks are their basis and they work through the workbooks with our help. They can see their progress because if they complete one workbook they get another one. If they complete another one, they go ahead again. And they can actually see their own progress because when
they complete the workbook we sit down with them, we discuss everything, they get the feedback from us here, everyday (indistinct). Here you know where, they know where they need to improve, this bit is not good enough, you still need to work on addition, and you still need work on this and this question to get better. (Interview, Lillian, Program Teacher)

Deictic categories were identified in this account. This feature worked to identify discursive practices, the use of levelled workbooks and teacher and student interactions. The categories were evident in the use of the pronouns they, their and you, in contrast to we, us and our, to distinguish between the students who used the workbooks and the teachers who guided and helped them in that use, was crucial to that association. The students, they, received the workbooks, which they “work through” with teacher support—“with our help”. Its two central themes—“their progress” and “our help”—were articulated in workbook completion—“they work through the workbooks with our help”. The conditional nature of that progress was implied by the use of the modal marker, if—“if they complete one workbook they get another. If they complete another one they go ahead again”—worked to emphasise this progress. Such progress was almost certain however, because of the interactions between the teacher and students and the reinforcement of continued success, emphasised by the modal marker, actually—“they can actually see their own progress”. This usage of actually worked to emphasise that the students did see their progress in the program. Hence, “when they complete the workbook we sit down with them, we discuss everything, they get the feedback from us here, every day”. While the students, they and them, worked to complete each workbook and progress to the next, the teachers, identified as we, were active participants in constructing and supporting workbook completion and student progress. The identification of deictic categories in the account was significant because this feature enabled
the understandings of the social organisation of the participants and their relation to one another when workbooks are used.

This aspect was further emphasised by the identification of a classification scheme that showed a series of repetitions to order the interactions and workbook usage in the program. The phrases, “we sit down with them”, “we discuss everything, they get feedback from us everyday”, “they can actually see their progress”, “if they complete one workbook they get another one”, “if they complete another one they go ahead again”, and “they can actually see their own progress”, worked to reinforce this scheme. These phrases also worked to provide a definition of the feedback and workbook as a suitable tool for supporting and documenting the students’ mathematics learning. The use of the modal marker, actually, as noted previously, worked to emphasise that from the teacher’s perspective, with the aim of assisting and helping students with their learning, the students’ progress was visible and explicit. The detail of that help was emphasised by a fourfold repetition. For example, the phrases, “they know where to improve, this bit is not good enough, you still need to work on addition, and you still need to work on this and this question”, and the use of modal markers in “where to improve”, “not good enough”, and “still need” along with the repeated use of “this” for the specificity of that help in “this bit” and “this and this question” worked to emphasise this repetition. Here the shift from the third person pronoun, they, to a direct address to a listener—you, by implication, the student—is significant in indicating that this assistance applied to each student. The classification scheme, in particular the repetition identified above, has enabled a better understanding of the meaning relationships between the words used in the text, the discourse type underlying the word and ideologies on which they are based. The repetition worked to emphasise the same theme in the text, that is, the use of workbooks together with teacher and student interaction worked to assist students with their
learning. This point was reinforced by the program tutor’s account.

In the maths, we have like I said seven booklets and they work through. It is signed and dated and then we get them to put their signature on it as well so they’ve okayed it that they’ve worked through, and so they feel they are a part of the assessment process, and the sheet of paper is taped on the front so they can see what book they still need to work on. The first one or two is sort of slow progress, but when they see the columns starting to fill they will often volunteer to take a book home and work on it so they can get their columns filled up quicker. It’s an ongoing effect, the more they get done, and the more they want to be there. (Interview, Louise, Program Tutor)

The use of expressive modality, that is, the tutor’s claim to speak with authority about the use of workbooks was traced in the phrases “like I said”, and the inclusive “we get them to put their signature on it”. The focus, as indicated by the repeated use of the third person plural they and them, is completely on the students, and their use of the workbooks. By recounting the stages that students accepted in completing each one and moving to the next, the textbooks were evaluated as desirable for supporting learning. This evaluation also worked to produce a definition of the students’ active participation in learning mathematics in the program—“the more they get done . . . the more they want to be there”. It acknowledged the status of the students, and their authority to share in the responsibility of their mathematics learning, including documenting their own progress. This documentation was identified as working to act as an “emblem of personal achievement” (Fairclough, 2001, p. 53), further reinforcing student access and participation in learning in the program.

That the textbooks were used to support the students in their learning was also identified in a student account.
Yeah, well you get a set of booklets sent around um you know it’s not like an actual classroom. . . . The teachers says you do what you know, whereas if you don’t know the teacher comes and tells you and makes sure that you understand otherwise they won’t leave until you understand. (Interview, Natalie, Program Student)

Declarative mood was identified in this account. Declarative mood show the facts about this student’s experience of learning in the program. For example, the phrases, “you get a set of booklets”, “it’s not like an actual classroom”, “the teacher says you do what you know”, “the teacher comes and tells you and makes sure you understand” and “they won’t leave until you understand” worked to provide information about this student’s experiences of learning mathematics in the program. This information is significant because it works to construct a discourse about the program and emphasises the source of authority used to assist the student with their learning, in this case, the work booklet and the interactions between the teacher and student. The articulation of the two discursive practices, the use of workbooks and teacher and student interactions in the program, was evident in this student’s account. That is, for the workbooks to be advantageous to student learning, effective three-way interactions was a necessity. Whilst the work booklets were used in the program, they did not seem to hold central place. That is, as with forms of instruction, the interactions between the teacher and student and the classroom community suggest an intermediate stance between instruction- and reform-based approaches as described in chapter 2. A reduced pace was also implied—“they won’t leave until you understand”.

Pace of Instruction

Pace, that is, the time needed, allowed or taken to work through tasks, was a significant issue traced in the accounts of teachers and students. Classification schemes were identified in the program manager’s account earlier in this chapter. These schemes, in particular overwording
and synonymy, worked to classify the discursive practice pace in the phrases “there’s not so much to cover”, “a lot slower”, “there is more time for people to spend with kids to actually work things through”, and “it’s the pace, it is the content, it’s not the pressure to really whiz through”. The significance of this classification is that it works to construct a discourse about the program and its associated discursive practice pace. In this discourse the practice of reduced pace was found to be an enabling practice for learning and legitimate peripheral and full participation.

The use of presupposition here allows insight into what was unsaid in the text, where what was implicit can be of social importance because of its very taken-for-grantedness. One presupposition here was that “there’s not so much to cover” referred to restricted curriculum content as discussed in chapter 2 (cf. Balfanz, MacIver & Byrnes, 2006). In that chapter, a restricted curriculum was described as a curriculum that was less intensive and delivered at a slower pace. The significance of presuppositions is that they have an ideological function—“what they assume has the character of ‘common sense in the service of power’” (Fairclough, 2001, p. 128). The synonymy of phrases in this and the previous paragraph cumulatively helped “naturalize” (p. 128) the discursive practice, reduced pace, as assisting students in the program. In the case of the program manager, “having power may mean being able to determine presuppositions” (p. 127). A program teacher also arrived at a similar conclusion.

What is different is our approach, because maybe we have more time to spend with the students. Maybe the students can learn at their own pace. They don’t have to hurry so much. We don’t force them to do one chapter in one session. If they can’t do it is okay, we can split it up. The students are working at their own pace and they have plenty of time to ask us questions. (Interview, Lillian, Program Teacher)

Among the presuppositions in the program teacher’s interpretation are, “learn at their own
pace”, “they don’t have to hurry”, and “the students are working at their own pace”. As was the case for the program manager, the program teacher has arrived at a similar interpretation of reduced pace.

Expressive modality was evidenced in the evaluation of reduced pace in this teacher’s account, indicating its desirability. Evaluative sentences assess in terms of importance and usefulness. So the evaluative sentences, “they don’t have to hurry so much” and “they have plenty of time”, imply that the practice of reduced pace is desirable. Within a discourse such as one about the program, the evaluative sentences above worked to propagate desirability for something, suggesting that reduced pace is significant for student participation in learning. They also work to identify possibilities for student learning.

A classification scheme was identified in the above account. This scheme was evidenced in the use of synonymy in the text. The repeated use of the inclusive pronoun, we, along with our and us, in for example, “our approach”, “we have more time”, “we don’t force them” and “we can split it up” worked to represent the processes and relations in the social context of the program. Such classifications also worked to show how the program teacher was thinking and acting as a social agent. These processes are further identified in the phrases, “we have more time to spend with the students”, “we can split it up”, and “they have plenty of time to ask us questions”. Classification schemes are significant because they enable the identification of instances as representations of what is going on in terms of reduced pace. This point is reiterated in a student account.

Up here you can just go to your level, your level, and you don’t have to rush, rush.

That’s why I like it here better than school. (Interview, Adrian, Program Student)

Expressive modality was identified in this account. This modality showed an evaluation of the discursive practice, reduced pace. The use of repetition in the phrases, “your
level, your level” and “rush, rush” and the use of the adjectives “like” and “better” indicated that this evaluation was “true” (Quirk, et al., 1985, p. 538) and that reduced pace was desirable. An implication of evaluation for discourses about mathematics learning is that it allows inclusion to be identified along with participation in learning as an evolving form of membership.

In this section reduced pace has been shown to be desirable and inclusive of students in learning. This form of pace was identified in chapter 2 as crucial in reform mathematics classrooms (Kyriacou, 2005b, 2005a). It was also identified as promoting student participation and engagement in the learning process together with teachers (Denvir & Askew, 2001; Tanner, Jones, Kennewell & Beauchamp, 2005). Through such engagement and participation, opportunities for students to reflect on and formalise their learning are orchestrated by the teacher together with the student (Jones & Tanner, 2002; Tanner et al., 2005). The desirability of reduced pace for student engagement and participation in learning works to construct the discourse about the program. In and through this discourse, this practice was identified as enhancing student learning because it assisted students with gaining access to the mathematics in the program. Another feature found to be crucial for engagement and participation in learning was how the students were grouped.

**Grouping of Students**

Levelling or grouping students by ability was identified as an accepted discursive practice in the discourse about the program. For example,

> And so it is a lovely sense of belonging and feeling comfortable in the classroom where you’ve got ten students who are flying ahead of them. So because we assess them and put them at their particular level in mathematics then they feel comfortable in the knowledge that there might be fifteen students at their level. So then that’s
encouraging them to try different things without the fear of failure, and without being ridiculed, because I think that’s important to young people. (Interview, Tania, Program Coordinator)

Expressive modality was identified in this account. This modality shows the account’s evaluations about importance, usefulness and desirability. The adjectives, lovely and comfortable, in the sentences, “it is a lovely sense of belonging and feeling comfortable in the classroom where you’ve got ten students who are flying ahead of them” and “we assess them and put them at their particular level in mathematics then they feel comfortable in the knowledge that there might be fifteen students at their level”, worked to show that grouping students by ability was desirable. Further they worked to show that when students were grouped by ability they felt “comfortable” because they were in the same group as other students of similar achievement. The use of levelled work booklets was critical to this grouping.

The significance of this evaluation is twofold. First it identifies the practice as enabling possibilities for students to be included in learning. Second, it reveals the problems that are associated with exclusion and isolation from mathematics but which grouping in the program attempts to resolve by “encouraging them to try different things without the fear of failure, and without being ridiculed”. This conclusion confirms that part of chapter 2 where instructivist approaches grouped students by ability according to their level of achievement because teachers could instruct the groups and attend to the learning needs of individual students in those groups (Watkins & Slocum, 2004). Once more, the program does not follow all aspects of the reform-based approach.

The confirmation of this argument in chapter 2, was noted in the claim that such groupings were shown to be influential to student learning of mathematics. The significance
of this practice was that the mathematics was adjusted according to the groupings of students. The higher ability-groups covered the content at a fast pace whereas with the lower groups the opposite was the case. Students in the lower groups were provided with more structured work that covered less of the curriculum topics (Ireson, Hallam & Hurley, 2005; Zevenbergen, 2005). This may be the case for some students in the program as was identified earlier by the program manager. However, the limitations of homogeneous grouping on student learning when existing problems that produce isolation are resolved were also identified in the following accounts.

Sometimes we try to hone in on who has got the actual ability levels, where we try to put them together. So we teach like ability levels, but it doesn’t work, not with those kids because they don’t want to move over, they want to be with their friends and they don’t want to feel segregated, so I don’t do that. (Interview, Lesley, Program Teacher)

Expressive modality was evidenced in this account. In contrast to the position of the program coordinator, this modality evaluated ability grouping as not useful for student learning. For example, “it doesn’t work . . . so I don’t do that”. Student rejection of homogenous ‘ability grouping’ was acknowledged as the reason for this teacher’s decision—“they don’t want to move over, they want to be with their friends and they don’t want to feel segregated”. Here the threefold repetition of, “they don’t want to move over”, “they want to be with their friends” and “they don’t want to feel segregated”, emphasised the strength of student desire to maintain a community of learners. The identification of expressive modality in the account was significant because it showed the possibilities for student learning and more importantly it emphasised the existing problems associated with exclusion and isolation that come with ability grouping students. This teacher added,
They actually like coming and sitting in their own sort of seats, they don’t move around all the time, they’ve got their own part of the room that they like to stick to.

(Interview, Lesley, Program Teacher)

Thus while the students were working at different levels, they were not placed in levelled ability groups. Rather, they were described as working in self-defined spaces with their peers on their own levelled workbooks. This aspect was emphasised through the use of the modal marker, actually. This marker worked to evaluate the groupings and sitting arrangements in the classroom as desirable. The students’ mathematical achievement was signalled by their level of textbook and not by their segregation into ability groups. As the teacher recalled,

There are certain children in the group who are just way beyond the Level 2 maths that they’re doing and won’t even need to be asked. They actually go around themselves and sit between the teachers and they actually tutor them and help them doing the worksheets. . . . I think it is fantastic that they are interacting like that. Because generally I think they learn better off their peers, because you see they speak their language and [learn better than] they do off their teacher. (Interview, Lesley, Program Teacher)

Deictic categories that worked to organise who was present and or absent in the text were identified in this account. These categories were indicated by the repeated deictic use of the personal pronoun I, to indicate the teacher in “I think it is fantastic”, “I think they learn better”, and, in an earlier account, “so I don’t do that”. They were further indicated by the use of they, them and their to indicate the students. The phrases, “they actually go around themselves”, “they are interacting”, “they learn better off their peers”, and “they speak their language”, worked to indicate that the students’ discourses were acknowledged and accepted
by the teacher and other students. The significance of the identification of deictic categories in the account allowed for understandings of how people were socially represented in the account and further how the account represented a community. Of further significance was how the relations between participants were represented.

However, an alternative position from the previous accounts of grouping was constructed in the following student’s account.

it’s sort of a bit easier and more independent like you have to work on it yourself and think about it more. You can’t really rely on other people to get you through it. It’s sort of a lot easier on myself because then I don’t have other people sort of looking down on me. I feel that TAFE mathematics is much better. . . . Yes definitely, it makes me feel like I have a belonging if I could say that. Sort of coming in every week and keeping it as a routine and seeing the same teachers and learning what I have to learn.

I definitely like the environment. (Interview, Andy, Program Student)

Declarative mood was identified in this account. This mood worked to show the statements made by the student that gave information. For example, “you have to work on it yourself” and “I don’t have other people sort of looking down on me”, “I feel that TAFE mathematics is much better” and “I definitely like the environment”, worked to construct his knowledge and experiences. The significance of the declarative mood is that it indicates who has the knowledge about particular events or happenings. Further, the student is providing an extended account about learning in the program and in doing so has responded to the questions asked by the interviewer.

Expressive modality worked to evaluate Andy’s inclusive experience in the program. The phrases, “I feel that TAFE mathematics is much better”, “it makes me feel like I have a belonging” and “I definitely like the environment” worked to show that learning was desirable
in the program. More specifically, it showed that this student was part of a community of learners where a sense of belonging and inclusion was significant for learning. This evaluation was significant as it indicated the possibilities for student learning. It also indicated that for this student a sense of belonging was crucial to his engagement and participation in learning. A more critical understanding of student ability and levelled work was presented in the account of a program tutor.

The students that I’ve had with the mathematics have been very low levelled and it’s simple, simple stuff. They’ve never got to the higher level of book to pass through, because they’ve never passed through the first book. So it is a bit hard to judge how they’re going with, in comparison to mainstream schools. . . . I think there is probably, in that there is more scope to feel they’ve achieved, you know, even if it is only at a low level. . . . But some of it is quite basic stuff. (Interview, Joan, Program Tutor)

Expressive modality was evidenced in this account. It worked to show negative evaluations of the mathematics in the program. For example, “very low levelled”, “it’s simple, simple stuff”, “they’ve never got to the higher level of book”, “they’ve never passed through the first book”, and “it is quite basic stuff”, evaluated the mathematics and the students negatively in the program. This evaluation worked to construct a different view of the students’ achievement and the program’s emphasis on levelled ability groups, albeit with the equivocal concession that “there is more scope to feel that they’ve achieved . . . even if it is only at a low level”. Identifying expressive modality in this account was significant because it showed a double repetition of negation in the phrases “very low levelled”, and “it’s simple, simple stuff”, reinforced by the positive affirmation, “there is more scope to feel they’ve achieved”.

These phrases also worked to construct both students and the program as the Other to “mainstream schools”. That is, by emphasising the normality of “mainstream schools”, the
program and its students were identified as the abnormal Other. A reasonable presupposition here was that this account implied the low ascribed status of the program vis-à-vis mainstream mathematics in the orders of discourse of mathematics education.

In this section, levelled ability grouping has been constructed as a discursive practice that was formally supported in the program but rejected by the students enrolled in the program. Students were traced as either preferring to work with their friends, regardless of differences in the level of achievement, or as preferring to work independently and at their own pace.

Here it should be observed that these two outcomes were not necessarily exclusive. Traced in these accounts, either explicitly or implicitly, was a sense of belonging, a sense of community. A reasonable presupposition was that this desire for community led to student preference for a more heterogeneous grouping in mathematics learning. However—and here the treatment of orders of discourse in chapter 3 is pertinent—the dissenting account reinstates the program in a subordinate position to the hegemony of mainstream education.

In the discourse about the program, assessment is a necessary concomitant of the discursive practices, levelled grouping and levelled work booklets. That practice is now addressed.

Assessment

The requirement that teachers assess students against set benchmarks was traced in the account of the program coordinator. This assessment was characterised as another discursive practice. However, a clear definition of how assessment was conducted or set out for students was not identified. What was established was that students received feedback about their learning from the teachers. Two letters “M” or “J” were used in the program to indicate the students’ progress. As the program coordinator recalled,
The teachers actually have benchmarks that they assess them at different levels. I think the way it is done they have to proceed through five or six booklets and each one has a ‘J’ mark on their assessment schedule. We give them an assessment, which we don’t call an exam, it is just a letter of how they’re going. . . . “M” is not yet competent, “J” is competent. I don’t know why they brought that in. I think it was to get over the P for pass and F for fail. . . . They’re ecstatic. You know as I said, they are so used to failures in their life, when they get that ‘J’ they think wow, this is terrific, can we do the next one? So immediately once they get that positive feedback, okay what’s next? They’re ready to take on the world then. (Interview, Tania, Program Coordinator)

Expressive modality was identified in this account. This modality worked to evaluate assessment in the program as desirable. Its usage suggests that the assessment process may be contrary to common consensus-based views of the program from outside the TAFE College. For example, the letters “M” and “J” was to indicate success or otherwise of the students’ progress. The impact on students when they received a “J” was evaluated as desirable—“they’re ecstatic”. This contrasted with and was explained by their past experience, where “they are so used to failure”. But with “positive feedback”, “they think wow, this is terrific, can we do the next one?” and “okay what’s next?” In this triumphalist account, “they’re ready to take on the world then”. The significance of evaluation here is that it worked to show that in the program the use of assessment worked to show possibilities for student learning. It also allowed for considerations of what had caused struggle for the student in the past which might lead to social changes that could enhance their access to the discourse of mathematics learning.

Program assessment, paralleling TAFE practice elsewhere (see for example, National Reporting System, 2007) was defined in terms of competence measured by benchmarks for
successful performance at different levels corresponding to their levelled textbooks and the students’ recording of their results at the front of those textbooks. Here, “‘M’ is not yet competent, ‘J’ is competent”. This form of assessment was clearly summative, separating those who passed from those who failed, thus differentiating the students on the grounds of success and failure. This was not a reform approach to assessment as it seemed to be pen-and-paper assessment where students were told about their success or failure. However, there were small elements of assessment for learning as described by Black and Wiliam (1998) in chapter 2. For example, through feedback and discussions with the teacher, students were told how they could make further progress in their learning.

Despite the form of assessment used, there was a strong focus on student achievement and success, as this teacher noted,

They are very happy. Usually they are very happy, they are very proud and they feel very good when they achieve something they didn’t fail. So it is very good for their self-esteem and that is why sometimes they are jumping and screaming, ‘yes I passed, I passed,’ they are very happy. Even when they complete one workbook and get another one they are so happy as well because feel ‘I’ve done something, I completed something and I am going ahead.’ So it is good for their self esteem…(indistinct) because it is really nice to see these young people make progress and feel better about themselves because usually they walk into the class and go ‘I can’t do maths it is too hard, I hate it, I won’t do it.’ (Interview, Lillian, Program Teacher)

Declarative mood was identified in the account. The expression of mood consists of a subject plus finite (Halliday & Matthiessen, 2004) which is used to provide or give information. The declarative is usually instigated by the person who has the knowledge and information, however, it can be instigated by the person who wants the knowledge. When
asked about student assessment in the program, the students, repeatedly referred to as they, were foregrounded. The teacher, the constructor of the account, was absent. As teacher by inference, her identity and status were other than theirs. The declarative sentences, “they are very happy” and “they are very proud and they feel very good . . .” worked to provide facts from her particular version of reality about the students in the program. This information was further elaborated by the sentence “they are jumping and screaming”. These declaratives contrasted with the strength of their initial negative evaluation of mathematics as underlined by fourfold repetition in the assertions, “I can’t do maths, it is too hard, I hate it, I won’t do it”. The compounding effect of success in the program, as students moved from level to level, on their “self esteem” was central to this account.

They just love to have all the, in their folders they just love to have the pages and the ‘J’. They just find that that is a great goal for them. It is a visible sign, instead of getting a report card at the end of the term which you’ve got A, B, or C for maths whatever the grading is in mainstream schools, they can see if they’ve worked hard this week, they’ve got a ‘J’. They’ve got something to show for it. So I think for them it is very important. (Interview, Joan, Program Tutor)

A binary opposition was identified in the account. This opposition was organised around the word choices used to compare methods of reporting in the program and at school, for example, “instead of getting a report card at the end of the term which you’ve got A, B, or C for maths”, and “they can see if they’ve worked hard this week, they’ve got a ‘J’”. The choice of wording in this account put the program at odds with secondary school mathematics because the students were identified as receiving weekly feedback on their learning and achievement unlike school where they received feedback at the end of term. The significance of identifying binary oppositions as shown in the phrases above is that they work to
differentiate between the program and secondary school with regards to assessment reporting. Such differentiation was further shown in the following account.

This is my future, and like I’m at the last resort sort of thing, this is all I’ve got because I’m so young. I really like, I don’t know, testing myself, like I really want to get in the top 80% of this test, so I’m just really focussing on the maths. So here there’s more of a reason to pass than at school. At school it’s like who cares, I can get a job without maths. And then you leave school and you don’t get anything you just sit at home and do nothing. So when I got this I just thought I’m not wasting this opportunity. (Interview, Leah, Program Student)

Deictic categories were identified in this account. They worked to socially organise who was present or absent in the text. The deictic categories realised as the first person pronouns, I, me, and my, underlined that the student was responsible for her current situation. Thus after her initial acknowledgement, “this is my future”, the first person pronoun is used repeatedly—“I’m at the last resort”, “this is all I’ve got”, “I’m so young” and “I really want to get in the top 80%”. The shift to you in the later part of the account—“and then you leave school and you don’t get anything”—which could be read as this is what happens, it’s natural. But in conclusion, using the first person pronoun, I, once more, she re-asserted her choice to act—“so when I got this I just thought I’m not wasting this opportunity”. Using the deictic categories above enabled an understanding of the social organisation of the participants in the account, here the student. They also worked to identify the student and how the learning community in the program was represented.

Expressive modality was evidenced in the above account. This modality worked to identify possibilities for learning and also existing problems experienced by the student. For example, the phrases, “I really want to get in the top 80% of this test so I’m just really
focussing on the maths”, “I’m at the last resort sort of thing, this is all I’ve got because I’m so young”, and “here there’s more of a reason to pass than at school” worked to show what exists for this student and causes struggle. The struggle was further evaluated in the phrases, “at school it’s like who cares” and “I can get a job without maths”, and the later realisation, “and then you leave school and you don’t get anything”—leading to her current commitment, “I’m not wasting this opportunity”. The evaluation in this account is significant because it allows for considerations of the struggles in and through discourse and also the possibilities that might lead to social change that might decrease that struggle and provide access to a discourse about mathematics learning.

In these accounts, assessment in the program was traced as closely linked to feedback. Although the assessment appeared to be summative, it was traced as a significant part of the routine of the program. The evaluations traced in the accounts worked to show that the assessment in the program created possibilities for learning, despite it being summative. Further, the evaluations showed the existing problems and struggles experienced by students and how considerations of these could be lead to change that would reduce the struggle and support them with their learning and participation in mathematics. The implications of this practice for the discourse about program suggest that although it was summative in form, the assessment in the discourse about the program mathematics was crucial for these students’ progress and success. However, not all accounts were positive about the program. An opposition to the program was traced in several accounts.

An Oppositional Discourse about the Program

In the previous section, the accounts of the participants in this study constructed a discourse about learning mathematics. That discourse and its associate discursive practices was a discourse of the Youth Reconnected Program community, the program. It was situated within
the social context of TAFE. In that discourse about mathematics learning, the enabling features of the discursive practices were made evident through the analyses of the accounts. However, as is shown in the following account, some students did not favour these practices.

Here at TAFE it is just really too easy for me at least and it is just so disorganised. The teachers have no control over the kids or anything; I would prefer to be in school. Yeah, I don’t know at school, I didn’t like it because they were strict and that but now that I am here I realise why. (Interview, Diana, Program Student)

Expressive modality was identified in this account. This modality showed an evaluation of learning in the program as undesirable. Evaluative statements evaluate by importance and usefulness where desirability is concerned, and as unimportant and useless where undesirability is concerned. For example, the use of intensifiers, too, just, just so and no, worked to evaluate the program negatively—it was “too easy”, “just so disorganised”, and “teachers have no control over the kids or anything”. In this evaluation, a lack of structure and order predominated. The intensifiers also worked to affirm the student’s preference to be at secondary school regardless of previous experience at school—“I didn’t like it … they were so strict”. After experiencing the program, however, the student concluded, “now I realise why [they were so strict]”. The significance of expressive modality in the account worked to construct a discourse about the program that was different or oppositional to previous discourses. In doing so, it emphasised those aspects that were a source of struggle for the student, that is, the work was easy, and the program disorganised and the teachers lacked of control of the students.

The discursive practice, the use of the levelled workbook, was evaluated negatively by another program student.
Here we just mainly work on workbooks, gets pretty boring at times. (Interview, Jemma, Program Student)

Once again expressive modality was identified in this account. The source of this evaluation was traced through the modal use of the term, just mainly, which indicated the frequency that the textbook was used in the program. This evaluation was further reinforced by the use of the term, “pretty boring”, to indicate undesirability for the workbooks. This was evident in the use of the modal adverb, pretty, to qualify the negative adjective, boring. Although the student indicated that working through the workbooks was boring, there is evidence of participation of peripherality. That is, the student does not indicate a complete disconnection from learning, rather “at times” it gets boring. A similar evaluation was evident in a third student account.

You have to learn all that stuff in the books. . . . See I reckon they should cut the maths in half and put them on two different days because it is so boring, because we have maths all day. And you’re just filling out questions, you just, I don’t know, I’ve done it all before. (Interview, Adrianni, Program Student)

Expressive modality was identified in this account. Explicit evaluative statements about undesirability were identified in the following: “I reckon they should cut the math in half” and “I’ve done it all before”. The use of the modal, so, to emphasise the degree of boredom is significant, as is the comprehensive adjective, all, in the statements, “all that stuff in books” and “we have maths all day”. This is reinforced with the dismissive modal marker just, in “you’re just filling out questions”. These evaluations challenged earlier accounts about the use of textbooks in the program, where the use of levelled textbooks was evaluated as desirable. However, this account reiterated the previous one, indicating a shared negative understanding of how textbooks were used in the program. The evaluations in the above
accounts have worked to construct a discourse about the program that is in opposition to earlier account about the program. The source of this opposition appears to be associated with a particular discursive practice—workbooks. The potential risk of using such workbooks is that they work to disengage students, thus reducing their opportunities to fuller participation in learning.

Discussion

The analysis to date has worked to provide a broad description of discourses about the program and its related discursive practices as constructed in the participants’ accounts. These practices included interactive teaching style, teacher and student interactions, the use of levelled workbooks, reduced pace, ability grouping and assessment. These discourses were situated within the social context of the TAFE College. In what follows, these findings are summarised using the three dimensions of discourse: representations, relations and identities.

Representations: The participants in the program constructed particular versions of reality. These versions represented their experiences in the program. Overwhelmingly, the teachers and tutors in the program were constructed as interactive and helpful with a focus on inclusivity. Its practices were mostly found to encourage and support the students’ success with learning mathematics, although a minority negatively evaluated the way in which the workbooks were used. In general, however, the discourse about the program and its associated discursive practices worked to construct students who had previously failed or withdrawn from mathematics as successful learners who were included and engaged in participating in learning.

Relations: The relations dimension of discourse worked to trace the relations of power constructed in particular versions of reality. Such relations included the ways the students, teachers and tutors were traced as interacting with each other. That is, the teachers and tutors
were found to be supportive of including, engaging and encouraging the students in their learning. The students, in turn, were found to be responding to this encouragement by participating in their learning. As noted earlier, however, three accounts indicated either rejection of the program or sections of it.

**Identities**: The identities dimension of discourse worked to describe the identities traced in the particular versions of reality presented. Through such versions, students constructed identities for themselves, for their teachers and for their tutors, while similarly the teachers and tutors in the program constructed identities for themselves, their colleagues and their students. The staff, which included the program manager, the program coordinator, teachers and tutors, were identified in the accounts as largely supportive, helpful, encouraging and respectful of the students enrolled in the program. The students were generally identified as constructing themselves as included, progressing and achieving as learners. Three dissenting accounts have been noted.

Using the dimensions of discourse to respond to the second research question identified in chapter 1, a discourse about mathematics learning in the program has been identified and described in detail through the discursive practices it constructed. In that discourse, the program was found to be an appropriate and effective way of learning mathematics for students such as those participating in it. However, while substantial similarities have been noted between the program and reform mathematics education, it has become clear they are not equivalent. Indeed, practices such as levelled workbooks, the attempt to group students by achievement and a degree of reliance on direct instruction in introducing new work might seem more consonant with the intermediate position advocated by Rowe (2006) or the US National Mathematics Advisory Panel (2008). These issues will be considered in more detail in chapters 6 and 8.
In the discourse about program mathematics, power was presented as exercised through staff in a largely benevolent and nurturing way, with students actively acquiescing and engaging in its ongoing constitution. The maintenance of the program’s conventions, its orders of discourse, rested with how particular ideological assumptions were represented and accepted as commonsense and part of the natural order by those who led and taught in it and those who were subordinate to it. These assumptions, as represented in the accounts in this chapter, included that the program was a special site for particular students who had not been successful in mathematics at secondary schools; that these students must be supported in their learning to meet the stated outcomes of the program; that teachers and tutors should develop positive relationships and interactions with these students; that levelled workbooks should be used to assist with engaging students in mathematics learning; and that assessment in the program was an appropriate means for documenting and assessing their progress in learning.

In the orders of discourse at work in the program, this discourse about the program was hegemonic. But with a substantial caveat—that hegemony was restricted to that particular situation. It was appropriate for a particular community—students who had failed, withdrawn from, or not completed a secondary mathematics education. Hence also constructed in the orders of discourse at work in the program site was a discourse about secondary school mathematics. As might be expected, and as the analysis to this point indicated, this discourse contrasted substantially with the discourse about learning in the Youth Reconnected Program thus reflecting the discursive practices of instruction-based mathematics education. This contrast is elaborated in the next chapter.
CHAPTER 6: DISCOURSES ABOUT THE SECONDARY CLASSROOM AND ITS DISCURSIVE PRACTICES

The previous chapter addressed the discourses about the Youth Reconnected Program and its discursive practices as represented in the accounts of the students and teachers in this study. This chapter addresses the discourses about secondary mathematics classrooms and their discursive practices, drawing on the accounts of students and teachers. Both chapters respond to the second research question: What discourses, discursive practices and forms of participation can be traced in the student accounts and how do they relate to those previously traced in the literature and research?

Two observations are relevant here. First, as noted previously, the program, as constructed in the practices and accounts of this study, was an alternative approach to mathematics learning for a particular group of students, those who had failed or withdrawn from secondary mathematics education. It was largely constructed as different in their accounts and the accounts of the teachers and tutors in the previous chapter. However, as noted in chapter 2, that difference was constructed on a common field of practice, it centred on alternative forms of the same practices, for example, textbooks, assessment, and pace.

Second, most of the accounts in this study have been constructed in struggles over the maintenance of particular ideological assumptions about the teaching and learning of mathematics, that is, the practices of instruction-based approaches to mathematics teaching and learning as described in chapter 2. This construction, as traced in the discourse of the Youth Reconnected community, is now analysed, and its implications addressed.

The analysis in chapter 5 has already brought out, by comparison or presupposition, certain evaluations of secondary mathematics or its practices. In some of the accounts, a favourable discourse about secondary school mathematics and its related discursive practices
could be traced. What seemed to be favoured in most cases, however, were practices by a particular teacher or in a particular classroom that were similar to those in the program and that enhanced learning and participation. In the majority of accounts, however, the discourse about secondary mathematics and its discursive practices was much less favourable. In the analysis which follows, these issues are addressed more directly, beginning with accounts that reject secondary mathematics, then moving to consider those accounts which support it.

The Predominant Discourse about Mathematics in the Secondary School

In a number of positive accounts of the program analysed in chapter 5, a less than positive evaluation of secondary school mathematics was traced. Thus, for the program manager, there was too much to cover in secondary mathematics, it wasn’t relevant, the pace was too fast, the pressure was too great and it promoted stress—for the program students. For Suzanne, who was “actually getting taught something” and who appreciated the teacher’s support, the program was “different”, and by implication, better. For Peter, “TAFE is better because . . . they don’t treat you like a kid”, which by implication, the secondary classroom did. Similarly, Damien found, “the teachers are different . . . here’s easier to learn . . . a more sense of belonging than was school . . . a more sense of belonging here than was school . . . the teachers respect you and you respect them”. Hence, as Natalie observed, “it’s not like an actual classroom” while for Andy, “TAFE mathematics is much better . . . I definitely like the environment”. In what follows, then, the accounts of the substantial majority of participants who did evaluate their experiences of secondary school mathematics unfavourably are analysed, beginning with the discursive practice, instructional style.

Instructional Style

As shown in the accounts below, the discursive practice, didactic teaching style, was found to negatively influence student learning in secondary school mathematics classrooms.
Then I’d look up at the board and all this stuff was written out like questions and stuff. Then I had to complete them, and when I’d completed then the teacher worked them out on the board and helped get us through it with his help. Then he wrote theory on the board that we wrote into our books, and we did some more work, and we did the same way, and then we did some more theory, and some more work and then until we finished. If we didn’t get it finished we had to finish it for homework. (Interview, Jessie, Program Student)

Deictic categories were evident in this account. Such categories worked here to locate who was included and who was excluded from learning in a didactic teaching style. In the above account the student and teacher were identified through the pronouns I, us, our, his and he. These social categories worked to constitute a particular social order that orientated the students and teacher in a them and us way. Thus the participants in the account were classified but not named. Understanding we and our is crucial to the identification of the participants and how the classroom of people were represented. Two groups were constructed, that is, there was the teacher, identified as his and he, and there was the student or students identified as I, us and we. These two groups were mutually exclusive. It was not possible, in this account, to be both. Of further note was the deictic use of the pronoun, I, to indicate the student’s claims to the truth about her particular version of reality and her authority to speak—this is what she experienced. Partway through the account, however, she moved to the more inclusive we and us as a tacit acknowledgement that what she experienced was equally the case for the whole class. The significance of deictic categories in this account is that they work to identify unequal relations of power between the teacher and students. Here, as addressed in chapter 3, the power of one group over other groups may limit their freedom of action and influence their thinking. That is, the actions of others can be controlled through the
This legitimate authority was reinforced by the use of the deictic order terms such as *up*, and *on*. These terms worked to locate the teacher and student. That is, the teacher was identified as located near the blackboard with the students located in reference to the board and the teacher. The teacher set the work and controlled the sequence of activities. He put the work on the board, the students looked up at the board and completed it, he demonstrated the correct processes and solutions on the board, and so on. Unfinished work became homework. At each step in this process the students were constructed as being acted upon and as responding to the action. The repetitive antonymy of active teacher and passive student/s is evident. A reasonable presupposition from all of this is that the teacher who possessed the knowledge must transmit that knowledge to the students who did not possess it.

A further understanding of a didactic approach to teaching can be ascertained from the following account.

They give you booklets, like here [in the program] and they say or write it on the board how to do it and sit down and say if you need help raise your hand, it’s just like not one-to-one teaching, it’s just general, it’s not good. (Interview, Leah, Program Student)

Expressive modality was evidenced in the account. This modality worked to evaluate the student’s claim to speak authoritatively about her experience of the teaching of mathematics. For example, the phrase, “it’s just not like one-to-one teaching, it’s just general, it’s not good”, worked to evaluate this student’s experience of being taught mathematics in secondary school. This evaluation seems to confirm the position of the reform approach in chapter 2, where a transmission model of teaching mathematics that focused on the processes of repetition, replication and reproduction of knowledge was claimed to be ineffective for
supporting student learning (Kalantzis, 2006; Kyriacou & Goulding, 2006). Conversely, it questions claims by instructivist approaches that argue that it is the teacher who is the expert who passes mathematical knowledge onto students via direct instruction, rehearsal and rote learning. The teacher who largely initiates interactions that are didactic, tells the students what they need to know and learn (Hirsch, 2002; Stotsky, 2006). The significance of identifying the explicit evaluation in the above account is its emphasis that the teaching style was undesirable and useless for this student. Of further significance was that the evaluation allowed for considerations of the existing struggles for this student and what caused the struggles in and through discourse. The evaluation above was shared by the teachers in the program. As one stated,

In the morning if I was to go and put a whole white board of sums on the board and say right I want you to sit there and start they would actually probably do it. But I find that too structured and too teacher orientated to do here at TAFE. It’s something you would do more in a classroom and that’s why these guys aren’t at school because they don’t like it. Even though they would do it, I don’t do it because they would dislike it more than anything. (Interview, Lesley, Program Teacher)

Once again expressive modality was evidenced in this teacher’s claims to the truth about her particular version of reality. Such claims worked to evaluate what existed and caused struggle for students in terms of teaching style. In particular, the phrase, “too structured and too teacher orientated to do here at TAFE”, worked to evaluate a didactic teaching style as undesirable for students in the program. The nuanced nature of that evaluation should not be ignored. It did not construct a blanket rejection of didactic teaching. Rather, it was restricted to TAFE, the program, and its participants. A didactic teaching style was traced as having a negative effect on a particular group of students, those who were in the
Youth Reconnected Program. But these were the students for whom a different approach to teaching and learning was provided by the program. Thus, that didactic teaching was “too structured and too teacher oriented to do” in the program context has a necessary consequence, “these guys aren’t at school because they don’t like it”, reinforced by the phrase, “they would dislike it more than anything”, and vice versa. A key implication of evaluation for analysing the above account was that it emphasised the possibilities for student learning. However, in doing so it also revealed the existing problems and practices of a discourse that exclude and isolate students from learning. It is this form of isolation and exclusion that was shown in chapter 3 to contribute to powerlessness and non-participation in learning (Lave & Wenger, 1991). The significance of identifying exclusion in the account shows that it is something that is done to students rather than something which just happens to them (see for example, Fairclough, 2003). Teacher-driven interaction was another practice identified in the accounts of students’ experiences of two learning contexts—here of secondary mathematics classrooms.

Communication and Interaction

In the participants’ accounts, teacher-driven interaction was traced as influencing student inclusion and engagement in mathematics learning. For example,

> When I first went there [school] we were doing dice figures and that, just rolling dice and everything and like he wasn’t asking us what we were troubling in, what we needed help in and that. He was giving us sheets of paper and telling us to do the worksheets and everything. So yeah he just wasn’t helping. (Interview, Kurt, Program Student)

Deictic categories were evident in the above account. Such categories worked to show who the speaker was referring to and in what context. For example, the pronouns, we, he and
us, where he and we/us were constructed as mutually exclusive categories, are significant because they work to suggest knowledge of the group in a ‘them and us’ way. It was not possible to be in two groups. Such a categorisation was identified as constructed around the subject, mathematics. The teacher, he, had the ability to explain the mathematics. The students, we and us, tried to respond but there was no mutual interaction, no help. This account centred specifically on “we were doing”, what was happening to “us”, and how “we were troubling”, in mathematics. These phrases directed attention to students who experienced difficulties, thus including them in a group who needed support, but excluding them from learning and receiving further assistance. The phrases, “giving us sheets of paper” and “telling us to do the worksheets”, defined what the group did as mathematics students. This positioning as passive recipients of instruction was further modified in the phrase, “he just wasn’t helping”. In this broader sense, students were positioned as powerless, experiencing difficulties with and exclusion from learning mathematics, with the teacher positioned as having the power to assist the student but failing to do so.

The significance of the identification of the deictic categories indicated the power relations between the teacher and student and also who was included and excluded from the discourse of mathematics in secondary school. This is of ideological significance because the communication is largely one-way with student interactions inhibited and opportunities to discuss and apply the language of mathematics constrained (McNair, 1998). It was argued in chapter 3 that for students in classrooms the purpose was not only to learn from talk as a substitute for participation, but also to learn to talk as crucial to participation and understanding mathematics (Lave & Wenger, 1991; Renshaw & Brown, 1997). The teachers’ role in this instance is to link students’ actions and representations with the “knowledge community of mathematicians” (Renshaw & Brown, 1997, p. 210). With the former aspect
alone, students are most likely to learn a restricted and narrow version of mathematics that has come largely from the teacher. This point was emphasised in chapter 2 as being a major issue for students’ mathematics learning (cf. Begehr, 2006; McNair, 1998; Nickson, 2002). One might conclude that the teachers’ knowledge of what and how students think mathematically is limited to their written worksheets. The following account is a case in point.

Put my hand up to ask the teacher but every time I asked, she wasn’t looking or would go to the next student and say just wait a minute. . . . Sometimes, a couple times going past, but they wouldn’t sit there for long enough with me to help me to understand the actual things that I’ve got to do, so I got failure, I used to fail a lot. (Interview, Courtnay, Program Student)

Of interest in this account was the use of the deictic categories, *my, I, me, and she and they*. These pronouns directed attention to a division between the student and the teacher in a ‘them and us’ way. This division and the student’s sense of futility, exclusion and powerlessness was further emphasised by the use of deictic ordering terms that described the teacher’s relation to this student—“wasn’t looking”, “wouldn’t sit there for long enough”, “go to the next student”, “say wait a minute”, “sometimes”, and “a couple times”. The modal marker, so, indicated the inevitable negative consequence—“so I got failure, I used to fail a lot”. The identification of deictic categories in the above account revealed that the student who needed assistance with his learning was equally a depiction of a teacher who was busy and with limited time to be involved in each student’s difficulties. In this instance, the account represented a classroom where the teacher has power and the student does not. In this construction the deictic categories worked to indicate who was included—the teacher—and excluded—the student—from the discourse of mathematics. Such a portrayal was crucial to the identification of participants in the text and how the account represented teacher-driven
interaction in large secondary mathematics classrooms. Here, as noted previously, the issue of class size was surely pertinent. Another practice that has been identified as influencing the students’ learning experiences is whole class textbooks.

Source of Authority

The use of whole class textbooks was a discursive practice traced in a discourse about secondary mathematics. This textbook was described in the accounts as a book of mathematical exercises that the whole class worked through and generally were left to work through on their own as the following account notes.

The teacher will just say, okay turn to page whatever, go through the example with them and then they’re left to their devices. . . . their numbers are just so big in the class. (Interview, Tania, Program Coordinator)

A classification scheme was identified in the above account. Such a scheme worked to organise, classify and evaluate the participants and things in the account. It also worked to show how the program coordinator was thinking. For example, the account organised how a teacher used a textbook in the classroom and what the students were left to do. However, the scheme also worked to evaluate how the textbooks used together with class sizes which was indicated by the modal marker, so, in “so big”—“their numbers are just so big in the class”.

The use of whole class textbooks in conjunction with large class sizes was traced in the account as working against the students and excluding them from learning, further reinforcing the division of power in the class between the teacher and students when this occurs. This identification was significant because it worked to operationalise how unequal relations of power were represented and acted upon in terms of the division between the teachers and students.

A presupposition was identified in the account. This feature worked to show that
large class sizes may have provided a justification for the use of whole class textbooks. In this sense, it could be said that this process made managing and teaching the class easier. A further presupposition is that because of the large class sizes, there was little or no other choice than attempting to keep students on the same exercises and pages in the text. If the latter was the case, it raises further questions about the extent that difference was or was not acknowledged. That is, when students were provided with the same textbook, and required to work to the same page and exercise, a universal student was constituted in and through this discourse. Thus, as discussed in chapter 3, difference was repressed or ignored (Chouliaraki & Fairclough, 1999). At the same time, the ensuing struggles can potentially constrain participation in learning. The identification of presupposition was important because it worked to show that what was implicit in the text was socially significant. Solidarity in a community is contingent on shared meanings, in this instance, a shared meaning about the use of textbooks. For example,

> Just too many students to one class. I don’t know, mainly they just got you to copy off the board and do it out of the text and shit. It’s got the answer and that but I learn more here. . . . I just go in there and he’d usually write up a section from the textbook, like Set 11E or whatever and we’d just do that set and like just different algebra and whatever, different times and crap and he’d just afterwards like it’s meant to be completed, write the answer on the board and then mark it off and that. (Interview, Dale, Program Student)

Deictic categories were evident in this account. They identified two communities, a *you* community and a *we* community, with the student included in both. The you community was the more extensive community of secondary mathematics classrooms. In this classroom of secondary mathematics, the students copied off the board and worked from a textbook. The
we community, however, referenced the particular class of which this student was one. The account suggested that this class would complete assigned sets from a textbook, and then mark it with answers written on the board. In this student’s version of the reality of that secondary mathematics classroom, “I just go in there”, “we’d just do that set” and “he’d just afterwards . . . write the answer on the board and then mark it off and that”. That experience is negatively evaluated by its contrast with his version of the reality of the program—“but I learn more here”.

Other deictic categories were identified in the account. They and he were used to describe his teachers, we and you to characterise the class, and I to indicate he was a member of that class. The deictic category, they, appeared to be a generic term for his teachers, all of whom were represented as relying on board and textbook work. He, was then a particular assemblage from they, but as teachers both he and they were evaluated with equal disapproval through the application of the derogatory terms, shit and crap, to the work process dictated by the teacher. Attention was specifically directed to how “they (the teachers) just got you (all the students) to copy off the board and do it out of the text”, and “we’d (again, all the students) just do that”, in a classroom with “just too many students”. The comparative unimportance or triviality of this process was indicated by the use of the modal marker just in such phrases as “I just go in there”, and “we’d just do that”, and “he’d just afterwards”, while the presupposition from “just too many students”, that ‘it just had to be done that way’ worked to reinforce the program coordinator’s earlier account about secondary school class sizes. The deictic categories evident in this account directed attention to how people and events are identified and represented in communities. In particular, and as noted in chapter 2, students were expected to learn from a didactic style of teaching. However, as noted previously student learning does not necessarily come from listening to talk but from learning
to talk, drawing on the discourse of that community. It was clear this student did not. This issue was reiterated in the following account.

If we were doing say um measurement or something he’d draw us something on the board and then say flip to that in the textbook and then just copy out of the book.

(Interview, John, Program Student)

A classification scheme was identified in this account. This scheme worked to organise and classify what the teacher and student did. In doing so it emphasised the differentiation of the teacher, students and practices from one another. For example the phrases “he’d draw”, “say flip to that” and “copy out of the book” worked to show what the teacher did and then expected the student to do. The identification of this scheme was significant because it allows for understanding the student’s particular version of reality. It also reiterates the argument in chapter 2 from a reform-based approach that substituting teaching with a textbook was more likely in classrooms where there was heavy reliance on textbooks to demonstrate how something was done, and where learners were expected to work through the same exercises to reproduce what the textbook had shown them (Romberg & Kaput, 1997). As a consequence teachers were freed from planning for teaching and learning or considering student differences in learning (cf. Kalantzis, 2006). One final account summarised the difficulties of being taught from the textbook for students such as those in this study.

Pretty difficult, I found that a lot of the smarter kids got help and not me. I don’t know I couldn’t understand what they were trying to teach me. I think they got a bit impatient. They would only come to me every so often, help me at the desk but I still couldn’t understand. . . . I’d walk in and sit down and bring out our maths book, turn to a certain page and start doing it, what was on the page to do. . . . I didn’t think I
learned that much. The maths book was pretty thick, what we had to work through. . . .

We had to keep up or do it, like if we didn’t finish it we had to do it at home and that.

(Interview, Courtnay, Program Student)

In this account declarative mood was identified. This feature worked to exchange information or provide information. It consists of a subject plus finite. The phrases, “smarter kids got help”, “I don’t know”, “I couldn’t understand”, “they got a bit impatient”, “they would only come to me every so often”, “I still couldn’t understand”, “I didn’t think I learned that much”, “the maths book was pretty thick”, “we had to keep up”, “we had to do it at home”, worked to provide information about this student’s learning experience. The significance of this feature is that it provided information that related to struggles for this student when learning from a textbook in school. It also highlighted the unequal relations of power and exclusion that existed in this student’s interpretation of reality in secondary school mathematics.

These accounts worked to indicate a shared discourse about the use of textbooks in secondary mathematics learning. They also reinforced the program coordinator’s earlier call for the reform of school mathematics because of the way it was taught to students. In chapter 2 a similar call was identified. Investigations of the use of textbooks showed that the activities in the texts were not well written, and focused on repetition and review, with topics covered superficially and at a fast pace (Lithner, 2004; Remillard, 2000; Shield, 2000). While these accounts emphasised the use of textbooks, they also raise the issue of the pace of work for students.

*Pace of Instruction*

In the participants’ accounts of their learning experiences, pace was defined as too fast, with students having to keep up with the teacher, the class, and the exercises in the book prescribed
for the class, and too often failing to do so. It worked to exclude students from learning. For example,

they would tell everyone how to do it while they’re out the front, and they get around to everyone. If they miss you, then the next lesson you’re onto something else and so you completely miss it and then you won’t know it. When you go onto to other things you don’t know it because they all blend in. You don’t know it for the next one and so it makes it a bit more difficult. So if you miss again they haven’t got time to teach you all the other ones that you’ve missed from the different lessons. (Interview, Andrew, Program Student)

Declarative mood was identified in this account. It shows the information in the account. This information included what happened when the teacher missed the student. In this instance, the pace of the lesson worked to isolate this student. When isolation occurs in mathematics classrooms students are less likely to engage and participate in learning, thus forcing them to the margins of learning.

Deictic categories were also identified in the account. These categories worked to show who and what was present in the text. For example, reference to the location of the teacher included “out the front”, “get around” and “miss you”. What happened to the student was referenced by time and arrangement, for example, “next lesson”, “onto something else”, “go onto other things”, “the next one”, “miss again”, “haven’t got time”, and “missed from the different lessons”. These references worked to demonstrate how a fast pace negatively influenced the students referred to in the account, that is, the you community which includes the wider community of students with which the student was including himself. There is a shared understanding about the problem with a fast pace in chapter 2. In that chapter the negative effects of a fast pace included that students demonstrated a dislike of mathematics
because they were unable to keep up with the demands of the classroom (Ulep, 2006). The negative effect worked to reinforce students’ perceptions that success in mathematics was attributed to ability. The consequence negative effect on lower achievers is evident in the next account.

all the nerds were at the front and they’ve finished their work, the teacher sees that they’ve finished and he goes on. And I’m at the back and like, and I still haven’t finished what I’m doing and he’s moving on and I haven’t even learnt it properly and I would try and put my hand up and he doesn’t even look at me so. (Interview, Alex, Program Student)

A classification scheme was evident in this account. It worked to order and evaluate the students in this particular student’s class. For example the phrases “nerds were at the front” and “I’m at the back” worked to emphasise three groupings, the teacher, “the nerds” and the student. Of these groupings, “the nerds” were constructed as reference points for the pace of learning in a classroom. They constituted the reference group for the teacher too—“the teacher sees that they’ve finished and he goes on”. In this scheme this student was the excluded Other, that is, “I’m at the back and like, I still haven’t finished . . . and he’s moving on”. Even when he acted—“I would try and put my hand up”—the student remained excluded—“he doesn’t even look at me so”. The significance of this classification scheme emphasised the differentiation of people and practices from one another. It indicated how the teacher and student were placed in opposition to each another.

A fast pace was a significant issue as identified in the accounts above. This practice worked to reinforce Chouliaraki and Fairclough’s (1999) argument about how a discourse and its associated discursive practices have implications for student learning in social contexts such as classrooms. That inference raises the question of how ability grouping influences
student learning.

*Grouping of Students*

Ability grouping is defined as the grouping of students by mathematical ability and segregating them into different class groups within a classroom or across classes in a common year level. In chapter 2 this practice was identified as problematic for students. The previously noted references of the program coordinator to “fear of failure” and “being ridiculed” are particularly pertinent here. As this student observed, it was hard, very hard um, very confusing and that’s just about it. Because I wasn’t in the right level I needed to be in the lower level and they put me in the higher level which I wasn’t ready for. Um the teacher didn’t really have time for every single student to teach them easier ways (Interview, Suzanne, Program Student)

Expressive modality was evidenced in the student’s explicit evaluation of her particular representation of a version of reality. This evaluation shows undesirability and is contained in the phrases, “hard, very hard . . . very confusing and that’s just about it”. The use of the modal marker, very, added emphasis to the evaluative terms, hard and confusing. This evaluation was supported by a further modal marker, just, indicating the finality of the situation. The significance of evaluation and where undesirability is concerned is that it shows that something is not useful—in the case above the grouping that the student was placed in was considered inappropriate by the student. An implication of this evaluation is that it reveals a problem with grouping for the student and the struggle that existed in and through a discourse of mathematics learning and its discursive practice ability grouping.

It is surely significant, however, that there has been so little discussion or criticism of this discursive practice in secondary school mathematics, whereas it was a matter of considerable importance in the program context, as discussed in chapter 5. In the student
account above, for instance, the complaint is that she should have been in a lower stream where she could cope with the work. The complaint was compounded by lack of time and—by presupposition—large class size, so that “the teacher really didn't have time for every single student”. A reasonable further presupposition here is that this group of students was so alienated from secondary school mathematics and so unable or unwilling to learn there that streaming was of no real consequence. Further evaluations were revealed with assessment.

Assessment

Assessment was found to largely involve pen-and-paper testing. Particular students’ experiences of this practice were identified as contributing to their failure in and exclusion from mathematics learning. For example,

Yeah, they just gave me a sheet, I just . . . . Yeah, it was just things and I just filled out. Bad. (Interview, Adrian, Program Student)

Expressive modality was identified in this account. This modality worked to show undesirability for the form of assessment given to the student. The evaluative term, bad, reinforced this undesirability suggesting that the assessment created struggles for this student. The impersonal nature of this problem was underlined by the continued repetition of the modal adverb, just—“I just”, “they just gave me a sheet”, “it was just things” and “I just filled out”. Its significance allowed for considerations of what existed that caused struggle for the student and the possibilities that could lead to a decrease in struggle such as using different forms of assessment to identify whether learning has occurred. The discussion in chapter 2 about assessment for learning provides a range of ideas that might be used to assess learning rather than using pen-and-paper testing (Black & Wiliam, 1998; Broadfoot, et al., 2002a). A second student’s account was even more emphatic.
Yeah. I would answer two questions out of the whole five pages. . . . Crap. (Interview, Courtnay, Program Student)

Expressive modality and the use of numbers converged in this account. The use of the numbers—“two questions” and “whole five pages”—worked to emphasise and evaluate this student’s failure in mathematics tests, thus providing added weight to his claims of failure. Their use expressed an exactness that reinforced the student’s authority to speak about his particular version of reality. The modal adjective, crap, played a strategic role emphasising and evaluating assessment as undesirable and that what he said was true (Quirk, Greenbaum, Leech & Svartik, 1985, p. 583). The unsatisfactory experience of assessment was traced even with students whose results were not so bad.

Yeah I found that I wasn’t really ready for the tests and that when they came up. I was a bit anxious and that. . . . I don’t want to do it. Surprisingly I done all right, I got Cs and that cause I just tried my hardest but you know it still wasn’t that good.

(Interview, Dale, Program Student)

Once again expressive modality was identified in this account. Evaluative phrases, “wasn’t really ready”, “a bit anxious”, “surprisingly I done all right”, “tried my hardest”, and “wasn’t that good”, worked to show undesirability for assessment. They also worked to explicitly evaluate this student’s experiences of exclusion as a consequence of the assessment, that is, at best as less than satisfying—“I don’t want to do it”, “I got Cs” and “it still wasn’t that good”. Further explicit evaluations of assessment continued to reveal the problems and struggles that exist for students.

Just things like that on the board and I’d just write it down on paper, blank paper.

Most of the time it was tests like that was the hard thing about high school. (Interview, Elan, Program Student)
The dismissive tone of this account on assessment was traced in the declarative mood in the phrases, “just things like that”, “I’d just write it down”, and “most of the time it was tests”, “it was tests like that was the hard thing about high school” and so ‘this is the way it was’. These phrases provided information about the social context from which the account came. In this context, the student’s authority, indicated by the pronoun, I, was restricted to just writing the answers down. Again, the modal phrase, “most of the time”, worked to indicate that this form of assessment was a regular event in secondary mathematics learning, but that its regularity made it no easier to accept. In chapter 2 this form of assessment was identified as continuing to dominate mathematics classrooms (Black & Wiliam, 1998; Shen, 2002; Tierney, 2006). This was because it was shown to be a product of standardised assessment requirements, and the consequence of an “assessment revolution” (Broadfoot & Black, 2004, p. 19) that prioritised quantitative data for “delivering transparency, accountability and predictability” (Broadfoot & Black, 2004, p. 19). With this type of assessment, teachers were not required to provide feedback to students about their learning. However, what the results of test were shown to influence were the students and their perceptions of themselves as unable to do mathematics. What they learned was that success in mathematics was measured by a pen-and-paper test and that only a few students got it (Ulep, 2006). Once more, what students such as these learn is that they are excluded from learning mathematics because they cannot do it.

The previous accounts worked to emphasise assessment as it was experienced and interpreted by the students. The following account adds further detail to the previous negative evaluation of this discursive practice.

They just give us a piece of paper and we had to face our desk the other way from the other person. Then when we need, they can’t tell you the answer, they have to read,
and if you can’t read or anything they come and help you read it and stuff like that.

(Interview, Harry, Program Student)

The deictic categories, they, and us, we, our, and you worked to identify and position the participants in this account. Here, they defined the teachers whose comprehensive exercise of power was constructed throughout this account. In this construction, us, our, we and you variously defined and located the students. For example, in “they just give us a piece of piece of paper”, the teacher acted and students were the passive recipients of that action. That control was implicit in the statement, “we had to face our desk the other way from the person”, so that each student became an isolated cipher. In an interesting construction of fairness, “they can’t tell you the answer” but “if you can’t read or anything they will come and help you read” the test. The exclusion of the student, in that the first person pronoun, I, was absent, was significant. It suggests a case of backgrounding. That is, the student was passivated—an affected negative beneficiary of another control, more than other students who were identified generically in the account as us, we, our, and you.

In the accounts above the discursive practice, assessment, in secondary mathematics classrooms was traced as something that was done on paper, with either questions read from the board or from a sheet. It was also traced as something done in isolation. This method of assessment was evaluated as undesirable and contributing to student failure, another negative feature of the discourse about secondary school mathematics, as constructed within the program discourse of mathematics learning.

A Favourable Discourse about Secondary School Mathematics

Chapter 5 has shown that a minority of accounts criticised or rejected aspects of the program and its practices. Thus in Diana’s account the program was “just really too easy” and “just so disorganised” while the teachers had “no control”. In consequence she now understood why
“they were strict” at school. Jemma’s account described the workbooks as “pretty boring at times”, while in Adrianni’s account, the length of time devoted to maths was too long, the work was repetitive, “so boring” and she’d “done it all before”. One tutor’s account suggested that the work was “quite basic stuff” and there “should be more scope to show they’ve achieved”. In what follows, participants’ accounts that support aspects of secondary school mathematics are considered.

Interaction

In the account below, a judicious form of teacher and student interactions in the secondary mathematics classroom was evaluated positively. Here what was crucial was the teacher’s effective use of explanation.

Um, I think we wrote the page and columns in separate ones, then did some stuff out of the book and some off the board then talked us through it. That was in Year 9 when he explained everything to us. We were in the lowest maths class but we were doing the same sort of stuff as the highest, because he explained it more to us, he didn’t just rush through it. We were more up to date with it all. He’d slow it down when we got to know it easy. (Interview, Ben, Program Student)

Declarative mood was evident in this account. Declaratives provide information about a social context, here the mathematics classroom. In particular the declaratives, “he explained everything”, “we were in the lowest maths class”, “we were doing the same sort of stuff as the highest”, “he explained it more to us”, “he didn’t just rush through it”, and “he would slow it down”, worked to provide the facts about this student’s mathematics learning in secondary school classroom. Significantly, though, the authority of this student’s claim to truth in recollecting his experience in secondary classroom was qualified by his prefacing remark, “Um, I think”.
What is important here is the quality of the relationship constructed in this account between the two distinct groups, the teacher and the class. Unlike some later more critical accounts of secondary school mathematics, the concomitant failure of the teacher to provide effective help is missing. Here a classification scheme was identified in the phrases, “then talked us through it”, “he explained everything to us”, “he explained it more to us”, “he didn’t just rush through it”, “we were more up to date with it” and “he’d slow it down” worked to evaluate this situation as an example of successful secondary school mathematics education. This scheme worked to organise and evaluate the student’s experiences and who was involved in such experiences. It also worked to emphasise that the discursive practice, teacher and student interaction, in the discourse about secondary school mathematics, was evaluated as desirable for learning in this student’s version of reality. Such an evaluation also worked to show the value of participation in mathematics learning, in that the student was becoming part of that classroom community (cf. Lave & Wenger, 1991). Gaining mastery of the mathematics taught and learned was seen as evidence that the student was becoming a mathematics learner.

Within the active/passive dichotomy of instruction-based teaching and in the lowest stream of mathematics, this teacher was constructed by the text as supportive of his students and their learning and as modifying the pace of their work to their needs, so that, “we were doing the same sort of stuff as the highest”. This class was represented as the lowest maths class in the account but doing the same work as the highest class. The teacher, identified as he, and traced as in a position of authority, was found to be supportive of the class, identified as we and us, to which the student belonged. A presupposition here is that of a tacit acceptance of the discursive practices—the board, textbooks and streaming. However, it would seem reasonable to characterise adapting the pace of work to student needs and
providing effective support and explanations as being enabling for students. A further
evaluation was provided in the following account.

Sometimes I would get it, yeah like, sometimes when the teacher would come up and
explain the whole thing to me I would get it. I would do the whole thing really well,
but other times I would just flunk out. (Interview, Aderley, Program Student)

Expressive modality was identified in this account. The evaluative terms “really well”
and “flunk out”, worked to show two contrasting evaluations of the student’s experiences of
learning. Here, “sometimes I would get it” and “other times I would flunk out”, indicated a
median desirability of learning in secondary mathematics classrooms. Possibilities for
learning were evident in the phrase, “when the teacher would come up and explain the whole
thing”. Other times—and a reasonable presupposition is that explanation and interaction
applied there also—“I would just flunk out”.

The continued use of the deictic pronoun, I, in this account is significant. The
implication is that this student retained a degree of active authority in this process,
exemplified in the threefold repetition of “I would get it”, “I would get it”, “I would do the
whole thing really well”. Hence also a possible acknowledgement of personal responsibility—
rather than blaming the teacher?—for failure when “I would just flunk out”.

Source of Authority

The next account presents a positive view of textbooks, when assisted adequately by the
teacher.

Yeah, that’s it like a maths book. . . . And I just when I get help I call the teacher.

Yeah, I reckon, yeah time tables I reckon I find that like easy and divided by. I am
learning that now. I reckon they’re fun to do. . . . Like games about maths, like 2 times
2, like you’ve got to say it faster. It’s like that, you know what I mean? Yeah, like two
people stand up and you go like that like they’ll be there or something, and you’ve got to say the answer quickly. I reckon that was fun. (Interview, Adrian, Program Student)

Expressive modality was identified in this account. Evaluations such as, “I find that like easy” and “I reckon they’re fun to do”, showed a desire for learning mathematics at school. This evaluation was linked to the textbook described as “like a maths book”, and rote learning, as in “time tables”. An implication of this evaluation is that it has allowed for identifying possibilities for student learning. Here, and despite the student having to work through a text and learning multiplication tables, the evaluation in the account indicates a significant desirability. In chapter 2 differing arguments were presented about learning from a textbook in school. That is, the argument from the instructivist approach indicated that as concepts and strategies were directly instructed to students, they were required to do independent work with “mass practice” of exercises that were to be completed without teacher assistance (Stein, Silbert & Carnine, 1997, p. 25). Textbooks and worksheets provided sequenced tasks for each of the different concepts taught. Their purpose was to coordinate the related teaching activities and memorisation exercises. This allowed the teacher to easily monitor the progress of the students’ performance and mastery. A counter-point to this argument, again in chapter 2, was that in secondary mathematics classrooms students were found to largely work from a textbook in isolation and with the mathematics separated from other curriculum areas (Askew, 2001; Nickson, 2002). Consequently, what students learned was that mathematics was about solving routine tasks that were broken into discrete steps and isolated from their daily experiences. However, the evaluation in the account above suggests that learning from a textbook and reciting multiplication tables may, when combined with “games about maths”, provide possibilities for student learning and access to the discourse of mathematics.
Grouping of Students

Further support for learning in secondary school mathematics was found in the following account.

I went to this place, there was a tutor thing and there was a school, Mistiville High. There was a block way up the end of the hall and you go up stairs and you get tutored by maths, for maths. It helped me better than when I was in class. (Interview, Trevor, Program Student)

Expressive modality was evidenced in this account. The student’s particular version of his learning experiences in secondary school was evaluated positively thus indicating desirability for learning in the social context described. In particular, the use of the modal adjective, better, worked to show that withdrawal from class and being tutored in mathematics was desirable. What this shows is the possibilities for student learning in secondary school. In doing so, it also showed that for this student, leaving class to attend a support program was desirable as noted by the evaluative term, “better”.

Evaluating the Discourses about Instruction-based Mathematics

Two discourses about secondary school mathematics were identified in the participants’ accounts. They were constructed around the discursive practices of secondary school mathematics classrooms. Didactic instructional style, teacher-directed communication, a common textbook, fast pace, homogenous grouping and pen-and-paper assessment worked in conjunction to establish the unequal relations of power between discourse participants, so that teachers directed and controlled all aspects of the classroom while students were the passive recipients of this direction and control. Broadly, these practices were seen to be derived from an instruction-based or traditional approach as described in chapter 2. With few exceptions, they were evaluated negatively by staff and most students.
Their Dimensions

The three dimensions of discourse—representations, relations and identities—reveal the underlying consistency of these discursive practices and the program discourses about secondary mathematics education and classrooms (cf. Fairclough, 2003). They give these discourses their particular form and coherence; they provide the organising principles that link their discursive practices. They are now briefly rehearsed, drawing on common aspects of the participants’ accounts, as revealed in the analysis to date.

Representations

The participants in this study constructed particular versions of reality to represent their experiences of secondary mathematics education. For most students, that experience of secondary mathematics was described as boring, frustrating, not relevant, or even ‘crap’ and ‘shit’. The teacher put work on the blackboard or the textbook, and told them to do it. Too often they could not. The pace was too fast, they couldn’t keep up, they couldn’t understand or do the work, they disliked mathematics, they failed the tests or they didn’t try. The discourse about secondary school mathematics and its discursive practices worked to construct them as unsuccessful learners of mathematics. In short, they were failures who did not or could not learn mathematics.

Relations

The relations dimension of discourse worked to trace the relations of power constructed in most participants’ versions of the reality of secondary mathematics classrooms. For the program staff and most students that relationship was negative. In that context, relations of power, partly associated with large class sizes, were constructed in which students were passive recipients of direction and control, exercised by teachers. Communication was essentially one-way, from teacher to students, students were taught as a group but worked in
isolation, while little or no help was available or provided for those who lagged behind or could not do the work. In the end they were either excluded or withdrew from a context in which they could not or would not succeed.

**Identities**

The identities dimension of discourse worked to describe the identities traced in the particular versions of reality about secondary school mathematics presented in the accounts in this study. Through such versions, student and teacher identities were constructed and maintained. In the secondary school context, teachers were the source of authority and knowledge. Often under the pressure of large class numbers and the time constraints of curriculum coverage, they taught to the group, with little time for those who could not keep up, did not understand or were just not interested. Students in turn became ciphers, passive recipients of instruction and grades. Those who could not keep up, who did not pass tests or who could see no point in the whole process were failures and isolates and identified themselves as such. In short, for most students in this study ‘no child left behind’ was distinctly not the case.

**The Analysis to this Point**

In chapter 5 and this chapter CDA has been applied to show how discourses and their associated discursive practices were constructed through the accounts of participants involved in the social activity of the classroom in the Youth Reconnected Program in a TAFE College. Discourses about program mathematics and secondary school mathematics were constructed within the discourse of the program community. These discourses were constructed around the same practices—instructional style, communication and interactions, source of authority, pace, grouping of students, and assessment—though differing in their discursive application. The discourse about the program was constituted by an application of these discursive practices that was traced as largely supportive and inclusive of mathematics learning for the
students in the program, whereas their application in the discourse about secondary mathematics was generally unsupportive and exclusive of such learning.

These two chapters have also shown that the participants in this study were able to interpret their mathematics learning experiences from two social contexts, the program and secondary mathematics classrooms. These chapters have revealed the complexity of the discourses and discursive practices in mathematics education and the struggles around them, along with their potential to enable or disable mathematics learning by students such as those in this study. However, one further issue from the second research question has yet to be considered—the forms of participation traced in the participants’ accounts.

**Forms of Participation in Discourses**

Analysis of the program community’s discourse on mathematics education as constructed in the accounts of its members has shown that it was characterised by possibilities and constraints for learners of mathematics such as those in this study. Thus on the one hand the Youth Reconnected Program’s emphasis on supporting students with their learning of mathematics and future opportunities to engage in further education and or training seems consonant with the points made in chapter 3 about identity, participation and communities of learners. That chapter emphasised that the learner’s identity was constructed through the practices of the community in which they were a participant. Where there was quality social interaction between students, teachers and tutors, the students were more likely to identify themselves as mathematics learners. On the other hand, traditional mathematics as constructed through those accounts echoed the issues raised in chapter 3 about identities of non-participation and failure.

The findings from these chapters’ analysis of the program community’s discourses about the program and traditional mathematics can now be translated to the tripartite model
for understanding participation (Figure 3) in chapter 3, with particular attention to its three forms, “identity of participation”, “identity of participation of peripherality” and “identity of non-participation of marginality”.

Thus in the program community, learning was found to be largely a social process where teachers, tutors and students actively shared ideas, and participated and belonged to a community of learners. Respect for teachers, tutors and students was identified as crucial to this community as was listening to opinions and ideas and taking them seriously. For most of the students, learning was identified as a transformative experience initially evolving from participation of peripherality to participation as they found they could contribute to, and engage with and in, the enterprise of a community of mathematics learners.

In turn, the community’s discourse about instruction-based mathematics seemed to be more associated with non-participation of marginality. That is, the students were unable to understand and or see the connections with the mathematics they were taught because it was taught from a textbook most of the time and in isolation. Mathematical procedures and explanations were provided by the teacher from the blackboard with students expected to replicate such procedures via their workbook and textbook. This form of non-participation was found to be an alienating one that presented barriers for these students. Kept at the margins and excluded from access, they were typically unable to participate as successful learners of mathematics in some secondary mathematics classrooms.

The tripartite model for understanding participation and in particular, its elements of participation and participation of peripherality were found to connect closely with Wenger’s (1998) characteristics of engagement, joint enterprise and shared repertoire, and Davies’ (2005) characteristic of access to a community identified in chapter 3. A discussion of each characteristic as it applies to the program now follows.
Engagement in an Interactive Community of Learners

In general, and with few exceptions, the teachers, tutors and students were found to mutually engage in the program. That is, they reciprocated in the learning process. Such reciprocity was identified as different to secondary school mathematics because of the kind of positive engagement that was openly encouraged and supported. This process required community maintenance and sustenance (Wenger, 1998). The continuation of such engagement was related to the kinds of identities as learners constructed in the program and because students were granted access and continued support for learning in it.

In this discourse, community maintenance was traced as requiring constant attention and competency from all those involved in the community. That involvement from the program manager, program coordinator, teachers, tutors, and students was central to its maintenance. The teachers and tutors encouraged the students to discuss and construct their mathematical understandings and the students responded with trust and appreciation. In doing so, they were mutually engaged in the enterprise of learning mathematics in that community.

Enterprising Conversations about Mathematics

Inclusion in and through discourse was traced as an important requirement for joint engagement in the interactions of the enterprise of the program and its related community. When the responsibilities of such a community were identified as shared between teachers, tutors and students, the students’ actions and engagement was found to improve. In this discourse, the community was constructed as a context where the students could proceed with their learning, thus becoming more proficient with doing mathematics.

Engagement in the joint enterprise of mathematics knowledge construction cannot be viewed separately from the social context of a classroom. Such engagement was found to be the case with the program. Mathematical meaning was more likely to develop through
interactive social relations between teachers, tutor and students. It was identified as gaining coherence through interaction and belonging to that community.

**Shared Repertoire of Ideas about Mathematics**

A shared repertoire includes the routines, the discourses and ways of doing things, the actions and stories produced during the course of a community’s existence (Wenger, 1998). Such characteristics were traced in this chapter as evolving as students and teachers, tutors engaged in a discourse that allowed for meaningful mathematical constructions. That students’, teachers’ and tutors’ identities were each constructed positively in the accounts worked to reinforce and further construct their repertoires of mathematical understandings. In doing so, such sharing legitimated these understandings.

Whilst negotiation was traced as important in the discourse about the program, it was not fully determining. Relations of power were also important to understanding the type of engagement, the interactions and how repertoires were shared. In the accounts, power was traced as shared appropriately between teachers and students as they engaged in the joint pursuit of learning. Thus, while the program acknowledged necessary differences in authority between teachers and students, this was substantially different from the alienating exercise of authority and control in traditional classrooms. This appropriate sharing of power and authority was established as a result of belonging to the community. Through this belonging, what students learned was how to build a sense of their place, identity, understandings and possibilities in society (Eckert, 2000).

The characteristics, mutual engagement, joint enterprise, and shared repertoire gained coherence through this analysis of the accounts about the program. Contributing to this coherence were the previously noted positive relations and interactions between teachers, tutors, and students constructed in the accounts. Without access to this discourse, these
characteristics failed to evolve. Thus, access to a community and its discourse was identified as crucial for inclusion in a learning community?

*Accessing a Community of Learners*

Access to an interactive learning community was found to depend on the relations between discourse participants, that is, how students were supported and the extent that the teachers and tutors were able to ensure quality learning experiences for students. With that proviso, accessing and participating in such a community of learners, here the Youth Reconnected Program, provided students with substantial opportunities for successful mathematics learning. This access was endorsed by most members, in this instance, teachers, tutors and students. The teachers in the program were found to accept students as they were and to establish supportive relationships on which they could build to encourage student participation. In this approach, students also supported students and related interactively with their teachers. Such engagement allowed for mistakes to be made and learned from, because students were engaging in negotiation and construction of mathematical meanings. It created continuing opportunities and possibilities for building mathematical learning.

*The Program Remains Subordinate in the Orders of Discourse*

From the analysis of participants’ accounts thus far, with their general preference for the program and its discursive practices, it could be concluded that the discourse about the program mathematics was hegemonic within the program community. However, it was explicitly constructed as alternative to the greater hegemony of secondary mathematics outside the program community. This is evident in the formulation of the Youth Reconnection Program, which was intended to provide a ‘second chance’ for early school leavers and youth at risk. Not only was it remedial, it was ‘practical’ and vocational in orientation (Department of Education Science & Training, 2002). Thus it was de facto subordinate to secondary
mathematics—and in particular to its higher streams—in the orders of discourse of mathematics education. Again, it was an alternative because aspects of the discursive practices of a hegemonic discourse, that is, a discourse of instruction-based forms of secondary mathematics education, were evident but modified in particular ways to assist students as much as possible with their engagement and participation in mathematics learning, thus weakening the distinction between reform and instructional forms of mathematics education. In short, the discourse about the program and its associated practices was traced as hegemonic in the TAFE setting but as subordinate and alternative to instructional-based mathematics in the more comprehensive construction of mathematics education in secondary mathematics classrooms.

A hegemonic discourse in this instance refers to the establishment and maintenance of one discourse type in a social context such as a classroom. Here certain ideological assumptions about what mathematics is and what it constitutes work to constrain students to operate within the subject positions established by this discourse. Whilst such positions imply constraint, tensions emerge as a consequent of this constraint, enabling the contributions of those in less powerful positions, here the students, to act as social agents and be creative (cf. Fairclough, 2001). In this case an alternative or oppositional discourse arises. In the accounts where an oppositional discourse was constructed about mathematics in secondary school, there was evidence of marginalisation and exclusion from learning, hence limited student participation. In the case of a hegemonic discourse of mathematics in secondary school, most of the students in this study were excluded learners or chose to exclude themselves because they stood in opposition to the hegemonic discourse. However, as members of the program community and actively participating in its discursive practices, they were reconstituted as successful mathematics learners in an alternative discourse about mathematics.
Two Caveats

Two caveats are appropriate to the findings of chapters five and six. First, it is significant that throughout the analysis class size has been identified as influential to whether students engaged and participated in learning. Large class sizes in secondary mathematics classrooms were found to hinder the students’ learning whereas with the program’s smaller class sizes the opposite was found to be the case. Also of importance and linked to the class sizes was the demands of working through a set curriculum in a particular time frame. In combination, these two issues arguably predisposed many of the secondary teachers in these accounts to follow taken-for-granted or traditional instruction-based approaches to mathematics education.

Second, it must be evident by now that the correspondence between the discursive practices of the program or secondary mathematics with instruction-based or reform-based practices and principles as outlined in chapter 2, is less than complete. Thus what the majority of accounts of secondary mathematics in this chapter described fails to meet direct instruction’s expectations for clear didactic communication and signals from the teacher to students, highly structured and scripted lessons and textbooks, a brisk pace for effective learning, objective testing and direct instruction and rehearsal. Indeed, the reported practices of secondary school mathematics seem to be more closely aligned with a debased form of the practices of traditional teaching than with direct instruction or positive teaching. Similarly, while there are similarities between much in the discursive practices of the Youth Reconnected Program and the practices espoused by reform approaches to mathematics learning as presented in chapter 2, they are not equivalent, as has already been observed in chapter 5. Here, Bernstein’s (1990) observation on the ways in which practices at the workface differ from their initial formulation may be pertinent. That is, what is observed and
called into question may be at some remove from an ideal situation. Indeed, direct instruction may be seen as providing a critique of the reported practices of secondary mathematics classrooms almost as extensive as it would provide of the program’s practices.

Conclusion

An analysis of what the participants said about two sites, secondary school and the TAFE program, worked to construct discourses about mathematics learning. That analysis also worked to show the importance of social interaction for student learning and to emphasise the significance of learning as a social activity. A further understanding was that through such interactions, teachers, tutors and students in the program were enacting the four characteristics of a community of learners identified in chapter 3 as crucial for successful participation in a community. In the next chapter, this discussion continues through a fine-grained analysis of sixteen students’ accounts using critical discourse analysis. This analysis traces the discourses of participation using the identities dimension of discourse introduced in these two chapters.
CHAPTER 7: IDENTITIES AND FORMS OF PARTICIPATION

This chapter continues the analysis of the participants’ particular versions of their mathematics learning begun in chapters 5 and 6. More specifically, it addresses the third research question: What identities are discursively constructed in these accounts and what relationships can be traced between these identities and the discourses, practices and forms of participation addressed in the previous question? To do this, the chapter focuses on a fine-grained analysis of sixteen students’ accounts to trace how identities of forms of participation and non-participation are constructed through discourse and its associated discursive practices as described in chapters 5 and 6.

The analysis of this chapter continues, in part, the organising framework presented in chapters 5 and 6. That is, the data are described using the identities dimension of discourse discussed in chapter 3. This dimension involves the speaker’s authority in the claims about particular version of reality (Fairclough, 2001). Evaluation is used to trace how the speaker makes such claims. Evaluative statements are about the desirability or undesirability of anything that is socially constructed. The textual features that form the basis of the analysis employed in this chapter include expressive modality, binary opposition, classification schemes, presupposition, deictic categories and declarative mood as described in chapter 3 and identified in chapters 5 and 6.

This chapter consists of three sections. The first section traces identities of forms of participation constructed in and through a discourse about mathematics learning in the program first traced in chapter 5.

The second section traces the identities of forms of participation constructed in and through a discourse about secondary school mathematics as traced in chapter 6. The third section reviews and compares the identities traced in the accounts about the program and
secondary school mathematics to ascertain what can be understood about identities, forms of participation and community.

Forms of Participation in the Program

Particular forms of participation in mathematics learning in the program were represented in the accounts in chapters 5 and 6. More specifically, these forms included participation, participation of peripherality and non-participation of marginality. Briefly, an identity of participation of peripherality refers to students’ initial exposure to a classroom, its discourses and related discursive practices. It is more than an observational lookout (Lave & Wenger, 1991). Learning as increasing participation in a community of learners involves the student taking part in the context of the mathematics classroom. Viewing learning as participation directs attention to the “ways it is an evolving, continuously reviewed set of relations” among people in activity that arises socially in the classroom (Lave & Wenger, 1991, p. 50).

Increased and extended participation in a mathematics learning community provides students with opportunities to come to know and understand mathematics. From the periphery students assemble a general idea of what constitutes mathematics in the classroom. They come to be involved in what they are doing, how they, the teacher and other students talk, collaborate and challenge about mathematics and what they need to learn to continue participating (Lave & Wenger, 1991). However, as discussed in chapter 3, if, over time, students are unable to access the discourse and its related discursive practices, which position students in deep adversarial relations with the learning of mathematics, “involuntary servitude rather than participation distort[s], partially or completely, the prospects for learning” (Lave & Wenger, 1991, p. 64). When this occurs, constructing an identity of participation is constrained, with identities of non-participation of marginality emerging.

In short, how the identities of students as participatory and competent mathematics
learners are constructed in discourse is linked with the manner in which they engage in learning mathematics (Nasir, 2002a; see also Lave & Wenger, 1991; Wenger, 1998). Here participation implies social inclusion (Hill, Davis, Prout & Tisdall, 2004; Lave & Wenger, 1991). Active participation is linked with increasing motivation to learn mathematics (Cobb & Hodge, 2002). For example,

I just put my hand up and ask the teacher, and she, she just says if I’m stuck on something she’ll do it for me, ah not really we both do it together and then she will make me do like three of them. She’ll just write and do them, and then I get the hang of it and then she’ll leave. (Interview, Cam, Program Student)

A classification scheme was evident in this account. This scheme worked to organise, classify and evaluate the participants and forms of participation. Participation was identified in the phrases, “I just put my hand up and ask the teacher”, “she just says if I’m stuck on something she’ll do it for me”, “we both do it together”, “then I get the hang of it and she’ll leave”. These phrases worked to organise and classify the student’s involvement and participation in learning. Because participation is based on situated negotiation and renegotiation of mathematics in the mathematics classroom, “it implies that understanding and social experience are in constant interaction” (Lave & Wenger, 1991, p. 51-52). It was this aspect that was identified in the account above—the interaction between the teacher and student worked to connect and maintain the student’s participation in learning. The classification scheme identified in the account above was significant for allowing an understanding of the wording of the particular version of reality. That is, how students construct their identities as competent mathematics learners is strongly influenced by the quality of their interactions and relationships as they participate in learning mathematics (Nasir, 2002a). In this account, the student’s identity was constructed as moving from the
Declarative mood was identified in the account. It allows for the identification of the facts about the social interaction between the teacher and student. In doing so it allows for the identification of the interactions that were crucial to how this student, Cam, represented and identified himself as a mathematics learner. That is, the classroom interactions brought the identity of the student into focus—and in doing so, his identity of participation—with mathematical learning taking on a deeper meaning (McClain & Cobb, 2001; Schoenfeld, 1994, 2002; Thompson, 2001). Identifying declarative mood in the account is significant because not only does it provide information, it allows for the identification of the discourse type used by the student to give structure and coherence to his involvement in learning in the program. This account continues, to provide a further understanding of participation.

I am coming home and doing it myself and actually working hard so I think the work here is more challenging for me, better work and if you’re stuck the teachers do help. I reckon it’s a lot easy here and like you know that’s my point of view. (Interview, Cam, Program Student)

Expressive modality was identified in this account. The student’s evaluation worked to show desirability for participating in learning. The phrases, “actually working hard”, “the work here is more challenging”, “better work” and “if you’re stuck the teachers do help”, worked to evaluate Cam’s version of reality. For example, the modal markers, more, better, and do, worked to emphasise the authority of this account. The modal marker, actually, played a strategic role in the account by further emphasising the student’s stance and an
unexpectedness and surprise related to working hard. The phrases also worked to represent the student as participating in mathematics learning, a finding that was further emphasised by the positive assertion, “that’s my point of view”. The significance of the identification of expressive modality in the account was that it allowed for the recognition of possibilities for student learning. In doing so, it emphasised the importance and usefulness of interactions for student participation in learning. In support of this claim, this student added further,

I just feel like I am learning more than what I’ve learnt for the last three years. I’ve learnt basically I knew my times tables but I’m gonna have to think. Now I’m like not much better but I’m slowly type, getting good at them. (Interview, Cam, Program Student)

The use of a deictic category, I, was significant in this account. It was used frequently—eight times—thus prefacing who was present in the account: the student. The absence of teachers or schools indicated that they were not positioned as important in the discourse about the program identified in the account. Rather what was important was that the student was positioned as authoritative about his claims. The account was constructed in such a way as to reinforce the student’s identity as a participatory mathematics learner. The construction of such an identity is a work in progress. It develops and evolves over time and through participatory experiences with others. As students learn the language, the gestures, interactions, practices and routines of the social learning context, identities are constructed, maintained, modified and reshaped (Berger & Luckmann, 1966).

The previous account has indicated the positive effects of participation in learning and teacher and student interaction with supporting student learning. This point was supported by other participants in the program community.
It’s like they spend more time with you here, like they’ve got more teachers going around and rotating around the classroom showing you everything. It makes it a lot easier. . . . It is good here too because you can talk sense and say anything to the bloke next to you and say look at this I am stuck here, teachers are busy, do you know anything about this? It works like that or vice versa. (Interview, Michael, Program Student)

The use of expressive modality in this account worked to evaluate this student’s experience of participating in the program. The evaluative statements supported by the modal markers, more, easier and good in the phrases, “more time”, “more teachers”, “a lot easier” and “good here”, indicated the desirability of learning in the program. The discursive practices contributing to this evaluation included the interactions between the teachers and students. Significantly, and supporting the previous inferences about a community of learners in chapter 5, mutual assistance between students was common and accepted. Here, and as discussed previously and in chapter 2, three-way interactions were identified as leading to substantial improvements in student achievement and participation across classrooms. The identification of expressive modality in the account worked to emphasise the possibilities for learning and participation—in particular that classroom interactions were crucial to this aspect. Within the discourse about the program, such an evaluation propagated desirability for learning—suggesting its significance. That is, teacher and student interactions were useful and important for participation.

In such communities, identities of participation are a work in progress as mentioned previously. As described in chapter 3, identities develop and progress for a variety of social contexts over time as people participate and learn the practices and processes of a community (Fairclough, 2001). The relevance of a particular identity is to a degree a function of the social
context in which the student finds themselves (Pietikäinen & Dufva, 2006). It is through continued social interactions in social contexts that inclusion, membership and the formation of an identity in a community occurs.

The use of the deictic categories, *they, you and I*, in the account is significant here for further understanding identities of participation and the practices influential to such participation. You was used five times in the account. Its usage directed attention to the groups constructed in the account as well as who was included in the groups. Here you referred to all the students, while they in “they spend more time with you here”, they referred to the teachers, and in “they’ve got more teachers going around . . . showing you everything”, it referred to the organisation of the program. The sentence, “you can talk sense and say anything to the bloke next to you and say look at this I am stuck here . . . do you know anything about this?” worked to position the student as actively co-constructing an identity as a participatory learner in a community of learners.

The account also supported the view described previously and in chapter 3 that identity construction is a social process, and not something that occurs in isolation. The account indicated the opportunities in the program for students to initiate and direct their learning and in doing so to participate and construct their identity as members of the program community. These identities develop through and over time as students legitimately participate in and learn the practices and processes of particular contexts or communities such as classrooms (Fairclough, 2001). Learning to be a legitimate participant also involves learning when to and how to talk, and be silent in a classroom (Lave & Wenger, 1991). A further example was provided by the following account.

It was difficult, like I was more immature then than what I am now, so difficult I would just switch off, and just not do it but now like we got them booklets here, and I
just sit there and take as much time as I want, stay back, take the books home. The first book I copied a few things out of the back, and then I thought aah what is the use of doing that because I want to get into a cabinetmaking course. Yeah, I’m now good at maths, volume, area and stuff like that I’ve never been good at it, and I thought I have to learn this if I’m gonna do cabinetmaking. So I sat through that book as much as I hated it, I got it done and I understand (Interview, Robert, Program Student)

The textual feature, deictic category, was identified in the account. This category worked to show who was included in the discourse of mathematics in the program. The personal pronoun, I, in the phrases, “I was more immature”, “I would just switch off”, “I just sit there and take as much time as I want, stay back, take the books home”, “I copied a few things”, “I want to get into a cabinetmaking course”, “I’m no good at maths”, “I thought I have to learn this”, and “I got it done and I understand”, worked to identify who was present in the account and also who was represented in the classroom community in this student’s interpretation. Once again the absence of teachers or schools from the account indicated that they were not positioned as significant to the discourse about the program. Rather what was important was that the student was positioned as authoritative about his claims about his particular versions of reality, thus accepting responsibility for his situation. In making these claims, the student was represented as good at maths in the program and not good at school, represented as “difficult, so difficult I would just switch off”. The identification of a deictic category was significant because it worked to show who was included and excluded from the discourse about mathematics learning. In contrast to his experience of secondary school mathematics, the student was constructed as an active participant in the discourse about the program, who had the power to do things and make things happen—thus constructing an identity of participation in the social context of the mathematics classroom in the program. Of
further significance in that context was the discursive practice, “them booklets” and “that book”, whose mastery, “as much as I hated it”, would enable this student to “get into a cabinet-making course”. Similarly, the one acknowledgement of the program community was in the inclusive, we, “we got them booklets here”. The student’s account indicated that movement from the periphery to a fuller participation occurred in the program. In this case, there were varied ways in which the student engaged and was located in the fields of participation defined by the program community. Here, changing locations and perspectives are a crucial part of a learner’s learning trajectory, her or his developing identity and membership in the classroom. This same commitment to learn, though with a more inclusive sense of community, was expressed in the account below.

I think because um, it gives me, it makes me want to learn when I know when I know what I am talking about and what they’re talking about it kind of gives me the confidence to do it as well, with them in the class to join in so it’s a lot better.

(Interview, Angelique, Program Student)

Declarative mood was identified in this account. This mood provides the information about this student’s learning. In this account, the student was identified as wanting to participate when she understood the discourse of mathematics. For example, “it makes me want to learning when I know what I am talking about and what they’re talking about” and “it kind of gives me the confidence to do it as well, with them in the class to join in”, worked to provide information about the student’s participation in learning. The evolving identity, that is, identity of peripheral participation, suggests an opening, a way of gaining access to the language and learning for understanding and growing involvement. Here once again learning to become a legitimate participant involves accessing and learning how to talk in and talk about the mathematics language of the community. Thus, access to the language for learning
may have more to do with legitimate participation than simply transmitting knowledge (Lave & Wenger, 1991). This point was exemplified in Angelique’s comment that it was a lot better in the program. This comment suggests that talking and understanding the language of mathematics was crucial for a student whose previous experiences suggested failure in mathematics.

Chapter 3 discussed the significance of having someone, here a teacher, to translate technical language into something that is comprehensible and accessible by students. The problem for students such as those in this study occurs when the language is not translated in a way that students can understand and apply to other mathematical contexts and tasks (cf. Lemke, 1995). Developing mastery of the language of mathematics is crucial to learning. Hence her evaluation, below:

It is a lot easier and better here because they start with you even if yeah, they start from counting, if you can’t count they come here and expect you not really to count and then they help you from that. (Interview, Angelique, Program Student)

Declarative mood was identified in the account. This feature is used to exchange information. The phrases “they start with you”, “they start from counting”, “if you can’t count they come here and expect you not really to count”, and “they help you from that” worked to provide information about how this student was supported with her learning. The significance of the information provided is that it was from the person who had the knowledge to speak with authority about her particular version of reality. This is crucial because it emphasises that participation in learning is about inclusion in what is going on. In this case, learning the knowledge and skills required to actively engage in the learning process attenuated conditions of legitimate peripheral participation (Lave & Wenger, 1991). This idea indicates a “particular form of engagement of the learner who participates in the practices of an expert, but only to a
limited degree and with limited responsibility for the ultimate product as a whole (Lave & Wenger, 1991, p. 14). Moving towards full participation infers that the student has a reason to believe that what they are learning can make a difference (Wenger, 1998; Sinclair, 2004). They also learn that they can contribute to their learning and that such contributions are important for learning to occur.

The identification of expressive modality in the account worked to reinforce the facts about the student’s experience further. The evaluative phrase “it is a lot easier and better here” suggest desirability for learning mathematics in the program. Such an evaluation allows for considerations of possibilities for learning. One possibility is the discursive practice, teacher and student interactions, identified in the student’s discourse about the program. In chapter 2 this practice was found to strongly influence the developing identities of students as participatory learners. Such identities are a work in progress and develop through interactions with others as they participate in learning in social contexts such as the classroom. Participation then is enabling and affords students the opportunity to acquire and apply mathematical understandings in a range of contexts (Cobb, Boufi, McClain & Whitenack, 1997; Schoenfeld, 1994, 2002).

Developing positive identities in the program mathematics classroom is not about discarding school uniforms and other identities that students bring from previous contexts and experiences. Rather what it is about is understanding the identities and relationships of the learners. This implies examining the historical experiences from previous learning experiences that students bring to these contexts (Henriques, 1998). Because learning occurs through participation in social contexts and interactions, any changes in these contexts and relationships may affect students’ identities as learners (Dudley-Marling, 2004). For example,
Mary and that will like, sit there with us and explain it to us and like, help us, like they will sit there with us and help us do the booklet. Whereas if in a normal classroom, say thirty odd students in there the teacher could not do that and they were not allowed to because like you have to get like tutors or something in. But here it is more better because I am learning more here than what we would in a normal classroom.

(Interview, Asia, Program Student)

Deictic categories were identified in this account. Such categories work to locate how participants are included or excluded from a discourse (Thomas, 2006). Inclusion and participation in interactions were central themes in this account. For example, the deictic category, *us*, was used five times in the first sentence. There was also one instance of *we* and *you*. In each instance, this use denoted inclusivity. That is, the students were included as a group who valued the learning support and assistance in the program. Further, the pronoun, *they*, in the first sentence, “like they will sit there with us and help us do the booklet” defined the teachers in the program, “Mary and that like”, as helpful and in doing so enabling students to participant in learning. However, its use in the second sentence, “the teacher could not do that and they were not allowed to because like you have to get like tutors or something in”, suggests that this student’s previous experiences of learning was made more difficult in secondary school because of large class sizes—“thirty odd students”. Hence the final evaluation of the program when compared to the school context—“here it is more better”—signalled by the first personal pronoun, *I*, in “I am learning more here”. The modal use of the adverb, *more*, added emphasis to this contrast. The significance of deictic categories is crucial to identifying people and how the account represents learning communities. In this instance, learning was a participatory experience in the program because of the assistance from the tutor, whereas in secondary school learning was constrained because of large class sizes thus
impacting on the student’s participation in learning. The understanding of the program was shared in the following account.

   Just the way they teach, like they’re more into it, they show us a lot better than how school was. . . . Like the work is basically the same but they teach you a lot different. There is someone that like if you don’t understand the question, there is someone who will be there and explain it and show you how to do it. (Interview, Jasmine, Program Student)

   Expressive modality was evidenced in this account. The evaluative phrases “they are more into it”, “they show us a lot better than how school was”, and “teach you a lot different” were featured throughout the account. These phrases reinforced the student’s claim to speak authoritatively and collectively about the program. This evaluation was evident in her dismissal of school in favour of the program. However, while acknowledging the program as positive, the account acknowledged that “the work is basically the same” as the work at school. The critical difference constructed in the account was to do with the extra support and assistance provided by the program staff. The identification of expressive modality in the account allows for considerations of the possibilities for student learning, that is, interactions between students and teachers that enhance learning. This modality is of further significance because it reveals the existing problems that produce exclusion and isolation from mathematics, here the teaching of mathematics in secondary school. This conclusion was confirmed in the account that follows.

   Here I can understand them more, they’ve got more time for everyone, you can associate with them and they’re not like teachers they’re more like friends, you know what I mean. You can just communicate with them real good, or I do anyway. So that’s how I’d like my maths learned. . . . Just help you work it out. No one is ashamed
or if you’re not the top of class and stuff like that, you know what I mean. . . . It’s different and that’s all it is to me, it’s totally different. I’ve only been here two and a half months and everyone’s pretty cool. (Interview, Troy, Program Student)

Declarative mood was identified in this account. This feature shows the facts about this student’s experiences in the social context of classrooms and how they identify themselves as participatory mathematics learners. The phrases, “you can associate with them”, “they’re not like teachers they’re more like friends” and “you can just communicate with them real good”, reinforced the stance of this study that identity construction arises socially through engagement and participation in the discourse of a community. This construction of an identity of participation can be traced in the declaratives, “I can understand them more”, “they have got more time for everyone”, and “no one is ashamed or if you’re not the top of class”. The identification of declarative mood in the above phrases worked to provide information about this student’s experiences. In doing so, this information also allowed for an understanding of how the construction of students’ identities as mathematics learners is linked to how they engage and participate in the subject (Nasir, 2002a).

Of equal significance in this account was its construction of teacher identity. As noted above, the program teachers could be better understood, had “more time for everyone”, and were “not like teachers . . . more like friends”. Communication with them was “real good”. The reciprocal relationship of teacher identity and student identity constructed in this account is exemplary. Where agency is distributed between students and teachers and together they determine the legitimacy of each other’s mathematical contributions, participation is linked with increasing motivation to learn (Cobb & Hodge, 2002).

Active engagement as a member of a learning community is required if students are going to construct an identity of participation. Engagement refers to the reflective
involvement in deep understanding and valuing what is being done through participating in mathematics tasks (Munns & Woodward, 2006). Membership then affords opportunities for shaping identities and belonging and contributing to a mathematical learning community. It is strongly associated with support and relationships. This was evident in the next account.

For similar it’s the same kind of maths, probably a bit easier these days, exactly the same. But the teachers are different, I think here’s easier to learn because the teachers actually come around and show you what to do, they sit with you and actually show you how to do it when you know it, make sure you know after they leave. That’s different to Cameron where I went to school and they would show you so you would know, yeah, it’s easier. . . . Yeah, probably a more sense of belonging here than was school. . . . I can learn easier, the teachers help you more and you just feel like the teachers respect you and you respect them and that. (Interview, Damien, Program Student)

Relational modality was evident in this account. This modality is concerned with the authority of the participant in relation to others. The modal marker, actually, worked strategically in the account to identify the relations between the teachers and the student. It was used to ensure that the student’s interpretation stood out. Its use also indicated a degree of unexpectedness and surprise with what the teachers did in the program. This surprise was evident in the sentences, “teachers actually come around and show you” and “they sit with you and actually show you”. What these sentences also did was reinforce the shared understanding of the program and the teachers as supporting the students’ construction of an identity as a participatory mathematics learner. When such an identity is constructed it is in some degree contingent on the relations of power between the teacher and student and how the student is positioned (Nasir & Saxe, 2002b). What is evident in the account above is that
the relations between the teacher and student were significant for understanding what is required for learning mathematics and shaping an identity of participation. Further, when access to a discourse is legitimated by the teacher through the learning process as described in chapter 3 (cf. Davies, 2005; Wenger, 1998), the student’s inevitable stumblings became opportunities for learning and belonging and consequently contribute to the construction of an identity of participation.

Expressive modality was identified in the account. This modality shows how Damien evaluated his experiences of learning mathematics. His claim to authority to speak and evaluate their particular version of reality was evident in the phrases, “the teachers help you more”, “the teachers respect you” and “probably a more sense of belonging here than was school”. These phrases were emphasised further by the use of the modal markers, more and probably. The modal adverb, probably, worked to indicate a median probability to his claim about a sense of belonging, while the modal marker, more, worked to strengthen the claim about a sense of belonging. They also indicated that the teachers acknowledged the right of this student to actively engage in learning mathematics in the program, and thus assisted in the construction of his identity as a successful learner. The identification of expressive modality in the account was significant because it allowed for considerations of what was desirable for learning to occur. It also allowed for considerations of what might exist that causes or has caused this student’s struggle. This aspect is further understood through the identification of classification schemes.

Classification schemes work to organise, sequence and evaluate people, events and things giving meaning to this student’s experiences. For example, the mathematics in the program was classified as, “the same kind of maths, probably a bit easier these days, exactly the same”. This classification worked to place the mathematics in the program and at school
as similar to one another. However, the program teachers were classified as different to
teachers in secondary school. Such a classification worked to create and proliferate particular
differences between teachers in both contexts. This difference was evident in the sentence,  
“but the teachers are different, I think here’s easier to learn because the teachers actually
come around and show you what to do, they sit with you and actually show you how to do it
when you know it, make sure you know after they leave”. The wording of this scheme worked
to construct an opposition between the teachers in the program and school which was
experienced by the student who made the claim. Such a difference was traced as linked to
mutual respect and a sense of belonging as a learner in the program. Here, mutual respect and
a sense of belonging worked to construct his identity as a learner. Classification schemes are
significant because they enable a better understanding of the meaning relationships between
the wording in the text and the discourse types underlying the words, here a discourse about
the program. Damien was granted access so that he could legitimately participate in this
discourse. This participation was not so much based on whether the mathematics was abstract
or concrete in this discourse—the student described it as “similar”—rather it was about the
practices which enabled learning to take place, the issue of access and the transparency of the
social learning environment with respect to the meaning of what is being learned (Lave &
Wenger, 1991). This conclusion was supported by the next account.

You get as an adult how they get taught like at work and there are better things here,
like you get anything you want. . . . and the maths is commonsense. . . . You get good
support. . . . Put your hand up and ask the teacher to come and help me. And she will
come down and help me. If I have got something wrong with addition, she will show
me how to do it and then I will get it right. She will set it out all for me and then I have
to do it myself after that. (Interview, Trevor, Program Student)
A classification scheme was evident in this account. Such a scheme worked to organise and evaluate the people, events and things in the account, here the assistance that was provided to the student in the program. The phrases, “you get as an adult how they get taught”, “you get good support”, and “she will come down and help me”, worked to extend the differences between the assistance provided in the program with that of school.

However, the reference to being taught as an adult was taught can be identified as ambiguous. The identification of presupposition in the account allows for making judgments about the learning of what has been said in the text (Gee, 1996; Fairclough, 2003). One possible presupposition here was that this student understood the mathematics learning in the program as something done by adults—it was more work related. An alternative presupposition was that Trevor concluded that he was respected enough to be treated like an adult. The significance of presupposition is that it allows for further understandings of what was said and the social group that the student belonging too, here the program. Meanings are made easier if there are similarities in the group and or the language spoken (Gee, 1996). In this case, the similarity was with being treated with respect like an adult.

Expressive modality was identified in the account. This modality worked to establish Trevor’s authority to speak about his learning experiences. The evaluative statements, “better things” and “get good support”, worked to indicate the desirability of learning in the program. This modality affords considerations of possibilities for student learning that might lead to change, decrease struggle and enhance student access to discourses of mathematics learning.

The discursive practices, interactive teaching style, and teacher and student interactions, as traced in the discourse about learning in the program in chapter 5, worked to provide some order and regularity for learning and participation in the social context of the program. It was through this articulation of discursive practices with participation that
identities of participation were constructed. For example,

I like practical work, I like talking about it. . . . my opinion is listened to, and the differences are they get into conversations with you. (Interview, Alex, Program Student)

Expressive modality was central in this account. The evaluative sentences worked to show desirability for learning for this student. For example, the sentences, “I like practical work”, “I like talking about it”, “my opinion is listened to”, and “they get into conversations with you”, worked to evaluate learning as desirable. These evaluations also indicated possibilities for learning for this student—talking about mathematics with the teacher. Of significance here is the term “practical work” which encourages a dichotomy between “abstract” and “concrete” or practical. The issues may not be so much about whether the mathematics is abstract or concrete and practical, but rather that learning to become a legitimate participant in a classroom requires learning how to talk in the ways of that community (Lave & Wenger, 1991). In time students are more likely to create a view that closely matches the mathematics classroom, eventually producing skilled talk and discussion and gaining validation from their teachers and peers as they demonstrate the appropriate understanding (Lave & Wenger, 1991; Wenger, 1998). The next account emphasises the talk of the teacher and its implications for the student.

I can do stuff now that I could never do at school because she explains it so well. . . . she like taught us better and explained stuff and not just went through it all . . . I found it easier when she explained it, ever since then I have just loved it more because she was teaching it better. (Interview, Katrina, Program Student)

Once again expressive modality was evident in an account. This feature shows the student’s claim to speak authoritatively about her particular version of reality. This reality was
evaluated by the terms, never, well, better, easier, and loved. These words worked to indicate desirability for learning in the program, however for learning in school the opposite was the case. This indication is crucial as it allows for considerations of the possibilities that may enhance student learning, that is, talking and explaining in ways that the student understood. It also allows for considerations of struggles and how they might be redressed to decrease such struggles.

However, as noted in Diana’s account in chapter 5, such possibilities were not the case for all students. In that account an oppositional discourse about the program was traced because of its disorganisation and lack of control of the students. When there is evidence of struggle, constructing an identity of participation is likely to be inhibited, while an identity of non-participation of marginality develops. In this instance, limited opportunities to access the discourse for learning were more likely to occur.

Summary

The analysis in this section has described the forms of participation as constructed in a discourse about the program. In and through that discourse, an identity of participation and peripheral participation was found to be influenced strongly by the program’s discursive practices. The practices shown to positively influence the learning experiences of the students and traced in chapter 5 included an interactive teaching style and three-way interactions between teachers and students.

Gaining mastery of the language of mathematics is crucial to this process. The program and its related discursive practices provided a context where the students could safely express their thinking as they developed and applied their mathematical understandings. It provided a stable learning environment and a social audience where students could engage in these processes (cf. Clark & Holquist, 1984). Such engagement was
traced in those evaluative statements where the students took a strong positive stance about their learning and their future. Thus, they recognised themselves as learners engaged and participating in learning. Learning was represented as a social act that involved interactions and relations with others in a learning community (cf. Matusov, 1999; Renshaw & Brown, 1997). Also significant was the idea that the program was similar to life at work and appeared to be more relevant and connected to the students’ lives and future opportunities.

As students engage in the language, the gestures and interactions and routines of their social context, identities are a work in progress (cf. Fairclough, 2001; Martin Rojo & Gomez Esteban, 2005). They are constructed, maintained, modified and reshaped through the social context of learning and through interactions with their teachers (Berger & Luckmann, 1966). As stressed previously, these identities cannot be understood without taking account of the social context and the historical background that gave shape to them (Henriques, 1998). Here, understanding the social context of learning such as the program community is crucial to explanations of learners’ identity.

An identity of non-participation was identified, but through inference. In this instance, non-participation was traced but through inference through claims one student (Diana in chapter 5) made about the program and the teachers. Such an identity of non-participation was traced as unusual and isolated in the program.

A previously noted and substantial caveat with respect to class size remains. Several accounts in chapters 5 and 6 and in this chapter defined the program context as being one in which smaller class sizes had positive consequences both for the students and the teachers. For example, teachers in the program were classified as competent, helpful and supportive of students because of smaller classes, whereas teachers in school were described as unable to do so, because of larger class sizes. The significance of the positioning of teachers in the program
and at school and the issue of class sizes suggest that these related issues contributed to the construction of identities of participation in learning in both school and the program.

Forms of Participation in Secondary School Mathematics

In the three analysis chapters the most prominent feature traced through the participants’ discourse were discourses about the program and about secondary school mathematics. Constituting the latter discourse were the discursive practices, minimal teacher and student interaction, didactic teaching style, the use of whole class textbooks to teach mathematics and fast pace. These practices were traced in the accounts as negatively influencing the students’ participatory experiences in mathematics classrooms. Thus, learning at school was largely evaluated as undesirable. The significance of evaluation is that it allows for considerations of what exists for some students in secondary mathematics classrooms and what possibilities can follow from it. It also works to identify what causes struggle and what could lead to social change that could decrease the struggle and provide students with access to mathematics learning. However, not all students’ experiences of learning in school were evaluated as undesirable. Other forms of participation were identified in the accounts of some students. Participation was found to be enabling, particularly when the relationships between the teachers and students were positive and interactive as was found in the discourse about the program in the previous section. The following account was significant in demonstrating this understanding.

Um, I think we wrote the page and columns in separate ones, then did some stuff out of the book and some off the board then talked us through it. That was in Year 9 when he explained everything to us. We were in the lowest maths class but we were doing the same sort of stuff as the highest, because he explained it more to us, he didn’t just
expressive modality was evidenced in this account. It was found in the evaluative phrases made in the student’s claims to speak authoritatively about their particular version of reality. For example, “he explained everything”, “he did not just rush through it”, and “he would slow it down”. These phrases worked to evaluate this student’s claims on the basis of his particular version of reality. Hence, learning in school was desirable. This evaluation worked to construct a discourse about this year 9 secondary mathematics class that enabled him to participate in learning. That is, through the provision of access to the discourse and the discursive practices, teacher and student interactions and reduced pace, the student was afforded the opportunity to construct an identity of participation.

Also identified in the account were the deictic categories, he, we, and us. While there was a clear distinction of legitimate power and initiation of action between the teacher, he, and the students, we and us, the relationship was inclusive, not exclusive. Hence also pivotal was the use of the conjunction, but, in the statement, “we were in the lowest maths class but we were doing the same sort of stuff as the highest”, and the modal marker, more, in “we were more up to date with it all”. Each aspect of this account was related to who was involved in the student’s learning and the discursive practices, in particular, teacher-student interaction and pace, that supported this learning. Together they were traced as contributing to the construction of an identity of participation for the student in this account. A somewhat different construction, but nevertheless one in which the student did “pretty well” at secondary school, was traced in the following account.

I did pretty well but just my teachers that I didn’t get on with. I had a couple of good teachers, like involved me or something but pretty much boring and basic...
grades were alright. . . . At school I go at my own pace and just learn it all from the book, like I don’t even need the teacher really. I took most of my books home and just learned it all. So I like learning by myself or something. (Interview, Alex, Program Student)

The expressive modality of this version of reality presented in this account is unusual in its combination of negative and positive evaluations of secondary mathematics education. Here the student “did pretty well” and his grades “were alright”. He “had a couple of good teachers, like involved me or something”. At the same time he “didn’t get on with” most teachers and the work was “pretty much boring and basic”, indeed, “I didn’t even need the teacher really”. These evaluations were significant because they emphasised the possibilities for this student’s learning and also highlighted the struggles that caused isolation—in both cases the teachers.

The resolution of this apparent discrepancy was that he took control of his learning. Here the deictic category, I, indicated his authoritative assumption of authority for his learning—“at school I go at my own pace and just learn it all from a book”, and “I took most of my books home and just learned it all”. The concluding statement summed up this evaluation, “so I like learning by myself”. Significantly, there is no you, we or us in the account. For this student, then, participation in secondary mathematics education involved the textbook and the subject; in all other aspects learning was independent, a solitary process. This point confirms the discussion in chapter 2 about students working as isolates in mathematics classrooms. Emphasised in that discussion was that if mathematics is seen as transmitting knowledge with minimal or no discussion, it is also seen as memorisation, rehearsal and learning in isolation (cf. D’Ambrosio & Harkness, 2004; Kalantzis, 2006). A conditional identity of participation was traced in the next account.
Yeah, in my classes I felt the belonging but it was just if you behaved or like I don’t know. If you’re not behaving you don’t learn. It was a bit of both because I usually contribute in class, like put my hand up and answer questions and that. Like I wasn’t scared to do that at all but um. I also got along with everyone and everything else.

(Interview, Leanne, Program Student)

Declarative mood was identified in this account. Declaratives provide information or facts about something. The facts about this student’s learning were indicated by the continued use of the first person, I in the phrases, ―I felt the belonging‖, ―I don’t know‖, ―I usually contribute‖, ―I wasn’t scared‖ and ―I also got along with everyone‖. These facts were further reinforced through the way this student was identified in relation to participating in and with the class. The account made it clear that a sense of belonging in class was associated with and conditional on appropriate behaviour for learning.

The classification scheme, which worked to organise the facts about Leanne’s learning, was evident in the synonymy of the phrases, “it was just if you behaved”, “if you’re not behaving you don’t learn” and “it was a bit of both because I usually contribute”, that worked to reinforce this aspect. Participation was identified through the phrases, “I usually contribute in class”, “put my hand up and answer questions”, “I wasn’t scared to do that”, and “I got along with everyone”. These phrases in repetition emphasised a similar theme, that is, that this student participated in learning mathematics. Classification schemes are significant because focusing on the text allows for understanding of the meaning relationships between the words and the discourse type underlying the words and the ideologies on which they are based.

A positive construction of an identity of participation was found to strongly influence what students said about themselves and learning. For example,
I was good at mathematics except for percentages, like you go from percentages to putting in decimal points and decimal fractions. So it was really complicated but I ended up learning how to do it. (Interview, Asia, Program Student)

Expressive modality was evident in this account. This modality refers to the speaker’s authority with respect to the truth. An important feature of this modality is the student’s evaluation in the phrase, “I was good at mathematics”. This phrase worked to evaluate and more importantly identify in part how she saw herself as a learner of mathematics. This evaluation was further reinforced through the comment, “it was really complicated but I ended up learning how to do it”. This account suggests that at times participation in learning was from the periphery while at times it was more central, for example in an later account this student stated that learning mathematics at secondary school was crap!

Three other accounts, that of Trevor, Adrian and Aderley, reviewed previously in chapter 6, should also be noted. In one account, Aderley, participation was an occasional event indicating participation of peripherality, as traced in that student’s use of the contrasting terms, some times and other times. They worked to indicate that the student sometimes participated in learning and in interactions with the teacher. When this did not occur, that is, at other times, the student experienced failure. In Adrian’s account learning from the textbook was supported with mathematics games which appeared to increase participation in mathematics learning. In Trevor’s account, participation occurred only when the student was sent from class to a withdrawal room to be tutored in mathematics. However, in the greater number of accounts, secondary school mathematics was identified as undesirable or failing to enhance student participation in mathematics learning. For example,

It’s too technical in some ways like that’s what I thought kind of like I couldn’t understand properly some of it, just little things like that. Some of the stuff didn’t
make sense to me. . . . We’d sit down and get your books out, your book out and the teacher would start writing on the board and that kind of stuff. They expected you to listen and pay attention and stuff. I think that might have been the reason why I didn’t get to know some of the stuff because I probably didn’t listen in some cases.

(Interview, Leanne, Program Student)

In this account declarative mood was identified. Its function was to provide information, a statement of facts about something, in this case, the student’s experiences of learning mathematics in secondary school. The phrases, “the teacher would start writing stuff on the board”, “they expected you to listen and pay attention”, “they would just tell you once”, “they expected you to do it really fast”, “they don’t give you enough time” and “in school you are always expected, like you are always expected to have everything done”, strongly indicate this student’s knowledge of mathematics learning in school. The identification of these facts in the account worked to show the student’s struggles in the discourse of secondary mathematics. This aspect can be further understood through the identification of expressive modality.

Expressive modality was evidenced in the account by the use of the intensifiers just, really fast, don’t, enough, and always. Such intensifiers worked to strengthen this student’s evaluation of their particular version of reality of learning. They also worked to emphasise the discursive practices such as one-way teacher and student interactions and didactic teaching style—practices that have been identified as causing struggle for this student. These practices were identified in chapter 2 as contributing to student disengagement in learning. They also worked to construct a particular identity for teachers in the classroom context. That is, in this account teachers were represented as prescriptive, distant, indifferent and task-oriented. As Lave and Wenger (1991) point out, how access to discourses of learning is provided, can
either promote or prevent legitimate participation. In the case of the account above, this student provided examples of how access was to be denied. Whether the mathematics was technical or practical, at the core of learning communities and the relations within them are the discursive practices that allow learning to take place and provide access concerning the meaning of what is being learned. The practices identified in the account above were identified as disabling and causing struggle for this student.

Depending on how access is organised, peripheral participation can either promote or prevent legitimate participation in learning. In the account above gaining access to the discourse was identified as a challenge for this student, thus preventing her from accessing the discourse in play. In this case, Leanne’s identity as a mathematics learner was shaped negatively because of reduced access to the “technical” mathematics. For example, the phrases, “it’s too technical”, “I couldn’t understand properly some of it”, “some of the stuff didn’t make sense to me”, and “I probably didn’t listen in some cases”, worked to construct her identity as a non-participant in mathematics learning.

In this account, the use of the modal markers, some and probably was of interest. The modal adverb, probably, worked to indicate a median probability and a degree of uncertainty to her claim about learning mathematics at school. Further, the use of probably falls between two extremes, such as did listen/did not listen, with the meaning and interpretation of whether the student listened or did not listen left unclear. A similar situation was identified with the use of the modal marker, some, with the interpretation of what aspects of mathematics were/were not technical and difficult left unclear. This uncertainty was also evident in the claims identified as modal markers, mental process clauses (Fairclough, 2003, p. 170) such as “I think” “I couldn’t” and “I thought”, in the phrases “like that’s what I thought, like I couldn’t understand properly” and “I think that might have been the reason”. Such phrases
worked to show the ambivalence of these claims to Leanne’s particular version of reality. However, other versions of the reality of secondary school mathematics were more explicit. For example,

Oh … pretty shocking I suppose. He just, he had a textbook with all the things and that and he would just write it up on the board, give you like minutes and show you working. Then like because there is the whole class, doesn’t give you much time to show everyone, some people don’t learn as quick as the others and that, and then you just lose track, can’t keep up, you are just up to your neck in homework and that. I just got so behind ah and just stopped going and then like I was good at English and all that, just maths, like I am pretty good at it, just didn’t really get to learn it I suppose. . . . I would go in the next day, and like I would sit down and say look sir I had trouble with this. Me mum couldn’t help me the other night, he just like didn’t really care. He just had to start on the same old theme and it would just (indistinct) you. (Interview, Michael, Program Student)

The use of expressive modality worked to establish this student’s authority to speak about his experiences of learning in secondary school. The evaluative phrases in the account work to identify possibilities and causes of struggle in student learning. For example, the evaluative phrases, “doesn’t give you much time”, “some people don’t learn as quick”, “he doesn’t give you answers”, “doesn’t really teach you”, “doesn’t really show it”, “he just didn’t care”, “he doesn’t like going around”, and “you don’t really understand it”, worked to show learning mathematics at school as undesirable. Through this evaluation, particular discursive practices such as fast pace, minimal explanation and interaction, worked to position him as excluded from learning. This evaluation worked to confirm the discussion in chapter 2 about how students are excluded from learning in mathematics. The negative effects of pace in
classrooms where speed and accuracy are promoted indicate that students dislike mathematics because they perceive themselves as unable to keep up the demands of the classroom (Ulep, 2006; Zevenbergen, 2001a). Pace coupled with minimal interaction has a compounding effect because communication and interaction are largely one-way with student to teacher and student to student interaction inhibited. As a consequence opportunities to discuss and apply the language of mathematics for understanding in social interaction are constrained (McNair, 1998).

Without a strong focus on active student engagement, participation and membership in a classroom, a discourse and its related discursive practices are more likely to act as a social filter, marginalising particular students, as was the case for this student (cf. Chouliaraki & Fairclough, 1999). Such a discourse establishes and maintains particular ideological assumptions about mathematics teaching and learning that are seen as commonsensical and taken-for-granted. These assumptions include that mathematics is about memorising the methods prescribed by the teacher or the textbook, that students work in isolation on routine tasks and are tested on what they have learned using pen-and-paper tests.

The previous account worked to construct two distinct but corresponding identities. The secondary mathematics teacher was represented as pace-driven, textbook- and board-centred, teaching to the whole class and indifferent for those who could not keep up or understand. Understandably then this student was constructed in the account as wanting but failing to learn and seeking help but not receiving it. Here an identity was constructed as one of continued non-participation of marginality and exclusion from the community of mathematics learners.

When students experience difficulty in accessing the discourse and practices of the classroom context, struggle is likely as noted previously. This struggle is more likely to occur
if the student is represented as subject to the actions of others, here, the teacher, or has difficulty adapting to the discourse of the mathematics classroom. The implication is that the student is incapable of agency and is more likely to opt for passive indifference (Fairclough, 2001). In the accounts, struggle followed when a discourse appeared to conflict with the discourse that students brought to a learning context. As a consequence some students were at risk of exclusion. The account below provides an example of this situation.

Putting things up on the board, pretty much, giving out worksheets, she’d give out worksheets and just sit at her desk and I would just be like what? Um I just get her to help me with something and she’d come up talk to me and I don’t know. . . . It wasn’t what I wanted. . . . Not at all. . . . Not at all. I was just another one of her students that went into her class and just sat there. And half the time I wasn’t even in that class. I was just . . . I was just, as kids, as teenagers do, if they can’t learn something they just switch off and just act like dickheads. Excuse my language. . . . Yeah then they just send them to the isolation room and that wasn’t getting them anywhere, she wouldn’t just spend time with them. (Interview, Robert, Program Student)

In this account a classification scheme was evident. Such a scheme is related to stability and also when something is in the wrong category or does not fit a category (cf. Douglas, 1966). What unsettles stability is when something is out of place and or the rules are broken. When this occurs it can be viewed as a sign of boundaries being transgressed (Hall, 2001b)—here between the teacher and students. When something or someone is out of place they are removed from a context to restore order. Here, exclusion was emphasised in the phrases, “the teachers just go off”, and “I have just walked out”, “switch off”, and “send them to the isolation room”. These phrases also worked to identify the positioning of the teacher and the student, and consequently to construct their respective identities. Of particular interest
was Robert’s interpretation of what he did—“it wasn’t what I wanted”, “I . . . just sat there”, and “half the time I wasn’t even in that class”—and his immaturity as responsible for his difficulties, thus apportioning blame on himself, where his self-definition as one of the dickheads emphasised this point. However, this conclusion was generalised by the use of the deictic category they to include all those students like him—“if they can’t learn something they just switch off and just act like dickheads”. The classification of difference in the account above led to the exclusion of students who were defined as “impure” (Hall, 2001b) or “dickheads”.

As in other accounts, however, the quality of teacher-student interaction was crucial to this student’s identity as a student who rejected learning and was excluded in consequence. Once more, the consistency of teacher identity across the account was evident. This teacher prescribed work and “just sits at her desk”, apparently relatively indifferent to her students’ needs. While she would “come up talk to me”, “I was just another one of her students”. The final exercise of power by the teacher to this student was “they just send them to the isolation room”. Such exclusion did not help them—“that wasn’t getting them anywhere”. In this setting exclusion was the most complete form of non-participation.

There was a shared understanding between many students about their experiences of secondary school mathematics and the quality of teaching therein. For instance,

I don’t know, we just go in the class, sit down and then he would start writing out on the board what we had to do. We’d do it, but then if we got it wrong he would put us down and that, like because we were in Grade 9. That was about it, we did work and went out basically. . . . Well he reckoned that the work was easy, but then sometimes when you got it wrong it wasn’t that easy because you didn’t get taught it. I knew nothing about area before I came here. (Interview, Kate, Program Student)
Expressive modality was identified in this account. This modality worked to show the student’s evaluation of a particular version of reality. The phrases, “he told us off a lot”, “he would start writing out on the board what we had to do”, and “he would put us down”, worked to indicate the student’s authority to make such an evaluation. They indicated a high degree of certainty about the reality of the student’s claims. The relations of power were made explicit in the account above with the teacher defined by the student as strict and putting students down. In this instance, identities of non-participation of marginality were more likely to be constructed because the interactions between the teacher and student were identified as largely one-way and negative with students rendered as passive learners. In the case of this account, the evaluations worked to make significant the issues that caused student struggle, in particular the practices previously identified.

The likelihood of some students not participating in learning is high if they cannot access the discourse of the mathematics classroom (cf. Davies, 2005). When access is not granted their acknowledged status is likely to be lowered, once more rendering them excluded from learning as identified in the following account.

It was hard because I did not know the basics as I said and I did not know basics so coming to do all this was hard so I just blocked off. . . . Not really, at all because there was, I would have my friends that were, they were smart, they knew maths they [were] really good, get A’s and I was sitting there getting nothing right. . . . Did not feel I belonged at all in the class because you know I was not as smart as the other people and I just, I just started sitting there after a while and not paying attention to the teacher, not listening to what he had to say, kids in the class that were like that.

(Interview, Angelique, Program Student)

A classification scheme was identified in the account. This scheme, in particular its use of
synonymy, showed similar meanings about Angelique’s experiences with mathematics learning in secondary school. The phrases “it was hard because I did not know the basics”, “I did not know basics so coming to do all this was hard”, “I was sitting there getting nothing right”, “did not feel I belonged at all”, “I was not as smart as the other people”, “I just started sitting there after a while and not paying attention” and “not listening” worked to share a similar meaning. This meaning emphasised her marginality and withdrawal from learning secondary school mathematics.

It was hard, and really complicated because when from Grade 6 to Grade 9 I didn’t really go to school much so I missed out on really simple things like division and multiplication and all that stuff. So when I got to high school they’re doing like getting into algebra and all this stuff and I didn’t even know what it meant. And I’m like all our teacher would do is write up stuff on the board and if you didn’t know it he would, blah, blah, blah and quickly explain it and that’s it and he would walk off and teach the whole class. (Interview, Angelique, Program Student)

Declarative mood was identified in this account. Declaratives provide information and or facts about participants, events and objects. The phrases, “I didn’t really go to school”, “I missed out on really simple things like division and multiplication and all that stuff “, “when I got to high school they’re doing like getting into algebra and all this stuff “, “all our teacher would do is write up stuff on the board” and “he would walk off and teach the whole class”, provide facts about Angelique’s learning in secondary school. Although she states an important caveat in terms of not attending school very often from Grade 6 to 9, the implications of missing school together with the discursive practices drawn on, as identified in the account, worked to place her at best at the periphery of the classroom. The discursive practices, quick pace, teaching to the whole class, inadequate explanation, and minimal
teacher and student interactions, were traced as contributing to Angelique’s identity as an isolated learner. However, while the peremptory stance of the teacher to students such as this is transparent in the version of reality constructed in this account, by presupposition this may well be a consequence of the constraints of class size and the inflexible demands of timetable and curriculum. The description of a regular mathematics lesson at secondary school which follows affirmed the claims about secondary mathematics and its related practices in previous accounts.

A regular maths lesson, we just have to, like it was our textbooks, we just had to look up our textbook, go to the page we had to go to and write in our book and work it from there. The teacher hardly ever explained it to us and so it was crap. . . . I would have liked the teachers to like tell us about it, like help us work it out and like teach us how to do it properly. Whereas we never got that. (Interview, Asia, Program Student)

Expressive modality was evidenced in this account. The evaluative phrases showed the undesirability of learning. The use of modal markers, hardly ever, would have liked, crap and never, in the phrases, “the teacher hardly ever explained it to us”, “I would have liked the teachers to tell us about it”, and “whereas we never got that”, worked to justify Asia’s evaluation. The evaluative terms then worked to indicate the undesirability of the kinds of interactions between the teacher and the class that were constructed in the account. This was further reinforced emphatically through the use of the term, crap. Such an evaluation emphasises those discursive practices that produce exclusion and struggle for students. It will allow for considerations of what might be possible that could lead to social change and decrease such struggles for students.

Declarative mood was identified in the account. Such declaratives show the facts in this student’s particular version of reality. The phrases, “we just had to look up our textbook”,
“we had to go to and write in our book”, “the teacher hardly ever explained it to us”, “it was crap”, “I would have liked the teachers to like tell us about it”, and “we never got that”, provided information about Asia’s knowledge of learning in secondary school. In doing so, they reiterate previous accounts about student learning in that context. The implication of this repetition is that the discourse about secondary school mathematics and its related discursive practices is represented as causing substantial struggle for students such as Asia. Another student in the program made a similar claim about the importance of teacher-student relationships for success and failure.

In Grade 9 it was easy, in Grade 8 I had a shit teacher. I don’t know, they just pissed me off as I said to you, I just got into some trouble. (Interview, Ben, Program Student)

Expressive modality was central to this account. It worked to show the evaluative phrases in the account that related to the student’s learning in secondary school. In this brief account, one grade was evaluated positively while the other was discounted. This evaluation worked to indicate a desirability of learning in Year 9 and undesirability in Year 8. (This student’s positive experience of Year 9 was addressed earlier in this chapter.) The basis for this binary evaluation was represented as “it was easy” compared with “I had a shit teacher”. For the latter assertion, an identity of relation between mathematics and the teacher was significant. Through this relation, a high degree of intensity was traced through the use of the intensifier, just, the adjective, shit, and the verb, pissed. These words worked to suggest that Ben’s non-participation of marginality was strongly influenced by the quality of interactions with his teacher in Year Eight. The more positive evaluation of Year 9 suggested that negative outcomes in secondary classrooms were not inevitable. The identification of expressive modality identified in the discourse about secondary mathematics indicates both the desirability and undesirability of learning. Here, learning in Year 9 was useful and important
to the student. However, the opposite was the case for learning in Year 8, indicating that Ben experienced struggles and marginalisation in and through the discourse of secondary school mathematics in Year 8.

As discussed previously, the discursive practices of a discourse were traced as determining student access to that discourse and the forms of identities of participation and constructed in it. This access and its consequence for constructing identities were traced in this account.

It was okay but the teachers did not really explain it that well to the class. Like the teacher that we had. Hardly anyone in our class understood what we were doing. We would ask them but, we just had one big textbook so we would have to go to the beginning of the textbook and reread how to do it and that. . . . Yeah, but still got a lot of questions wrong. . . . Hate it. . . . Oh, because I didn’t understand any of the questions and just wrote down what I thought it was. . . . Just the person that was sitting next to me, but they didn’t really know much more than me. I belonged in the way that no one else really understood anything that we were learning anyway.

(Interview, Jasmine, Program Student)

Expressive modality in this account shows how Jasmine evaluated her particular representation of learning in secondary school. The modal phrases, “it was okay”, the teacher “did not really explain it that well”, “hardly anyone. . . understood”, “we just had one big textbook”, “got a lot of questions wrong”, “I didn’t understand any of the questions” and “they didn’t really know much more than me” worked to show mathematics learning undesirable. These evaluations also worked to show the negative relations between the teacher and student, for example, minimal interactions and explanations about the mathematics to be learned. The identity of the student as a mathematics learner was further reinforced with the
evaluative phrases, “hate it”, and “I did not understand”, thus indicating participation from the margins of her class—an identity of non-participation. This experience supports the conclusion in chapter 3, that failure to learn was contingent on several related factors including the differences in relations of power and the practices of the classroom (Lubienski, 2002). Questions about what the student learned and how much or how little was learned are in some degree questions about the relations of power implicated in the learning context. If students are unable to negotiate meanings or receive adequate support for their learning, their lack of understanding and ineffective participation will become a relation of marginality. The experience of non-participation means that conceiving of a different trajectory has the potential to become difficult or in some instances impossible (Wenger, 1998).

This account indicated the negative effects of discursive practices such as board work, unclear explanations and the use of a textbook on participation in learning mathematics in secondary school. The account that follows further substantiated this conclusion.

It was just boring, and the teacher, like say they would not explain the whole subject to you. They just explain parts of it and then I would not understand most of it anyway and then I would get into trouble for not listening, but the things is they would not explain the whole thing, so I thought there is no point in me doing something that I am not going to get right. (Interview, Aderley, Program Student)

Declarative mood was identified in this account. Declaratives work to provide information about people, events and actions. For example the phrases, “I just did not like it at all”, “I would not understand more of it anyway”, “I would get into trouble for not listening”, “I would just flunk out”, “I was an outcast in that class” and “I am not going to get right”, indicated the facts related to Aderley’s particular version of reality. This account reiterates the previous discussion of what occurs when students are unable to access the discourse of the
classroom, that is, they are excluded or exclude themselves from learning.

Expressive modality was also evident in the account. It worked to evaluate the student’s experiences of learning. The phrases, “it was just boring”, “would not explain”, “they just explained parts of it”, “I would not understand most of it”, and “there is no point”, worked to evaluate Aderley’s learning as undesirable. These claims ascribe a level of intensity to the discursive practices of a discourse about secondary school mathematics. A lack of explanations was deemed to result in disinterest and withdrawal from learning. Here, as indicated in chapter 3, the discursive practices of a discourse can offer possibilities for learning or constrain learning in classrooms. Constraints and enablers include what is said and done, the relationships people engage in, the subject positions they occupy and the identities they construct (Fairclough, 2001). Within that framing, the discursive practices of a hegemonic discourse were traced in chapter 3 as maintaining particular definitions of what is commonsense in mathematics. When such a definition is used, some students are likely to struggle because they reject this version of commonsense.

Just roll up to class with these thick maths books and you just go, start from the front and go right through, through the whole book in a whole year. I got a bit of help but like I, the way they were explaining it to me, I could not pick up. It was just, I don’t know, it was hard. . . . I just caused trouble then, because I could not do it. Caused trouble and got kicked out of school. . . . I don’t think, like I just kept on getting worse. I did not feel right in there, never. I have never felt right in there because I cannot do it. (Interview, Troy, Program Student)

Once again declarative mood was identified. The declaratives worked to provide information about the student’s interpretation of learning. The phrases, “I got a bit of help”, “I could not pick up”, “I just caused trouble”, “I could not do it”, “I just kept on getting worse”,

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“I did not feel right in there” and “I cannot do it”, worked to show explicitly Troy’s authority to speak about his experiences and to emphasise his rejection of the whole learning process. Significantly, the pronoun I, worked to define a situation where he was positioned as a marginalised and excluded learner. This type of exclusion worked to shape his identity as marginalised learner because learning became difficult. When such an identity is constructed, students are ultimately excluded or exclude themselves from participation in mathematics learning.

Expressive modality was also evidenced in the account. Modal evaluative adjectives such as pretty hard, too hard, struggling real bad, struggling, getting harder, and it was hard, combined to evaluate this student’s claims to his version of reality. In doing so, they worked to indicate the undesirability of mathematics learning at secondary school. They also worked to show how an identity of non-participation was constructed through the discursive practices of secondary school mathematics education. They worked to emphasise the experience of exclusion and failure through such practices.

**Summary**

This section has identified forms of identities of participation constructed in a discourse about secondary school mathematics. Identities of peripheral participation, participation and non-participation of marginality were traced in the student accounts. In doing so, attention was given to the particular discursive practices that were traced as contributing to the forms of participation that showed possibilities for student learning and those that emphasised struggle and exclusion for students.

The practices that contributed to peripheral participation and full participation were identified as providing students with access to learning and gaining mastery of mathematics. These forms of participation were a source of power in that they afforded students the
opportunities to become legitimate participants in a community. This power combined with a
more equal level of power sharing between students and teachers works to further enhance
students’ learning of mathematics. In the case of those practices that led to non-participation,
students were identified as disempowered from their learning, resulting in a relation of
marginality. When students lack an understanding of what is happening, opportunities to
negotiate and discuss mathematics become challenging. Learning opportunities become
closed by the practices used to teach mathematics in some mathematics classrooms.

The difficulty with accessing the discourse of secondary mathematics was found to be
linked closely to the quality of interactions between teachers and students in the accounts.
These interactions together with the other discursive practices, such as didactic teaching style,
fast pace, whole class textbook and pen-and-paper testing were identified as largely negative
in their effects. This negativity was found to impact on how the students identified themselves
as participatory learners or non-learners and their access to the discourse.

In chapter 3 the issue of transforming a “technical discourse” (Lemke, 1995, p. 65)
into something comprehensible for students to learn was noted. This emphasis was due to
what Lemke described as “the opacity of technical discourse to the uninitiated” (p. 65). The.accounts above worked to indicate the negative consequences of the opacity of a secondary
school mathematics discourse for student learning.

However, not all the students’ accounts indicated negativity about learning
mathematics in secondary school. An identity of participation was found to be the case when
the interactions between the teacher and student were positive. When this was found, access
to the discourse was endorsed by the teacher through the practices used to involve the student
in learning. In short, the interactions between the teacher and student worked to shape an
identity of participation.
Some final comments are in order. What the analysis in this section of this chapter has established is the complementary nature of teacher and student identities in a particular context, here secondary mathematics education. Thus where the teacher was not supportive of students, those students will fail to access and participate in successful mathematics learning. They will have constructed identities of non-participation. However, a minority of accounts of secondary school mathematics have constructed teachers who are helpful and supportive of students at risk. In such situations, a positive response from their students has been noted such that some form of identity of participation is constructed.

Thus, while there is substantial evidence from the analysis of these accounts to support the claim that the Youth Reconnected Program largely constructed student identities of peripheral participation and participation and secondary school mathematics constructed identities of participation and non-participation, that association is not universal. Again, as noted earlier in this study, the accounts on which the analysis is based were from a particular grouping of students, the program community, who had failed or withdrawn from the secondary school context and who had subsequently undertaken a second approach to education in the Youth Reconnected Program at a TAFE college. Their accounts were situated in a particular context and produced from that context. For better or worse, their versions of the reality of their secondary mathematics experiences were in a sense shaped by their subsequent experience of the program. Hence for this study it is not appropriate to generalise conclusions beyond the experiences of students such as these.

What has also been acknowledged is that while much in the discursive practices of the Youth Reconnected Program is similar to the practices espoused in reform-based approaches to mathematics learning as presented in chapter 2, they are not completely equivalent—the program press for homogenous ability grouping being a prime example. Similarly, while the
reported practices of secondary school mathematics seem to be more closely aligned with the practices of instruction-based mathematics education outlined in that chapter, their similarity to much that is advocated by a direct instruction approach is questionable. As noted previously, in most participants’ accounts of secondary school mathematics, clear didactic communication and signals from the teacher to students, highly structured and scripted lessons and textbooks, a brisk pace for effective learning, objective testing and direct instruction and rehearsal, were seldom if ever traced. Here, direct instruction may be seen as providing a critique of traditional practices almost as extensive as it would provide of the program.

Finally, as noted in chapter 6, the issue of differences in class size and available support between the two contexts must be acknowledged. Students in the program received a degree of support and individual attention that is less possible in secondary school mathematics classrooms. What must be acknowledged once more, then, is that reported differences in teacher identity between the two contexts, particularly with respect to individual support and attention, may in part be a consequence of differences in class size, the discursive practices and available resources.

Conclusion

This final chapter of analysis has documented how forms of identities of participation were constructed in and through discourses about the program and secondary school mathematics. The evidence was traced in sixteen students’ accounts that provided particular versions of reality about their learning experiences at school and in the program. Such evidence also worked to emphasise the importance of positive social relations and interactions between teachers and students. The teachers were identified as key participants in supporting the students in their learning trajectory.
Of particular significance here, and previously noted in chapter 2 and chapters 5 and 6, was the way in which the discursive practices of the Youth Reconnected Program and secondary mathematics classrooms were constructed and contested in relation to a common set of practices—teaching style, teacher and student interaction, assessment, and pace. Here teachers and the kinds of interactions in these two contexts were traced as generally significant for supporting or inhibiting student participation in their mathematics learning.

Through a fine-grained analysis of the students’ accounts, the researcher has identified the discursive practices that were and were not supportive of student learning and participation in mathematics. Through these practices, teacher and student identities were produced and constructed and student success or failure in mathematics learning followed. Thus, what the students reported about their learning worked to show who they were, that is students engaged in mathematics learning or students marginalised from mathematics learning.
CHAPTER 8: CONCLUSION

This study examined the discourses and discursive practices influential to forms of participation in mathematics learning. It was built around the following four research questions:

1. What practices and forms of participation can be traced in the relevant literature and research relating to the previously introduced approaches to mathematics education?

2. What discourses, discursive practices and forms of participation can be traced in the student accounts and how do they relate to those previously traced in the literature and research?

3. What identities are discursively constructed in these accounts and what relationships can be traced between these identities and the discourses, practices and forms of participation addressed in the previous question?

4. Hence, what can this study contribute to more effective mathematics learning for students such as those in this study?

Chapter 1 argued for the significance of these questions and the value of the study that has been built around them. Chapter 2 reviewed the evidence, claims and counter-claims and arguments around instructional-based and reform-based approaches and their associated practices to mathematics education. It found that the research questions and the issues they raised had not yet been adequately addressed. Hence, rather than seeking to resolve that debate, it proposed to evaluate the different positions advanced by proponents of reform and instruction-based mathematics in terms of the reported experiences of the participants in this study. A gap in the literature was identified which could be resolved by an alternative and comprehensive framework for addressing forms of student participation in mathematics education and the processes that inhibit and support participation. Chapter 3 proposed a novel
theoretical and methodological framework that was suited to the task. Chapter 4 presented the context and method of the study. The analysis in chapter’s 5 and 6 addressed the second research question and related issues, while chapter 7 addressed the third question and related issues. In this chapter, these three research questions are reviewed and the fourth and final question is addressed. The theoretical framework that informed the study is revisited to evaluate its explanatory power and its usefulness for further investigations of this kind. The contributions and limitations of the study are then assessed, and the chapter concludes with recommendations and suggested areas for further study.

As the four research questions above indicate, this study has identified that the social experience of learning is influential to participation in mathematics classrooms, in particular, that a range of interactions support student engagement in mathematics learning. It has also shown that participation in learning mathematics can be enhanced by the employment of discursive practices that promote learning. It emphasised that the elements of participation and participation of peripherality could be connected with Wenger’s (1998) characteristics of engagement, joint enterprise and shared repertoire and Davies’ (2005) characteristic of access to a community. Through this identification, positive relations between teachers, tutors and students allowed for continuing opportunities for building and sustaining mathematics learning.

The accounts of mathematics learning on which this study was based came from the students and staff engaged in the Youth Reconnected Program at a TAFE college. The forty-three students were a select group of early school leavers. In particular, they had experienced two learning contexts, secondary school and the program at TAFE. Other participants included a program manager, program coordinator, two teachers and two tutors. The program was a Commonwealth-funded program designed to support early school leavers who had not
attained a Year Ten Certificate in re-engaging with education and or training. The focus of the program was to improve their literacy, numeracy, and life skills. It ran for fourteen weeks, two days per week from 8:30 a.m. to 4:30 p.m. Six hours per week were allocated to literacy and numeracy. Life skill subjects were taught for the remainder of the time.

Summary of Major Findings

Six discursive practices and two significant discourses about mathematics learning were identified in participants’ accounts of their experiences of mathematics learning in the program and in secondary school mathematics classrooms. These discursive practices were instructional style, communication and interactions, source of authority, pace of instruction, grouping of students and assessment. As table 5, indicates, these practices differed in their application in teaching mathematics in the two contexts as identified in the students’ accounts. The two significant discourses were a discourse about mathematics learning in the program and a discourse about mathematics learning in secondary school classrooms. In most instances, there were differences in mathematics learning between the two discourses and how the discursive practices were applied in both contexts as evidenced in the accounts. These findings are now briefly rehearsed before addressing the research questions.

A Discourse about the Program and Its Discursive Practices

Within the orders of discourse of mathematics education, and from the participants’ accounts of their experiences, the discourse about the program was constructed as alternative to secondary mathematics learning. This difference was evident in how the discursive practices traced in the accounts were employed to teach mathematics in the program, as indicated in table 5. It was also evident in the limited purpose for which the program was established—to effectively encourage early school leavers to re-engage, participate, and achieve in their learning of mathematics. In effect, the program was a second chance for most of the students.
to re-engage in education.

Table 5: Discursive practices identified in the accounts

<table>
<thead>
<tr>
<th>Practice</th>
<th>Program Discourse</th>
<th>Secondary Mathematics Discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional style</td>
<td>Interactive teaching</td>
<td>Didactic teaching</td>
</tr>
<tr>
<td>Communication</td>
<td>Three-way interactions</td>
<td>Teacher-directed interactions</td>
</tr>
<tr>
<td>and interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source of authority</td>
<td>Levelled work booklets</td>
<td>Whole class textbooks</td>
</tr>
<tr>
<td>Pace of instruction</td>
<td>Reduced pace</td>
<td>Fast paced learning</td>
</tr>
<tr>
<td>Grouping of students</td>
<td>Ability grouping/friendship grouping</td>
<td>Ability grouping</td>
</tr>
<tr>
<td>Assessment</td>
<td>Assessment – summative/feedback</td>
<td>Assessment – summative</td>
</tr>
</tbody>
</table>

Although class size was not the focus of the study, its significance cannot be ignored. There was very strong evidence to indicate that small class sizes impacted significantly on student engagement and participation in learning. The teachers had more time to explain, discuss and assist students with their more immediate needs for progress with learning. However, small class sizes may not always guarantee successful learning. A crucial factor here rests with the role of the teachers and tutors and how, given the opportunities created by the reduced class size, they implement, sustain and maintain interactions with the students for effective teaching and learning to occur. If in this context consistent interactions that also include clear and explicit explanations, discussion, and negotiation when learning mathematics are provided, students are more likely to maintain their interest and actively participate in learning. This appeared to be the case for most students in the program.

Engagement and participation allow for involvement in understanding and valuing what is being learned, and shaping how it is to be learned (Munns & Woodward, 2006). Such
engagement is likely to result in a sense of satisfaction and investment in learning. This is distinct from procedural forms of student engagement, where students are on task and complying with the teachers’ instructions and not knowing what they are learning and why (Munns & Woodward, 2006).

From the participants’ interpretations of the program, student engagement and participation in learning in the program were identified as linked to an interactive teaching style. The teachers and tutors were identified in the accounts as readily available to assist, explain and support students in their learning. Such interactions were found to be crucial for student access, inclusion and continued progress in mathematics learning. They were also a significant contributor to developing and maintaining the program as a community of learners. Whilst the interactions were identified as something that the teachers and tutors did, they were identified as unexpected and a surprise to most students whose experience of secondary school mathematics had been very different. The interactions identified in the accounts complemented its focus on supporting students with their inclusion, engagement and participation in learning.

From the students’, teachers’ and tutors’ accounts it appears that three-way interaction was associated with the students constructing identities as mathematics learners. That is, this practice was an enabling feature that provided students with access to learning, developing mastery of mathematics and consequently the shaping and construction of identities as mathematics learners. The interactions afforded students with opportunities to be legitimate and successful participants in a learning community.

The practice of levelled workbooks was used to ensure the work undertaken by each student was appropriate to their level of achievement. The level at which students entered was determined by an initial assessment at the commencement of the program. This aspect was
identified as crucial to re-engaging students in learning. An entry point that closely aligned with the initial assessment meant that students had a starting point, knew what they had to learn, how they were going to learn it and why it was important to their future. That acknowledgement of student difference in achievement and the support appropriate for that achievement were significant features in contributing to mathematics learning in the program.

Students had a record of their learning progress at the front of each workbook and received regular ongoing feedback from the teachers and tutors as they worked through them. However, there was some evidence to suggest that for some students learning from the textbook was boring, basic and at a low level of instruction. Similarly, the extent that the tasks in the levelled textbooks used in the program led to a deeper level of inquiry remains open to question. Although there was a shared understanding about the use of the textbook, it was evident that the tasks were largely practice exercises not much different to what is found in a secondary mathematics textbook. Once more, however, the compounding effect of program practices was traced. That is, although levelled workbooks were used, the interactive support provided and maintained by teachers and tutors was crucial to whether students actually made gains from the use of such a text. Levelled workbooks also had definite implication for the program’s next discursive practice, the pace at which each student learned.

The evidence from the participants’ accounts suggested that a reduced pace enabled students to better engage in the teaching and learning process. This contrasted positively with their previous unsatisfactory experiences of pace in secondary school mathematics. Explanations for the benefits of a reduced pace were found to include more time to work on mathematical concepts and tasks, and that students could work at their own pace. There was also evidence of a significant relationship between a reduced pace and levelled textbooks, and positive interactions with the teachers and tutors.
From some of the evidence in the accounts, it appears that ability grouping within the same class was used in the program. There was, however, considerable student resistance to this practice, to the extent that staff allowed students to remain in the particular groups to which they were accustomed, regardless of their level of achievement. In these mixed-ability groups, the more advanced students were found to act as peer tutors for students at lower levels. Opportunities for working with other students regardless of their level of achievement were deemed important for engagement in learning. This finding provides further support for viewing the staff and students in the program as a learning community.

From the evidence in the accounts, assessment in the program was identified as summative. It was identified from the accounts that students received regular feedback on their mathematics learning. This feedback was not just by the result on a task. The feedback was provided by way of interactions between the teacher or tutor and the student, pen and paper tests, and levelled textbooks. This practice was found to be more like summative assessment but with regular feedback provided to students about their learning. The evidence indicated that on-going feedback about learning was associated with improvement in mathematics learning, and improvements in participation in learning. However, more work is needed to identify specifically how the feedback was provided, that is, what was stated to students, reflected on by the students, and the steps taken by students for forward progression.

Two significant points should be noted. First, the discussion of each practice as a discrete element is largely arbitrary. As the analysis in chapter 5, 6 and 7 and the brief discussion above indicate, they were woven together in the fabric of the program. The organic nature of their articulation can be judged by the students’ rejection of ability grouping as a discrepant practice. Thus the strength of the program’s discursive practices in supporting mathematics learning was not simply additive, it was compounding.
Second, as noted previously in this study, the program staff and students can properly be understood as constituting a community of learners as defined and elaborated in chapter 3. That community shared a discourse about mathematics learning that was enacted in its discursive practices. As a community it assisted new members, those who participated on the periphery, to access its knowledge and engage in its practices, after which it provided them with appropriate support as they moved to full participation and successful inclusion and achievement in mathematics learning.

That the program was not always successful is evident from the accounts; that it was open to improvement is not disputed. What is not open to dispute, however, are the positive reports of the majority of accounts, and the contrast they provided with the reported experiences of secondary school mathematics.

*A Discourse about Secondary School Mathematics*

In the accounts on which this study draws, it appears that the practices of secondary mathematics were strongly associated with a tradition in mathematics education that has seen an overemphasis on memorisation and rehearsal of procedures learned via a student textbook, board work and students working in isolation (Schoenfeld, 2002). From the students’ interpretations of their secondary experience, secondary mathematics was largely represented as negative and isolating in its experience and effect.

As noted previously, a partial explanation may be that large class sizes in secondary school negatively influenced student achievement and progress in mathematics. The evidence could be read as indicating that large class sizes constrained the range of possible interactions between teachers and students, in particular limiting opportunities to attend to the learning needs of all students.

There was strong evidence that a didactic teaching style was not beneficial to this
study’s students and their learning. They reported, for example, that mathematics procedures
were demonstrated on the board with minimal explanations and discussion. The evidence
from this study was that the consistent use of a didactic teaching style and the transmission of
knowledge appeared to limit opportunities for effective learning. It also revealed that this
style of teaching negatively influenced most students, marginalising them from their learning
because of a disregard for their particularities and differences.

The evidence from the accounts of students and staff in the Youth Reconnected
program about teacher and student interactions in secondary school mathematics was clear.
The interactions reported were generally one-way from teacher to student or, more usually,
the class. This kind of interaction was identified as negatively influencing relationships
between teacher and students and hence negatively impacting on their learning. This is
consonant with other research that linked the quality of teacher and student interactions with
student success or failure in mathematics (Alexander, Entwisle & Horsey, 1997; Hill & Rowe,
1998; Organization for Economic Cooperation & Development, 2001). From the accounts, it
appears that some students in this study had a tendency to blame themselves for their low
levels of commitment to their learning while at secondary school. That the majority saw
themselves as succeeding in the program, however, returns attention to the nature of
classroom interaction and the importance of teacher support for all students.

Consistently indicated in the evidence from the accounts, was that when mathematics
was learned from a textbook without effective teacher support, students were less likely to
understand the mathematics to be learned—the answers at the back of the book were useful
only for the short term. At the same time, the whole-class approach was problematic for the
students in this study. They experienced extreme difficulty keeping pace with the teacher and
the class as they worked through the textbook. A high level of negativity towards the pace of
learning mathematics from a textbook was evidenced. This finding is important, as using whole class textbooks and a fast pace have been found to be negatively associated with differences between student performances, learning in isolation, and contributing to student failure (Raman, 2004; Shield, 2000; Harries & Sutherland, 1999). The evidence suggests that for many of the students, mathematics had become something done in a book, reproduced from examples from the teacher or the text, and done in isolation. It is clear that it is not sufficient merely for students to be given a whole class textbook without the provision of opportunities to discuss, inquire and challenge the content and move to a greater understanding of mathematics.

Ability grouping was identified from the students’ experiences as negatively affecting student achievement although it was not emphasised in most student accounts. There was recognition by one program teacher that it was also associated with failure and ridicule; however a program student complained that she had been put in a stream that was too high for her to succeed in. This is consistent with other research on factors contributing to student success or failure in mathematics (Hallam & Ireson, 2005; Wiliam & Bartholomew, 2004a; Zevenbergen, 2001a).

The practice of summative assessment, typically as pen-and-paper testing, was a negative experience for the students’ experiences of secondary school. From their interpretations of that context there was evidence of disappointment and a lowered self-esteem for failing tests. This is consistent with students finding themselves in unbreakable cycles of performance, thus lacking a strong sense of themselves as mathematics learners (Walkerdine, 1998). The evidence here suggests that pen-and-paper testing was the main form of assessment and that it was done separately from learning.

From the accounts of the program students and staff, these practices were found to be
compounding in their effects. That is, the lack of three-way interaction between teacher and students was compounded by a didactic teaching style, the common textbook created problems with fast pace, while all of these practices impacted on an assessment process for which students were not prepared and from which they learned that they were failures.

Answering the Research Questions

Drawing on the relevant findings of this study, as presented in chapters 5, 6 and 7 and reviewed above, it is now possible to answer the research questions. However, several caveats are in order. First, as noted previously, to gain an adequate understanding of the students’ experiences in the Youth Reconnected Program within the discourse-theoretical framework in which this study was cast, it was found necessary to include the accounts of their teachers. They provided background contextual information about the program, its context, and the students enrolled in the program. That association can now be extended, in that this study has found a clear correspondence between student identity and teacher identity. Each presupposes and constructs the other. In chapter 3, identity was referred to as who and what people think they are in a social context, what they do in consequence and how they interpret what they do – here in the program. Identities are socially constructed (Pierce, 1995; Pietikäinen & Dufva, 2006). In the case of this study, the identities of the teachers and tutors were found to be constructed by the students. Through the social relationships and interactions as identified in the accounts of students, a reciprocal relationship was constructed. The distribution of agency between the teachers, tutors and students worked to determine the legitimacy of their contributions to mathematics learning which, as a consequence further shaped the students’ identities as learners. Active engagement in learning is crucial to constructing identities as mathematics learners. But such engagement does not occur in isolation – it stems from the active engagement of all participants, here the teachers, tutors and students. Where students
expressed that they were participating in mathematics learning, it was in and through the social relationships with their teachers. Where they did not participate it was because they explained that they were attempting to learn mathematics in isolation, thus influencing the kind of identity they constructed as a mathematics learner. Second, as the theoretical conceptualisation of the study progressed, it became clear that the staff and students in the program constituted a community, the program community, set in a particular context of TAFE and program, which shared a common discourse, the program discourse about mathematics learning. That discourse can be traced in their collective accounts. Their various discourses about the program and secondary school mathematics addressed in this study are constituted within that more comprehensive discourse of the program community and take their place in the order of discourse within it. In turn, that discourse of the program community takes its subordinate place in the larger more comprehensive order of mathematics education discourse.

Third, as the analysis proceeded it became increasingly evident that the research questions set up ideal categories and arbitrary distinctions that fitted uncomfortably at best with the emergent results. This has already been noted with respect to discursive practices. For example, to speak of identity without addressing the discursive practices associated with its construction, severely constrained what could be said about it. The converse applied equally. In effect, as with teacher and student identities, each presumed the other. Similarly, the social context was an indispensable correlate of identity and discursive practices. The complexity of relationships between identity, practice and social context was clearly evident in chapters 5, 6 and 7. Hence the research questions that follow may be best seen as providing the needed initial scaffolding for the study.
What practices and forms of participation can be traced in the relevant literature and research relating to the previously introduced approaches to mathematics education?

As discussed and reviewed in chapters 2 and 3 a range of approaches to the teaching and learning of mathematics was identified and discussed. At the commencement of this study, the arguments put forward by proponents of reform-based approaches to the teaching and learning of mathematics seemed to hold sway. This was because it seemed self-evident that such approaches would resolve the issues associated with mathematics education that has created struggle and isolation for students such as those in this study. However, as the review of the literature progressed a countervailing position emerged.

This approach, well supported in the literature and the research evidence, appeared to have an emphasis on instruction-based teaching and learning. In particular a number of inter-related practices characteristic of this approach—direct instruction, rehearsal, memorisation and homework; didactic, top-down communication from teacher; textbook as authority, supplementing or justifying teacher authority; a fast pace of instruction aimed at the whole group; streamed homogeneous grouping by ‘ability’; objective assessment—were identified. Within this approach, these practices were intended to provide a structured, rigorous and effective form of teaching for learning. Indeed, an explicit, step-by-step approach that included rote learning was identified as necessary for the retention of what mathematics was learned. In this approach student participation in learning—or more properly, in being taught—was reactive or passive. However, a substantial critique largely informed by reformist perspectives, was aimed at this approach.

Two dimensions to this critique were identified, one driven by liberal-progressive and cultural studies assumptions about society (Beane & Apple, 1999; Dewey, 1916), the other at the level of practice. It is at this level that much of the critique was focused. For example, the
practices identified as central to traditional instruction-based approaches were claimed to cause a substantial amount of struggle for students. They were shown to impact on how students identified themselves as mathematics learners and their forms of participation in mathematics classrooms. While the literature acknowledged that some students might learn in this approach, others would not. From this critique it was concluded that the practices did not operate in isolation. Rather, the combined effects of the practices worked to disengage or exclude students from mathematics learning. These effects were identified as of major concern by advocates of reform-based approaches (cf. Boaler, 2002; Schoenfeld, 2006; Zevenbergen, 2006).

Advocates argued that the necessary knowledge and skills required for effective participation in mathematics learning would develop through meaningful problem-solving contexts (Drake, 2006; Schoenfeld, 2006; Boaler, 2002). In such contexts, they argued that mathematics would become more enfranchising and less likely to cause the documented struggles of more traditional instruction-based approaches which have contributed to student isolation. Reforms that focused on providing rich and demanding curriculum, well trained teachers, effective practices for learning and improved teaching and learning environments were identified as significantly contributing to student participation and achievement in mathematics (Balfanz, et al., 2006; Senk & Thompson, 2003). The following practices were central to such reform-based approaches—problem-driven enquiry or discovery assisted by the teacher; interactive communication between teacher and students and among students; the pace of instruction regulated to individual learners; heterogeneous grouping of students with differentiated learning; and on-going assessment to evaluate and promote student learning. In this more social framework, the evidence from the students’ interpretations indicated that they actively participated in learning—learning was an inclusive experience.
From the literature review it became evident that instruction-based approaches and reform-based approaches shared a commitment to the improvement of student mathematics learning. However, they differed over what constituted mathematics education and how it should be undertaken. The review made evident that the approaches differed in how their practices—instruction style, communication and interaction, pace of learning, source of authority, grouping of students and assessment—were deployed in classrooms. Further the review made clear they differed in the forms of participation constructed by these practices.

The review of the literature emphasised the complexity of the claims and counter-claims about traditional instruction-based and reform-based approaches to mathematics education. As stated in chapter 2 each had a persuasive body of theory and evidence to support its claims and to deny those of the other. Rather than seeking to resolve these differences, this study set out to evaluate them in and through the reported experiences of the participants in both an instruction-based approach in secondary school mathematics and what appeared as a more reform-based approach in the Youth Reconnected Program.

What discourses, discursive practices and forms of participation can be traced in the student accounts and how do they relate to those previously traced in the literature and research? The analysis from chapters 5, 6, and 7 identified two major discourses about mathematics learning. These discourses were a discourse about the program mathematics and a discourse about secondary school mathematics. Associated with each discourse and constitutive of it were the discursive practices addressed below.

As illustrated in table 5, variants of the following discursive practices were traced in the accounts as being shared by the Youth Reconnected Program and secondary mathematics classrooms—teaching style, teacher and student interactions, source of authority, pace of learning, grouping of students and assessment. At issue were their applications in practice as
identified in the participants’ accounts. That is, where the program encouraged three-way interaction—teacher-student, student-teacher, and student-student—in secondary school mathematics interaction was largely teacher-controlled and initiated. Similarly, where in the program, pace was adjusted to student learning, individually-tuned, as it were, in the secondary classroom a fast pace for the whole class was the norm, and those who could not keep up fell behind or gave up. From the evidence in the accounts, it appeared that assessment in the program was summative as was the assessment in secondary school. The evidence also indicated that ability grouping in both contexts was identified as the norm, although in the program students changed this arrangement to friendship groupings. In the program, students used graded booklets or workbooks while textbooks were central to the secondary classroom. From the evidence, it appeared that in the secondary mathematics classroom, teaching was didactic, but in the program it was more student-centred.

From the evidence in the accounts, in most cases differences appeared to be constructed around practices. The case was somewhat different, however, with textbooks, grouping of students and assessment. Textbooks were central to both the secondary mathematics context and the program. Here the difference was that the program work booklets were levelled, that is each student worked at their own pace with a work booklet that was levelled to their current achievement level, whereas in the secondary mathematics classroom all students worked from the same textbook and at the same pace. Summative assessment was shared by both contexts, although in the program it was more frequent and more learner-oriented. Finally, with respect to ability grouping, the secondary mathematics classes were traced as streamed according to “ability”. However, in the program, where a similar process of grouping was entertained, the students objected, preferring to remain with their friends, and seeking learning assistance from their friends. This desire was supported by
the accounts of their teachers and tutors.

These differences were traced in most accounts as constructing different forms of participation. However, particular attention must be given to the critical importance of teacher support in both contexts. Here, as noted earlier in this study, the real difference between the forms of participation may lie with class size and available resources. Also of critical importance was the type of community constructed by these discursive practices. Here again, in the discourse about the program constructed in most accounts, something very like a community of learners was traced. There was little evidence traced in the accounts of secondary school mathematics that corresponds to such a form of community as described in chapter 3.

It must also be stressed that a one-for-one correspondence between discursive practices supporting or inhibiting participation and a particular context was not possible. There is indeed a strong relationship between the program context and discursive practices supporting participation, for example. However as indicated in the analysis of the accounts, that association did not hold for all students. Nor, arguably, did the program completely meet the ideal formulation of every practice. Again, some examples from experiences of secondary school mathematics were positive, and here the issue of teacher support was crucial. It might be argued then that the most appropriate connection is directly between the articulation of a set of practices and forms of participation. To the degree that such a conclusion ignores the necessity for a context, or particular forms of contexts, it must be rejected. More appropriate, here, is the dynamic interaction of discourse, practice and context in ways which enable and support participation and social learning.
What identities are discursively constructed in these accounts and what relationships can be traced between these identities and the discourses, practices and forms of participation addressed in the previous question?

As indicated above, this study investigated discourses about learning mathematics in the program and secondary school mathematics. Three forms of participation were ascertained—participation of peripherality, participation and non-participation of marginality. Student identities of participation were shown to be constructed in and through a discourse about mathematics learning in the program and—for a few—secondary school. Significantly, an identity of peripheral participation and fuller participation was typically, though not always, associated with the discourse about the program, while, conversely, identities of peripheral participation and non-participation of marginality were typically, though not always, associated with the discourse about secondary school mathematics. Thus in a few instances, identities of non-participation were constructed in the program and identities of participation were constructed in secondary school mathematics. These three forms of identity are now addressed in turn.

Identity of Peripheral Participation

An identity of peripheral participation as traced in these accounts was one where the students were in transition to fuller participation in mathematics learning. This transition was identified as a work in progress and shaped over time in and through the practices utilised in the program and secondary school mathematics. Ongoing social interaction with teachers, tutors and peers was a significant part of this transition and the kinds of identities students constructed. In turn, these identities could be described in terms of their attributes—developing engagement in the practices of that community, acquiring and learning how to apply the relevant knowledge, skills and practices to find solutions to the mathematics
problems and challenges they face. When students are granted access to a discourse through these practices, they learn to engage in the practices of the community and experience success in mathematics learning. The evidence from the participants’ accounts indicated that with quality social interaction between teachers, students and tutors, students came to identify themselves as successful mathematics learners.

Access was an indispensable prerequisite for participation. Prospective members do not have open access to membership simply because they want to be a part of a community and its practices (Davies, 2005). Two aspects, transparency and acceptance, were essential. Transparency allows students to see what the prerequisites for membership are. On that basis they can judge what they need to have and whether they possess it. Acceptance in turn was contingent on those who have the power to allow access to occur (Davies, 2005). Acceptance picks up from that point, assisting prospective members to acquire what they do not possess and supporting them while they are acquiring it. Thus acceptance complements transparency, for if transparency is to be comprehensive, prospective members need to know who possesses the authority to make such judgements and what guarantees they offer to ensure effective access and sustained participation in the community. This was evident in the initial encounters between newcomers to the Youth Reconnected Program and the program manager and coordinator. It was also evident in some of the accounts about secondary school mathematics.

Identities of Participation

From the evidence in the participants’ accounts the program students’ progress from peripheral participation to fuller participation in mathematics learning in secondary school and the program was shown to be supported by teachers who were helpful, encouraging and respectful, with an emphasis on success, in a word, student-centred. In short, access, mutual engagement, joint enterprise, shared repertoire and continuing maintenance and support were
critical to their success.

From that initial access and acceptance, mutual engagement in the joint enterprise of mathematics followed. That is, where access was provided and authority was distributed appropriately between the teacher and students, students actively engaged and participated in improving their mathematical knowledge and understanding. They took a strong positive stance about their learning and their future. Learning became a social act that involved ongoing interactions and relations with others in a learning community.

As students internalised the language, the gestures and interactions and routines of their social context, their identities were a work in progress. They were constructed, maintained, modified and reshaped through the social context of learning and through interactions with other students and their teachers. Moreover, as stressed previously, these identities cannot be understood without taking account of the social context and the historical background that gave them shape. Here the evidence strongly indicated that identities of participation were shaped and constructed through the discursive practices of the program and secondary school communities. Through these practices, identities were constituted and reconstituted through the various practices with which students engaged. These identities did not exist outside of discourse, they were represented in discourse, produced by the knowledge and regulated by the practices of the learning contexts. Thus students were discursively positioned as active participants in mathematics learning in the program and at times in secondary school mathematics as constructing their identities as mathematics learners in the program. As noted earlier in this study, this finding is consistent with the literature in chapter 2 (see for example, Cobb & Hodge, 2002; Nasir, 2002a).

From the evidence in the accounts it appeared that the discursive practices employed in the program and some secondary mathematics classrooms supported and encouraged
student participation and inclusion in learning, while the experience of participation in the program interactions shaped their identities as mathematics learners. This provides some support for Wenger’s (1998) and Treseder’s (1997) models of participation, with improvements in participation shown in the program. However, their combination of their characteristics, as in Figure 4, presented in chapter 3, provides a more detailed and comprehensive description of the three forms of identity in a classroom context, that is, identity of peripheral participation, identity of participation, and identity of non-participation of marginality. As this model indicated, when practices are used effectively they work to provide opportunities to engage students in their learning. They are more likely to participate and construct their identity as a member of that community. When new to the community, they are more likely to experience participation of periphery while they learn how to become a member of the group. Learning is more likely to be supported and actively encouraged by the teachers and how they deploy the practices appropriate for mathematics learning. Decisions are shared between the teacher and students. However, when teachers draw on ineffective strategies for teaching, and where the focus is more on the teaching process rather than the learning, students are more likely to experience marginalisation and are less likely to participate in their learning.

From the evidence in the accounts there was strong support indicating that the discursive practices employed in the program and in some secondary mathematics classrooms were significant for creating and sustaining a community of learners (Matusov, 1999; Rogoff, Matusov & White, 1998). This is an important finding as student voice was acknowledged throughout the interactions with teachers and tutors. In doing so, and through these relations, students were found to identify themselves as mathematics learners, who participated and shared in the enterprise of learning. The evidence here indicated that through collaborative
and engaged endeavours, learning was transformed into participation (Renshaw & Brown, 1997). In doing so, finding out and learning about mathematics took a central role together with the teachers, tutors and students as active participants.

Finally, two matters remain to consider. First, as indicated previously, teacher identity and student identity stand in a complementary relationship. From the evidence in the accounts, teachers who were identified as supporting student participation were interactive, student- and subject-oriented and attentive to the needs of students. They were indispensable to the establishment and maintenance of learning contexts and the scaffolding of students’ mathematics learning. Second, and perhaps the most significant practical implication of this study—is the implied understanding of identity as a social construction. Most of the accounts of the students in this study indicate a substantial transformation of identity from non-participation to participation in mathematics learning, and from failing, resisting, withdrawing or being excluded from mathematics learning to inclusive and active engagement where identities as successful learners were constructed.

Identity of Non-participation of Marginality

An identity of non-participation was traced in the accounts as a marginalising experience with students struggling to access the discourse to learn and with exclusion or withdrawal from mathematics learning the usual consequence. Where the criteria for gaining access to a discourse community were not made explicit to students, and where they were treated as passive recipients of information they could not comprehend, their identities as mathematics learners were more likely to be constructed negatively. From the evidence in student and staff accounts, how the practices were deployed in classrooms can be seen to contribute to the students’ experiences of failure as mathematics learners. Their consequent identification as a failure mirrored and reinforced their own identification as failures at mathematics learning.
They were not able to move from their initial participation of marginality to fuller participation in the discourse and practice of mathematics learning.

The findings from the evidence of this study, as presented in student and staff accounts, strongly indicated that the discursive practices of traditional instruction-based mathematics learning negatively influenced most students’ identities as learners (cf. Cotton, 2002; Klein & Saunders, 2004). They were unable to access the discourse of this mathematics through the discursive practices of the classroom. These practices worked against these students preventing them from actively engaging and participating in their learning. What was taught and expected to be learned was initiated and organised by the teacher. Students were positioned as passive objects of instruction. Without effective support and lacking understanding of the discourse of traditional instruction-based mathematics, their experience was traced as one of marginalisation, passive indifference, exclusion and alienation from mathematics learning.

The importance of class size should be taken into account, however. There was strong evidence to suggest that large class sizes in secondary school negatively influenced student achievement and progress in mathematics and the construction of communities of learners and identities of participation. The evidence also indicated that because of large class sizes the interactions between teachers and students were associated with non-participation of marginality in learning mathematics. More work is needed to identify how these issues contribute to student failure. The research presented in this document provides some clues to how this occurs, in particular, indicating that there was not enough time for teachers in large classes to attend to the learning needs of all students, a situation that is less likely to provide the students with opportunities for improved achievement in mathematics.

Two issues remain to be addressed. First, in what ways can secondary school
mathematics classrooms such as the ones represented in this study be construed as communities? They do not correspond to communities of practice, inquiry or learning as described in chapter 2. Social learning hardly features in their list of how the discursive practices are deployed. While they encompass a large number of students and while the class is typically taught as a whole and works on the same material at the same time, each student works in isolation and succeeds or fails alone. Hence for this study they are better considered as classrooms of individuals, where teaching and learning do not function particularly well.

Second, the sort of teacher identity constructed in most of the participants’ accounts of secondary mathematics education was subject-, task- and timetable oriented, teaching to the whole class, unavailable or unable to help those who could not keep up or understand the work.

_Hence, what can this study contribute to more effective mathematics learning for students such as those in this study?_

This research has supported the findings of a number of previous studies of the practices of mathematics classrooms as identified in chapter 2. This has included support for findings of negative associations between their practices and student failure (Boaler & Wiliam, 2001; Hallam & Ireson, 2005; Thompson, 2001; Walkerdine, 1998; Watson, 2001; Watson & de Geest, 2005; Wiliam & Bartholomew, 2004a; Zevenbergen, 2004; Zevenbergen, 2005) and support for findings that effective practices can lead to a reversal of this failure (Drake, 2006; Kyriacou, 2005a).

Evidence has been presented that student re-engagement in learning mathematics could be established and improved in programs such as the Youth Reconnected Program. These improvements were related to the inclusion of positive interactions and relationships with teachers and tutors in the program. For example, the strongest evidence was found when
students interacted with their teacher and or tutor with the aim of improving their mathematical knowledge. Other factors presented as being important in relation to student success were small class sizes, feedback on assessment and reduced pace.

New evidence has been presented that improvements in mathematics for this particular group of students were more likely to occur when the discursive practices of a mathematics classroom are used effectively to support their learning. Boaler (2002) demonstrated this for traditional and reform approaches to teaching mathematics, but in secondary schools only. In this research, however, its participants are able to provide interpretations of two learning contexts, the program and secondary school. Here the evidence supporting a social theory of learning in mathematics classrooms and the importance of establishing an accepting and supportive learning community for that process is significant.

However, not all the students benefited from participating in the program. Some evidence, as mentioned previously, was presented that demonstrated that participation in the program could be a negative experience in itself. The evidence also suggested that participation in secondary school mathematics was not always negative.

The Contribution of the Theoretical Frameworks to the Study

The review of existing research on mathematics education in chapter 2 identified a gap in the literature—the need for more comprehensive research on the social and discursive processes that inhibit and support student participation in mathematics learning and a theoretical framework adequate for that task. To meet that need, this study articulated a social theory of learning and critical discourse theory to examine identity, participation and membership for successful learning in mathematics classrooms. Critical discourse theory (Fairclough, 1995, 2001; Hall, 2001a) and its elements, discourse, discursive practices and identities, enabled an understanding of the realisation of power and ideology and how they are achieved through the
discursive practices of classrooms. This understanding served as a useful framework for understanding students’ mathematics learning experiences in mathematics classrooms, in particular the discursive practices that contributed to the construction of various identities of participation and non-participation. There was strong evidence in the research to indicate that the discursive practices of mathematics and their influence on student engagement and participation in learning could be described through the accounts of students’ experiences.

Discursive practices are the products of discourse and are equally constitutive of the discourse itself (Fairclough, 2001). That is, they are associated with social life such as in classrooms. The power of these practices resides in their everyday application of routine tasks that are considered commonsense, whilst at the same time creating a particular image of mathematics in the classroom. The discursive practices of the program were largely found to influence student re-engagement in mathematics learning. In turn, the practices were found to contribute to the construction of the students’ identities as learners and the discourse they drew on when talking about their mathematics experiences. Thus, through discourses and their associated discursive practices, identities were shaped. More specifically, in the program and in some secondary mathematics classrooms, student identities as successful learners were found to be largely constructed positively. In secondary mathematics classrooms students’ identities were largely constructed negatively, although this was not always the case as discussed in the findings.

Applying the characteristics of a community—mutual engagement, joint enterprise, shared repertoire and access (Davies, 2005; Wenger, 1998)—allowed for considerations of what can occur in classrooms and how learning can be a transformative experience for students as they make attempts to understand their learning. The use of these characteristics for viewing students’ accounts of their experiences in classrooms enabled an understanding of
how they access and learn to become members of communities of learners and develop a
sense of belonging. These characteristics provided a lens through which to view the rich and
complex world of interaction, engagement and participation in learning, identity construction,
and participation in mathematics learning.

Participation was identified in chapter 3 as a complex process but crucial to student
inclusion, achievement and success in learning. This success and inclusion was identified in
the accounts. In particular, their participation was identified as providing opportunities to be
valued and active members of their classroom community. This finding reinforces Treseder’s
(1997) conclusion, reviewed in chapter 3, that for students to participate in their learning, they
need to know that they are listened to, valued and respected.

In chapter 3 questions were raised about whether the four characteristics of a
community—joint enterprise, mutual engagement, shared repertoire and access—could be
articulated at the micro-level of analysis in this study, that is, with the students’ accounts of
their mathematical learning experiences in the program and in secondary school. This is a
major strength of the project. The use of accounts of experiences from the program manager,
the program coordinator, teachers, tutors and early school leavers has been a major advantage.
Once again that students could represent their experiences of two learning contexts, although
those contexts did not fully correspond to reform-based or instruction-based approaches,
added considerably to this strength. In doing so, this work adds substantially to the findings
already reported in the literature discussed in chapter 3 (cf. Davies, 2005; Meyerhoff, 2001).

The Contribution of Critical Discourse Analysis

Critical Discourse Analysis [CDA] as a method has contributed to understanding the accounts
of student mathematics learning experiences in the Youth Reconnected Program and in
secondary school. It was most significant for an exploration of the discursive mechanisms
influential to forms of participation. It has meant that the students’ experiences in learning can be attributed to the influence of the discursive practices of mathematics classrooms. This is a major strength of the overall project. There are few reports in the literature using CDA to apply a social theory of learning and critical discourse theory as a framework for analysis (cf. Klein & Saunders, 2004; Sfard & Prusak, 2005) to studies of mathematics education. The work in this thesis adds substantially to the findings already reported in the literature.

Another strength of using CDA was its ability to identify and explore the discursive practices of the discourses traced in the accounts. It provided a means by which the theoretical constructions of discourse could be applied to the particular situations, for example, in mathematics classrooms as reported in the accounts, while those findings in turn contributed to further development and elaboration of those theoretical constructions (Chouliaraki & Fairclough, 1999).

Using CDA brings to light theoretical constructions and notions of power and how they are operationalised in social contexts (Chouliaraki & Fairclough, 1999) such as mathematics classrooms. CDA is concerned with how accounts are used to realise such power. It is also concerned with redressing issues related to power (Martin, 2000). These issues include the influence of the discursive practices in mathematics classrooms on student engagement in learning and the kinds of identities of participation constructed in such contexts. Such issues can be identified using the three dimensions of discourse described by Fairclough (2001; 2003).

The three dimensions of discourse—representations, relationships and identities—served as a framework for providing cues to the ways that the participants represented their experiences of the social through discourse. Thus, the focus was on what was there in the account and the discourse that the account drew on (Fairclough, 2001). These dimensions of
discourse provided a framework for asking appropriate questions about participation in mathematics and a method for generating data that could be analysed systematically drawing on the textual features of discourse. Their employment allowed for the tracing of particular elements of discourse. The questions became the exploratory mechanism enabling an analysis of the participants’ particular versions of their realities.

In more general terms, this study was an exploration of the discursive practices that shape identity, and forms of participation with a select sample of students. A review of the literature to explore these practices provided a series of practices, when considered together with the theoretical frameworks of this study discussed in chapter 3, produced the research design as well as a data analysis method (Figure 5, chapter 3). In short, the design of the study made clear the process for generating data, analyses and theorising findings, and provided a clear structure for its conduct.

Limitations of the Study

The contributions made by this study have to be considered in the context of its limitations. Firstly, in relation to the sample of early school leavers used, no claims have been made that the results presented here can be generalised to all students or even extrapolated to all early school leavers. The sample used in this study was a small select group of early school leavers from one TAFE College. Nor can generalisations be made about all teachers and how they teach mathematics. This study has not been intended as an exercise in ‘teacher-bashing’, nor is it.

A further limitation of the study was that it was based exclusively on semi-structured interviews with participants in one context—the program. Staff voices were represented in the study, to support the evidence provided in chapters 4, 5 and 6. It is acknowledged that including secondary teachers and students would have further strengthened this study.
However, this was not the intention of the study. Rather, the scope of the study meant that its focus was restricted to issues relevant to early school leavers and their particular versions of the reality of their mathematical experiences.

Recommendations for Mathematics Education

In this section, drawing on participant accounts and recognising the need for students to learn, engage and participate in learning, a series of recommendations that emerged from the data collected and analysed in this project is presented. They are as follows:

The construction of identities as learners of mathematics should be foremost in mathematics classrooms where sustained engagement and participation in learning is the focus. This necessitates understanding the historical background that students bring to a learning context, how access to learning is endorsed by the teacher, made explicit to students and sustained by a learning community.

The discourses and discursive practices employed in mathematics classrooms should be made accessible to all students. This necessitates understanding differences in student achievement, learning styles, and background knowledge.

The benefit of small classes for supporting student engagement and participation in learning was reported in the study although not a focus of the study. Small class sizes worked to support active student participation and engagement in learning about mathematics. Through this process, interactions and relationships can be further developed and sustained.

The use of student textbooks needs to be tailored to the students’ achievement levels, rather than the one-size-fits-all model of whole class textbooks. Their use however, should be supported by positive teacher and student interactions.

Time to work through tasks should be provided for all students, with support when needed from the teacher and/or tutors, and opportunities to clarify their thinking as they
worked through the tasks.

Classrooms should become strong communities of learners where frequent interaction and student ownership of meaning encourage students to construct an identity of participation. Learners should be supported in developing their own experience of participation in the classroom community where competence is incorporated into an identity of participation, thus constructing their common purpose and identity as successful learners.

Directions for Further Research

This study has demonstrated the power that the discursive practices of discourses about mathematics learning have on student participation in learning. The analysis has shown how such practices contributed significantly to the construction of learners’ identities. To increase understanding of a social theory of learning and critical discourse theory in the context of low achieving students in mathematics classrooms, the following three significant issues have been identified for further research.

1. Further investigation of the discursive practices identified in this study through participant observation in secondary mathematics classrooms and semi-structured interviews with their teachers and students, with particular attention to low achieving students, class size and teacher support.

This study examined the accounts of 43 students and six staff members from a specific context set up for a particular purpose, to assist early school leavers to improve their literacy, numeracy and life skills. While its findings are certainly significant, their relevance to other mathematics students and mathematics education contexts is at best conjectural. A good start for further investigation would be to examine a small select group of secondary mathematics classrooms, their students and teachers, both from a participant observation framework and through semi-structured interviews, to be analysed using the theoretical framework and
methodology developed here. It should then be possible to compare the findings of the two studies to determine the degree to which the claims of this study are relevant to the secondary school classrooms of the later investigation.

2. A longitudinal pilot study of a mixed-ability group of secondary mathematics students in Years 8-10 constituted as a learning community.

The theoretical framework on which this study was predicated and its findings have highlighted the importance of a learning community for effective mathematics learning. However, the program only ran for fourteen weeks, its students were a particular select group, and class sizes were much smaller than the usual 30 or so students in junior secondary mathematics classrooms. Hence again, claims about the longer efficacy of a learning community for a more comprehensive variety of students and abilities are at best conjectural. Hence this aspect needs to be tested further, ideally for at least a year, with a group of some 30 students and across the usual spectrum of abilities in a typical secondary mathematics classroom. While the logistics involved would be considerable, and obtaining a teacher with the relevant knowledge, commitment and experience could be difficult, such a study could provide information not easily obtained in other ways and make a major practical as well as theoretical contribution to the current debate around improving students’ mathematical knowledge and ability.

3. Evaluate current and forthcoming developments in mathematics education that combine direct instruction and instructivist approaches (cf. Rowe, 2006) using the articulation of a social theory of learning with critical discourse theory developed in this study.

Given current political and media presses for better and more effective mathematics education, as noted in chapter 1, sometimes couched in terms of restoring ‘the basics’, the
‘evidence-based’ research into effective methods of teaching mathematics currently underway at the Australian Council of Educational Research (cf. Rowe, 2006). is of considerable importance. As noted in the conclusion to chapter 2, some strategic combination of direct instruction and reform approaches seems likely to be recommended. It would certainly be appropriate to evaluate such recommendations in the light of the findings of this study and its theoretical framework with particular attention to two aspects—the degree to which they support or deny this framework and the degree to which their methods might be improved by it.
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Appendix 1: Numeracy Module, Level 2
ASSESSMENT STRATEGY
Assessment should provide fair and equitable opportunities for all learners to
demonstrate competence at the standards expressed in the learning outcomes and
assessment criteria. Assessment tasks may be developed to assess more than one
learning outcome.

The learning outcome may be assessed through:
• responses to questions, which may be oral, signed or written as required
• activities undertaken during the course
• the activity of measuring
• practical activities

Assessment Conditions
Assessment should be grounded in a relevant context and reflect the level of
complexity and support found in the purpose statement of the module. Learners
should be assessed across a wide range of tasks integrated into practice and
involving a broad range of text types. One-off assessment tasks do not provide
reliable and valid measure of competence. Assessment should ideally be
moderated by more than one teacher and/or across providers.

Assessment tasks at this level would take place within a relevant, familiar context
directed toward a supportive audience and with access to structured support.

LEARNING OUTCOME DETAILS

Learning Outcome 1
Perform mathematical operations (addition, subtraction, multiplication) using real
numbers with decimal fractions to hundredths and the common fractions, 1/2, 1/4,
1/3.

Assessment Criteria
1.1 Select appropriate operation needed to solve problems from a real life
situation, e.g. involving money.
1.2 Estimate an approximate answer.
1.3 Calculate answer using calculator or pen and paper (any method
acceptable) correct to two decimal places.
1.4 Explain method to trainer.
1.5 Calculate discounts from catalogue items for 50%, 25% off.
1.6 Draw a representation of the common fractions, 1/2, 1/3 and 1/4 for
comparison (>=) using concrete examples.
Appendix 2: Reasons for Leaving School
I was good in maths and all that sort of stuff, but it wasn’t attempted much because I couldn’t keep up with everything… (indistinct).

I just had problems with myself.

Basically my peers, and I was…I left school when I went to New Zealand and I did schooling over and then I came back I had missed out on a lot in Year 11 and kind a like you can’t really catch up on it…so I was really behind and not understanding it.

I was away for 3½ months, I had an accident and I missed out of the basics of English and maths, so I didn’t want to repeated Year 10 at school so I came here, I’m doing it here.

Cause I used to wag because I used to hate it…um get involved in the cool group go up there, you stay involved, you know it like friends, real good friends and everything, and then you go like ah come over town it’s like or yeh that’s fine anyway so your friends, so you think ah well stuff it just go cause there’s nothing much here, you go over town and just wag you know all the time. I’ve only been away 200 days of Year 8 um…and Year 7 I pretty much missed 50 days I wasn’t there or partial you know, um in Year 9 I was probably only there about 3 days and um, ah what happened um I got involved in pot and like friends say come and try this and smoke pot, um and then like you got involved with it, and I got caught smoking, um I got level books, these level books and I never got off these level books, I’ve been on a level book for about 2 years and that used to get me into so much trouble cause you’d get caught out wagging cause you had to sign, get teachers to sign that you had been there and that um…that’s about it.

I moved to a different suburb and I couldn’t get to that school. So I had to leave school and there were problems with family services because I was supposed to be on foster care and
I couldn’t get back into school like cause um my guardians aren’t regularly my guardians, they couldn’t put me through schooling or nothing and so I came here because it was easier.

P: Fighting.

P: Oh…just I don’t know, just people, I was just getting into trouble all the time um, I couldn’t learn, I was only good at two subjects, that was cabinet making and woodwork and graphics. I’m no good at maths, but graphics I just rip into it, and um yeah, just teachers, just I don’t know I’ve always been the selected one out of the class. When I did go to high school I wanted to not be the selected and um I don’t know it’s just like I was always the one being called up to the office.

P: Yeah. I don’t know…the teacher wouldn’t sit down and spend time with me…they always thought I don’t want to learn, Yeah.

P: I didn’t get along with the people I went to school with, I had troubles at school.

P: Um I didn’t want to go anymore because I didn’t…the people at school didn’t like me very much, so I just didn’t show up. My mum works in the Education Department so she’s friends with Principals and Teachers and the Principal goes no K I know you, I don’t want to cancel your enrolment, so please come back, and I didn’t I just never showed up so he actually just cancelled my enrolment.

P: Um, I started to behave bad and tried to fix things and they didn’t sort of want to give me a second chance so it was just like because I was bad at the start, that was just the way it was going to be, so they didn’t let me have another chance to try and make it better even though I was good before that, I was always telling them, they wouldn’t give me a chance to make it better after I had got in a bit of trouble.

P: I just can’t have teachers telling me what to do so the way they taught me it just
wasn’t right for me. I just couldn’t learn really.

P: Didn’t like it, it wasn’t my thing, teachers didn’t teach me nothing, I was more of an out there person.

P: Probably because I felt that school, even though they educated you, they didn’t teach you what you needed to know in life and um it kind of, I just got into too much trouble, I was getting into and didn’t get along with the teachers and their rules and stuff. That’s pretty much why.

P: I got kicked out.

P: Because I kept on getting kicked out of home and I needed, I finally got kicked out and had no where else to go but a friend, and I needed to get money so I left and plus I was just sick of it.

P: Cause they got me into TAFE because they thought it was better, easier.

P: Because I wanted to get a job.

P: I don’t know I just didn’t like it anymore, there were just people there that, like the school work was easy for me, kind of fine, but just people and trying to get my life on track.

P: Got in too much trouble.

P: I don’t know.

P: I had a lot of problems in the school just hanging with the wrong people and stuff like that.

P: I just don’t really like being told what to do, you know. Here it’s more self-disciplined and you know at school you’re getting told to do assignments, do this, do that.

P: Mainly because the teachers thought I wasn’t keeping up with the code of conduct, like just say one month I’d break a tiny rule, they’d add it all up after three months and put it
to me.

P: I felt like if I went into Grade 11 that if I didn’t pass English and maths in grade 10 I would have no chance there, so I’d rather come back and do it here like you know English and maths and then go back to school or…

P: Cause I was mischief, playing up all the time, doing other stuff that you’re not suppose to do at school.

P: Because I kept moving around and I went to too many different schools and I just ended up leaving.

P: I sort of got expelled.

P: I got expelled from the school.

P: I got expelled because I jumped in the pool.

P: I had problems in school, and then they said I could leave for a couple of months and then come back the next year. I had an interview with the Principal and that and then they said like you can go to TAFE or something so I came in and chose to go to TAFE and they said next year you can come back or whatever you plan.

P: I was sick of the fighting I was like, at home with my uncle and that he was just, it was getting too much and that and like I was finding it hard to work at school and that and then one day I just thought I’d run away and so I ran away for two years. I came back and I seen mum. I met mum in Lismore and I went to school there for a little while not that long. I was wagging it most of the time because it was pretty hard work. And then after that I moved up to Townsville and I didn’t really do any school work after that, Year 9 and then like I started working and just handle that and I just came back. I was going to go back to school but I just rather TAFE.

P: Sick of the teachers and that’s pretty much it.
P: Because I was too bad at school. I was naughty in class and stuff... but not always. Only a little bit, like kids always do.

P: I didn’t really have a reason. I got kicked out because I was misbehaving sometimes.

P: I got suspended.

P: Got kicked out. Going to the isolation room too many times.

P: I just didn’t go to school. That’s about it. When I was going to Grade 10 then.

P: I was expelled.

P: I didn’t leave, I got transferred to a different school. It’s to . . . , poor people go there. It is like a learning difficulty place. I went there for a year or nine months and then I got expelled there and then I went to . . . and went to school there and didn’t like there and I came back up here and I went to TAFE.

P: I didn’t get much help from teachers and I didn’t get along with the teachers and that. I didn’t think it was doing much for me, I wasn’t learning very much.

P: It was just I didn’t get along with anyone, getting into drugs and that and just being stupid.
Appendix 3: Approval Letter from TAFE
22 March 2002

Ms Bronwyn McMahon
Faculty Of Education
Griffith University
Gold Coast Campus
Parklands Drive
SOUTHPORT QLD 4215

Dear Bronwyn

In response to your request to conduct research in the

access has been approved. I understand that you will be interviewing
students in the Youth Numeracy Programs and that these will be conducted
at a number of points throughout this year. I also understand that you may
need to consult with teachers on various issues related to the programs and
how students access them.

I assume that approval from your University Ethics Committee accompanies
this approval. The Institute would be very interested in your findings and
would appreciate that you share these with the staff.

Good luck with your project.

Yours sincerely
Appendix 4: Interview Questions
Students enrolled in the Youth Reconnected Program

1. At what age did you leave school?
2. What were the reasons for you leaving school?
3. What was learning mathematics in school like for you?
4. Take me through a mathematics lesson in your school life.
5. In what ways did you feel you were part of your mathematics class?
6. Could you tell me as much as possible about the details of your experiences at school as a student learning mathematics

Probing questions related to a sense of belonging may be asked here.

Staff

1. What is the name of the program you teach?
2. How many hours does the program constitute in a semester?
3. What are the attendance requirements of this program?
4. How responsive do you believe young people are to attending this program?
5. Take me through some instances whereby young people talk about their school experiences (good or bad) that helped to position the young people in relation to school mathematics.
6. In what ways do you see this program as similar or different to school mathematics?
Appendix 5: Findings Reported to the Director of TAFE
6th October 2003

Mr

Dear

I write this letter in response to research that I conducted in the from February to June 2002. I have attached to this letter a summary of this research.

This summary was produced as part of a PhD project of teaching practices that influence young people as learning of mathematics. If you would like further information regarding this project, please do not hesitate to contact me at the details below. At the completion of the project, I am willing to present the findings of this project to staff.

I would like to take this opportunity to extend my appreciation to you for granting permission for me to conduct the research. Similarly, I would like to extend my appreciation to all staff at the … who assisted me and took part in the project.

Yours sincerely

.........................................

Bronwyn Ewing (nee McMahon)

School of Education and Professional Studies

Gold Coast Campus Griffith University

PMB 50 Gold Coast Mail Centre Qld 9726

School of Early Childhood
Summary

The current investigation was conducted in Semester 1 of the 2002 TAFE year. In general terms, the aim of this study initially was about teaching practices that influence to young people as learners in mathematics classrooms. Whilst some practices, such as teacher and student discussion, were found to be supportive of learners, others, such as a teacher’s reliance on textbooks to explain and teach mathematical concepts instead of offering opportunities for engagement in subject matter, acted as barriers to learning. Students who had difficulties learning mathematics with this approach explained that they experienced underachievement in the subject and marginalisation from their class group.

As the study progressed, the influences that particular teaching practices had on a learner’s identity and participation in mathematics classes became evident. Young people who failed to identify and participate sort identity through subversive behaviours or refused to participate. Consequently, they were marginalised in class and at risk of exclusion from the subject or worse, school.

Forty-three young people, the program coordinator, the program manager, two teachers and two voluntary tutor staff from one TAFE College participated in the investigation. To determine why young people did or did not identity and participate in mathematics because of particular teaching practices, semi-structured interviews were
conducted.

The evidence derived from interviews verified the findings from the research literature, that is, particular theories and the practices inherent in these have been influential in the mathematics education field. Basically, young people experienced exclusion from their mathematics classrooms at school because of particular teaching practices found to be embedded in a transmission model of teaching which considers learning as an individual process. Such a process is disconnected from the lives of students outside the classroom and therefore is seen to have little relevance. Moreover, this model is a “one size fits all” where considerations of the diversity of learners is not evident. Such practices included one-way communication from teacher to student (this generally was described in conjunction with using the chalkboard), textbooks with repetitive exercises to explain methods, learning environments where students are arranged in rows of desks, pen and paper tests and homework. These practices were found to be influential to a young person’s identity of participation in learning communities such as mathematics. As such, these practices were seen to reproduce communities of failures rather than communities of learners to be supported as they shape their identity of participation in mathematics classrooms.

Of the young people interviewed nine particular themes were revealed as they shared their experiences of learning mathematics at school. These were:

1. Teacher and student communication – a relatively high number of nodes were linked to communication with students reporting this was mainly one-way from teacher to student.
2. Learning contexts–this includes conditions for learning and pedagogical approaches used. A relatively high number of nodes reported learning contexts that reflected a transmission model of teaching mathematics.
3. Teacher and student relationship–a relatively high number of nodes were linked to
relationships. Students reported this was significantly influential as they learned mathematics.

4. The use of textbooks to teach mathematics – a relatively high number of nodes were linked to textbook use with students reporting that learning mathematics using texts was difficult particularly when explanations were not communicated coherent enough for students to understand.

5. Sequencing and pace of curriculum content – a relative number of nodes were linked to difficulties with keeping up with the sequence and pace of the content

6. Grouping students by ability – a relative number of nodes were linked to problems with the groups they were assigned to in school.

7. Testing – a relative number of nodes linked to testing in school caused anxiety, particularly when students were unsure of the content. Algebra was reportedly a concern for students.

8. The structure of schooling – a significant number of nodes related to the structure of schooling, for example, obeying rules, wearing uniforms appropriately, keeping to time schedules.

Students who were exposed to the negative influences of these themes reported that they did not understand mathematics and found it difficult. A significant number of students reported they were taught mathematics using textbooks. They indicated that because they found mathematics difficult and because of the way the teacher communicated and explained concepts working from a textbook was difficult.

Of the young people interviewed six themes were revealed as they shared their experiences of learning mathematics at TAFE. These were:

1. A supportive environment – flexibility in timetable, e.g. have a break when needed. A relatively high number of nodes were linked to a supportive learning environment. Students
reflected that they felt they belonged in this environment.

2. Teacher and student relationships – a relatively number of nodes indicated that quality relationships were important. Students reflected that they felt more respected and were treated appropriately.

3. Teacher and student communication – a relatively high number of nodes indicated communication was important.

4. Pace – a relatively high number of nodes were linked to pace with students indicating they worked at their own pace.

5. Workbooks – a number of nodes linked to workbooks indicated that using workbooks were appropriate. However, a number indicated these were boring and not much different to texts used in schools. Some indicated the workbooks manageable as long as support was available when needed.

6. Structure of timetable – a number of nodes were linked to the flexible structure of the timetable at TAFE. A significant number of students reported they appreciated having breaks during the morning timetable. Some indicated they found the flexibility different to school and preferred the structure of the school timetable.

Generally, students explained that their experience of learning mathematics at TAFE was different to learning it at school. Of significance was a supportive learning environment where students described they could learn without fear of failure. Moreover, the students indicated they felt they belonged. This supports the literature related to shaping identities of participation in learning communities. In order for students to shape their identity of participation in such communities they must have a sense of belonging to that community. If they do not they are more likely to identify with another community, that of failure. If teachers offer new forms of identity and membership, and empowering forms of ownership of
meaning where young people can shape what they do, who they are, and how they understand what they do, they will better support them in their mathematics learning. If they do not, they risk reproducing the same communities outside of mathematics classrooms, that is, young people on the boundaries of society where they are excluded in other aspects of their lives because of their lack of mathematics knowledge and understanding of the connections to their daily lives.

Students reported that the teaching staff were very supportive, particularly when they were experiencing difficulties with learning mathematics concepts. They commented that this was different to their experiences of classroom learning at school. The comments about the workbooks were mixed with some students explaining that they are not much different to what was used in school, i.e. pages with lots of exercises. Some explained that they did not mind this provided they were given support as they worked through them. Others stated they preferred working through them at their own pace and not having to keep up with the class. While others stated they found them boring and not very challenging.
Appendix 6: Letter of Thanks from the Director of TAFE
14/10/03

Bronwyn Ewing
Gold Coast Campus
Griffith University
PMB 50 GCMC 9726 Australia

Dear Bronwyn

Thank you for the summary based on the research you have conducted in the . I find it interesting and informative.

I will forward the results on to the appropriate staff members.

Yours sincerely
Appendix 7: Transcripts
Cam

R: At what age did you leave school?

P: Um, what age? Fifteen up, yeah, fifteen up, finished grade 10 passed every subject except for maths and English. I passed all my others except for them two so I’d like to come here to do my other studies, you know English and maths.

R: What were your reasons for leaving school?

P: I felt like if I went into Grade 11 that if I didn’t pass English and maths in grade 10 I would have no chance there, so I’d rather come back and do it here like you know English and maths and then go back to school or…

R: Talking about school mathematics what was the learning of mathematics like for you in school?

P: Pretty easy like cause I went to Southport High School and they had like star English, star maths and English and like they help you out and stuff. It was pretty good. About the same here as at the Southport School.

R: So when you say they helped you out and stuff, they were doing, you were involved in particular programs to support you with your mathematics?

P: Like ah, yeah cause you had, yeah but not as much, I had more help there.

R: What were the things that they did to help you?

P: Like ah, you had these computers I could go on, you put your name in, you put like your ID thing in, you do like an, it’s not a game it’s a program, I remember the name of it. It’s like it would ask you questions and stuff, and then like after six turns it shows you what your average and what you have to work and then she’d give you what you have to work on and so it was pretty good.

R: When you say she was that the teacher or was that another person who came into the
Thinking back to when you were in school, can you take me through a maths lesson in any one day of your school week?

P: Yeah, like there was two groups, there was like, there was only like nine in the class, so like five would go on the computer cause there were five computers and then after doing that you do maths and then English and that takes half an hour. Then you do the work on the board and then the people who were on the first half on computers they would go the, do you understand what I mean?

R: Yeah

P: So you had like turns about on the computers.

R: So when you say work on the board was that mathematics from the board as well?

P: Yeah it was mathematics and you had work from the book and stuff like that. Difficult but…(indistinct).

R: So when you say that there were only nine people in the class, was that a class set up for all people…?

P: Yeah it was people like, learning support.

R: Did you have a textbook?

P: Yeah, yeah, paid school fees last year and got, I think we got an English book and a maths book.

R: In your maths class did you feel that you had a sense of belonging to that class, and you could contribute and take part?

P: Yeah like cause everybody in the class did Grade 8 to Grade 10, we were together so we did all three year, it was pretty good you know, we were all friends and stuff so like no
one was bored or so it was pretty good. I just didn’t want to go back to Grade 11 if I didn’t pass English and maths. I just didn’t really want to, I don’t know, I would rather do English and maths here and then try to get to Grade 11 again cause I done Grade 10 passed everything except for maths and English.

R: Thinking about the mathematics you learnt in school as a school student and comparing it to mathematics that you’re learning as a young person involved in a TAFE program, how are the two similar and or how are they different?

P: Last year the work was easy but I reckon last year I was a bit, I only went to school see my friends and be with my friends and stuff. I coming home and doing it myself and actually working hard so I think the work here is more challenging for me, better work and if you’re stuck the teachers do help. I reckon it’s a lot easy here and like you know that’s my point of view.

R: So when you say the teachers help you there’s that extra support?

P: Yeah.

R: Are there extra teachers in classroom when you’re doing your maths here?

P: Yeah, there two teachers.

R: And so if you need help, what do you normally do? If you need help here what is it that you do?

P: I just put my hand up and ask the teacher, and she, she just says if I’m stuck on something she’ll do it for me, ah not really we both do it together and then she will make me do like three of them. She’ll just write and do them, and then I get the hang of it and then she’ll leave.

R: So that’s something different to school?

P: Ah, it’s just sort of like really quick, you just did it (indistinct).
R: I’m jumping back a little bit, when you were in school, how did you know that, in what ways were you told and how did you know that you weren’t very good at school mathematics?

P: I couldn’t keep up and sometimes like they’d say and let you know what you had to do, repeat yourself because I didn’t really understand and it was like things I couldn’t do and like it was really just frustrating me (indistinct).

R: Any similarities between here and school?

P: No it is completely different. Like um at school because I’ve been at school for the last three years and I’ve only been out of school for four months and like it is so weird because I am so used to calling teachers by Miss or Mrs. and their last name and they call by first name and I’m not used to that because they don’t like me calling them Miss and I’m used to saying that. I am just so used to doing things at school what I shouldn’t do here, like this is different but kind of like a better way.

R: So when you say you were talking Miss, Mrs. and you’re not accustomed to using their first names, so do you think that has an impact on how you communicate with your teachers here compared to school?

P: I don’t know, it’s kind of a hard question to answer because I just feel like I am learning more than what I’ve learnt for the last three years. I’ve learnt basically I knew my times tables but I’m gonna have to think. Now I’m like not much better but I’m slowly type getting good at them.

Ben

R: At what age did you leave school?

P: Fourteen.
R: And can you tell me the reasons why?
P: I got kicked out.
R: In thinking about a mathematics lesson when you were at school, what was it, as a learner of school mathematics, what was it like for you?
P: In Grade 9 it was easy, in Grade 8 I had a shit teacher.
R: Let’s focus on Grade 8 first, when you say you had a shit teacher, can you be more specific like what was it that you felt had an impact on you as a learner?
P: I don’t know, they just pissed me off as I said to you, I just got into some trouble.
R: Can you remember the things that you were expected to do when you were in the maths class? Can you recall what….
P: That was a pretty low class, we got to talk that was the only good thing about. We hardly did anything.
R: So when you say you got to talk, it wasn’t necessarily about mathematics it was about whatever you wanted to talk about?
P: Yes we did, but he wanted us to talk about maths or something.
R: Year 9, you said that that was better. Did you feel it was…
P: Yeah he was pretty, he was an alright teacher.
R: Okay what made him an alright teacher?
P: He don’t treat you like a kid, if you swore and that he didn’t really care.
R: And did you feel like you learnt more mathematics with him as compared to your other teachers?
P: Yeah because he don’t treat you like you like a primary school kid?
R: So you see that that is important to you?
P: Yeah…I wasn’t in that class all that much….
R: You weren’t the classroom that much?

P: I wasn’t in many classes that much.

R: Okay, thinking about a particular maths lesson it doesn’t matter when, any time in your schooling that you can recall can you walk me through what was expected of you in the classroom for you as a learner and how were you taught. There are two things there. What were the things that you had to do as learner in that class and how were you actually taught?

P: Um, I think we wrote the page and columns in separate ones, then did some stuff out of the book and some off the board then talked us through it. That was in Year 9 when he explained everything to us. We were in the lowest maths class but we were doing the same sort of stuff as the highest, ‘cause he explained it more to us, he didn’t just rush through it. We were more up to date with it all. He’d slow it down when we got to know it easy.

R: That was quite good for you as a learner here?

P: Yeah.

R: And so he would put things on the board did you say or?

P: Yeah, if you wanted to, he’d chuck the pen, he’d chuck to you and get you to write it up on the board.

R: Okay… (indistinct) or your way of doing it was valued.

P: All the other teachers a part from one. My teacher in woodwork he’d actually treat you
like an adult.

R: How do you see that this program because you’re a young person here who has made a choice to attend the program, how do you see this program as compared to your learning mathematics at school? So what are the similarities and differences? May be just focus on one.

P: Yeah you don’t have to rush through it and have all these deadlines and extra things like you don’t have to finish it before a certain date. You can just take your time through it.

R: And that’s important for you?

P: Yeah.

R: Differences or any similarities? The amount of support you get here?

P: What do you mean by support?

R: Well, you have, how many teachers do you have in the classroom here?

P: Three.

R: And how many teachers did you have in your classroom at school?

P: In the lowest one in maths you used to have two.

R: Did you?

P: One was the teacher, one was a teacher aide.

R: So do you think you’re getting more support here like so if you’re having trouble with a particular maths …problem

P: Yes, there’s more teachers. You don’t have to wait for one teacher to finish off every student needs help.

R: Right. And you find that as a learner, as a learner of mathematics as a young person that it is helping you a lot more?

P: Yeah.
R: (Indistinct)
P: I did anyway.
R: Did you? Any thing else that you would like to contribute about you know your learning of mathematics at school that you think is important?
P: Maths was pretty easy.
R: So it’s easy for you? You find it easy? Particular parts of mathematics, what are the bits you find easy?
P: Measurement, algebra, can’t think, stuff like that.
R: Okay.

Leanne

R: At what age did you leave school?
P: Fourteen and a half.
R: And what your reasons for leaving?
P: I had a lot of problems in the school just hanging with the wrong people and stuff like that.
R: What was learning mathematics like for you in school?
P: I hated it, I didn’t like it.
R: Why?
P: It was just, it was just, I don’t know, it’s too technical in some ways like that’s what I thought kind of like I couldn’t understand properly some of it, just little things like that. Some of the stuff didn’t make sense to me.
R: What did you do when it didn’t make sense to you? What did you end up doing?
P: Either getting help or just leaving it and some things that were hard for me to understand I didn’t learn them, like I didn’t learn them at all really. Now, and when I come to
them it’s like, I don’t know how, I don’t have a clue (indistinct).

R: Sure. Thinking back to a lesson when you were in school. Can you walk me through a particular lesson in your school life, that you can recall even if it’s just bits? What was it you did as a learner and how were you taught?

P: I don’t know, you’d.

R: So what would you, if you walked into class into your maths class what is it that you did? What was expected of you?

P: We’d sit down and get your books out, your book out and the teacher would start writing on the board and that kind of stuff. They expected you to listen and pay attention and stuff. I think that might have been the reason why I didn’t get to know some of the stuff because I probably didn’t listen in some cases.

R: Did you find learning mathematics for you that way supported you in your mathematics? Or is there a way that you would have liked to have been taught?

P: Um, just more talk about the subject, more like talk about how to do it properly, sometimes they would just tell you once, you don’t, if you miss it you missed it, you’re like yeah.

R: In your mathematics class did you feel like you had a strong sense of belonging?

P: Yeah, in my classes I felt the belonging but it was just if you behaved or like I don’t know. If you’re not behaving you don’t learn.

R: Okay, when you say that you did feel that you belonged, did you, was it because you understood the mathematics and, that you could contribute in class or was it because you were…?

P: It was a bit of both because I usually contribute in class, like put my hand up and answer questions and that. Like I wasn’t scared to do that at all but um, I also got along with
everyone and everything else. I don’t know, it different when you’re in school…

R: Thinking about the mathematics that you’re learning here as a young person and comparing it and contrasting it to the school mathematics and as a school student, what are the similarities between the two and what are the differences between the two?

P: Well, the maths here, it’s, there’s something different about TAFE here you get more, you get treated like an adult. Like I don’t know, you, I don’t know how to say it. It’s easier for you to learn because you don’t feel pressured like in heaps of way and in school you’re always expected, like you’re always expected to have everything done on a certain, like, you’re expected to have everything done like on a cert….I don’t know how to explain it. It’s hard to explain.

R: So in school you had to get through what was set for you, you had to get through in a certain time?

P: Yeah, like they expect you to do it really fast. Like they don’t give you enough time in a sense.

R: Okay so they’re some differences?

Katrina

R: At what age did you leave school?

P: Last year I was fourteen, yeah.

R: What were the reasons for you leaving school?

P: Because I kept on getting kicked out of home and I needed, I finally got kicked out and had no where else to go but a friend, and I needed to get money so I left and plus I was just sick of it.

R: Thinking about your mathematics learning at school what was it like for you?

P: I didn’t like it because it was too hard, they’d just like explain it real quick and then
write it on the board. Very confusing.

R: Thinking about a maths lesson anytime in your schooling, okay. So can you walk me through, take me through? What were the things that you did as a learner as a school student? How were you taught? What were the things expected of you and that sort of thing?

P: They just pretty much talked and then wrote it on the board. They didn’t have like a teacher that come around like they have here.

R: And what did you do?

P: Sometimes I’d write down notes because I just didn’t get anything and then.

R: But did you feel like you actually got that support at school? Did you get that help when you would ask the teacher at school? Did you get that help?

P: Yeah.

R: And so you understood it better?

P: Yeah.

R: When you’re in your maths class did you for example, if you wanted to contribute to a class discussion of a particular maths concept that you were learning with the class, did you feel very comfortable about being a part of the discussion or contributing…?

P: Sometimes.

R: Yeah

P: Sometimes, sometimes not.

R: With sometimes, what was actually happening when it was sometimes for you?

Sometimes you felt like you belonged and wanted to contribute. What were the things that were actually happening in the classroom?

P: It was just basic stuff sort of, sort of revision work.

R: The stuff you understood?
P: But when we got onto the new stuff we just didn’t, I just didn’t get any of it.

R: And they were the times that you didn’t contribute or felt like you actually belonged?

P: Yeah.

R: The mathematics you’re learning here as a young person…?

P: Yeah, it’s heaps better because they explain every little detail in the book and they’ve got tutors who go around individually. And like I can do stuff now that I could never do at school because it explains it so well.

R: So when you say it explains, the book gives good explanations?

P: And the teachers, like if you have any other questions they just explain easier.

R: So that is something that is quite different to school?

P: Yeah, it’s better.

R: Any similarities between mathematics here as a young person as compared to being a school student? Any thing sort of similar at all?

P: You get books like we do here. We’ve just this big, fat text book and we just had to do that.

R: And so you were expected, at school you were expected to work through that textbook?

P: Yeah, whichever page.

R: How did you feel as a learner of mathematics in school, how did you feel mainly to learn that way?

P: I didn’t like it, I just thought that, I don’t know it was too confusing.

R: So it was confusing, was it the expectation on you that, that you had to learn everything that was actually from that page so. In the textbook did they provide an example for you?
P: Yeah, little one but um, but the one’s that here they’ve got examples for everything.

R: Right.

P: I just have heaps of question, I didn’t understand it at all when I was at school.

R: Yeah.

Michael

R: At what age did you leave school?

P: I was fourteen, half way through, three quarters of the way through Year 10. I was at…

R: What were the reasons for you leaving school?

P: I was good in maths and all that sort of stuff, but it wasn’t attempted much because I couldn’t keep up with everything… (indistinct).

R: What was learning mathematics like for you in school?

P: Ohh…pretty shocking I suppose, he just, he had a textbook with all the things and that and he’d just right it up on the board, give you like minutes and show you working, then like cause there’s the whole class, doesn’t give you much time to show everyone, some people don’t learn as quick as the others and that, and then you just lose track, can’t keep up, you’re just up to your neck in homework and that.

R: So when you say you were up to your neck in homework.

P: Oh yeah like cause like say you’re trying to get something but then by the time you think you’ve got it sort of sussed he’s already putting something else on there and that, he doesn’t give you answer, doesn’t really teach you, doesn’t really show it.

R: That’s what you felt about the teacher. What sort of an impact did that have on you as a…
P: Oh yeah, it was pretty full on because he was getting paid to teach, that’s his job. Like fair enough, I can’t, I might not have been able to keep up to well, like I worked me hardest and that, but he, he just didn’t care, just a slacker, a slacker.

R: So thinking about a maths lesson, can you recall one and take me through it?

P: Rido, you go into class, and you sit down and all that, he asks you take your textbooks out and that everything yeh, and then he’d say rido open your books blah, blah and you’d start on there today, something whatever it is. It’s just the same old thing, write it up on the board, give you like a heap of working, and then he’ll, like he’ll write the answer up and then he’ll show you the working through it, and then he’d like expect you to know it, cause he doesn’t like going around person to person and showing you through it. It was just on the board and you don’t really understand. You need like a bit more guidance. It was just like that through the whole lesson I suppose. Like you’ve just got to keep trying, like you’re flat out write everything out so you can take it home and try and get it sussed.

R: And so what did you do when you were in class?

P: I just got so behind ahh and just stopped going and then like I was good at English and all that, just maths, like I’m pretty good at it, just didn’t really get to learn it I suppose.

R: And so when you went home then of course you had…

P: All this shit!

R: When you’re talking about…?

P: Like I’d sit with me mother and all that and like she’d show me through stuff, but there’s so much of it ah. I just felt as though I didn’t wanna because she’s gotta work nights and that and I hardly see then. Then I got kicked out of school and I left home and now I’m living up here and working and that so…and now I come to TAFE here.

R: So that leads to me to my next question and that is from what you said, how did you
feel, did you have a sense of belonging to your maths class?

P: Oh not really, I suppose like you know everyone you like fit in and that and just.

R: It’s just with your peers.

P: That’s with your peers yeah like I can understand with me mates and that but not like some people would be flying through it because it’s stuff they already know and other people like myself would just be like t… to hard to learn, not hard but they just need a bit more time.

R: Yeah.

P: I just needed a bit of guidance through the sums and that.

R: So, well it was sort of like they were going along well? They probably felt as if they belonged to the mathematics class and could contribute and things like that whereas for you, because you needed that extra time, you didn’t feel like you could really contribute to the class because…

P: Yeah and like you can’t do that because you like the class is separated by an hours lesson or something like seventy minutes each class, four classes a day. And then you have one maths lesson, sometimes two maths a day in there, a bit out of control.

R: So what would happen when you had the, the work that you had to do at home?

P: I’d in the next day, and like I’d sit down and say look sir I had trouble with this. Me mum couldn’t help me the other night, he just like didn’t really care. He just had to start on the same old theme and it’d just s… ya.

R: Thinking about what you learn here, what are the similarities?

P: Oh it’s all the same, just like working and stuff, maybe everyone has their own different way or so with some things, some are easy some are harder but that doesn’t really matter. It’s like they spend more time with you here, like they’ve got more teachers going around and rotating around the classroom showing you everything. It makes it a lot easier.
R: So that would also be one of the differences compared to school as well?

P: Yeah. Like they’ve only got one teacher in school and twenty odd kids or more, you get so bored with teacher talk.

R: Whereas here you’ve got the extra support, smaller classes, smaller numbers?

P: I suppose yeah couple of them.

R: And that helps you, the way it is set up here?

P: Yeah it’s alright, it’s good here too because you can talk sense and say anything to the bloke next to you and say look at this I’m stuck here, teachers are busy, do you know anything about this? It works like that or visa versa.

R: And you feel that, that is important?

P: Oh yeah, suppose. It’s all a part of learning I suppose.

R: It’s giving you an opportunity to discuss and clarify your thinking too isn’t it? Is there something that you would like to see change or improved insofar as school mathematics is concerned? What would you like to change or improve? Or stay the same?

P: The same is probably not very good because it’s just gonna keep happening to every kid that goes to school I suppose. I don’t know, spend more time with you sort of thing and like, like it’s a pretty hard thing to ask for. It would cost the schools a fortune to train all these bloody teachers. I don’t how they work it so yeah they need to so something.

Robert

R: At what age did you leave school?

P: Um…fourteen, fourteen, fifteen, probably just turning fifteen yeah.

R: And what were the reasons for you leaving school?

P: Oh…just I don’t know, just people, I was just getting into trouble all the time um, I couldn’t learn, I was only good at two subjects, that was cabinet making and woodwork and
graphics. I’m no good at maths, but graphics I just rip into it, and um yeah, just teachers, just I
don’t know I’ve always been the selected one out of the class. When I did go to high school I
wanted to not be the selected and um I don’t know it’s just like I was always the one being
called up to the office.

R: Okay so that’s what you’re talking about when you’re being the selected one.

P: Yeah. I don’t know…the teacher wouldn’t sit down and spend time with me…they
always thought I don’t want to learn, Yeah.

R: All right…. so when you were in school what was learning mathematics like for you?

P: I can’t recall doing a full thing of maths a full class of maths, like learning like what
we actually did, like I’m no good at multiplication at all and I did go to a tutor when I was
twelve or thirteen, it did help a bit, like it’s all coming to me now cause um it’s a lot better
here.

R: So when you say that you know

P: Teachers help the students, just write it up on the board yeah do this, when you ask
what has to be done they tell you and they tell you hardest form possible for us to understand
and um like they don’t just explain it enough…it’s a set thing you do it this way. Mostly not
enough time to do the things because you’re lagging behind it’s probably because you are
spending time on it and learning it and um yeah when you do lag behind the teachers just go
off. I’ve just walked out of class…I’ve just walked up to the detention room RTC, one of the
teachers there I used to get along with him really well. He used to get my work I used to do it
up there cause I could learn easier there.

R: So…it was…I thinking then it was how you were taught that had an impact in the
classroom that had an impact on you. Is that right?

P: Yeah.
R: How was learning mathematics for you?

P: It was difficult, like I was more immature then than what I am now, so difficult I would just switch off, and just not do it, but now like we got them booklets here, and I just sit there and take as much time as I want, stay back, take the books home. The first book I copied a few things out of the back, and then I thought aah what’s the use of doing that because I want to get into a cabinet making course. I need to know a bit of maths so…so yeah?

R: So you’re working towards a goal?

P: Yeah, I’m know good at maths, volume, area and stuff like that I’ve never been good at it, and I thought I have to learn this if I’m gonna do cabinet making. So I sat through that book as much as I hated it, I got it done and I understand.

R: Good, so some determination?

P: I haven’t lived at home for the last I don’t know two years, year probably year and a half, I’ve just moved home just recently I’ve lived with my brother and my grandmother and whatever, I keep moving around too much.

R: Alright so um…if you could think of one lesson or it may end up being a combined lesson or a combination of lessons, can you take me through a particular maths lesson you can recall from when you were in school. Now whether it’s a good experience or not so good experience, if there is something that you can recall about a particular maths lesson or…

P: I used to have M…, do you know M…that works here?

R: No I don’t.

P: She was sort of I don’t know what they call them one of those other teachers that come in, studying at uni or something and um yeah she came in and I knew her before that and she help me with a bit of stuff. And um our class was out of control, it was the lowest class, it was just out of control, the teacher couldn’t keep it under control and ended up walking out of
class crying out the front. And um I ended leaving towards the end of it, ten minutes before it finished. Yeah she was trying to get us to learn and I was just sitting there. I was a bit of a pain in the arse at school, but what I did want to learn I’d tell the teachers that and they’d go yeah sure what ever

R: So when you say that that particular class was out of control can you sort of recall why you think that was the case, why you think, I mean you said that it was out of control from your perceptions you said that it was out of control, why do think that was the case?

P: Um the form of teaching that she gave out, that she put out it just wasn’t, it just wasn’t right…

R: So what was the form? How did she teach?

P: The easiest way possible for her, which was the hardest way possible for us…and um yeah.

R: Can you give me an example?

P: Like…. get everyone to be quiet, cause everyone was talking and everything and um she couldn’t concentrate on one person’s work um.

R: So she chose the easiest way which was the hardest possible way for you to learn, when you say that easy way, can you recall what that easy was?

P: Putting things up on the board, pretty much, giving out worksheets, she’d give out worksheets and just sit at her desk and I would just be like what? Um I just get her to help me with something and she’d come up talk to me and I don’t know…it wasn’t what I wanted.

R: And so from your perception and your experience then that was what added to the class being out of control?

P: Yeah.

R: Indistinct.
P: Yeah.

R: So when you had those experiences did you in some way feel like you belonged to that mathematics class?

P: Not at all...not at all. I was just another one of her students that went into her class and just sat there. And half the time I wasn’t even in that class. I was just.... I was just, as kids, as teenagers do, if they can’t learn something they just switch off and just act like dickheads.... excuse my language.... yeah then they just send them to the isolation room and that wasn’t getting them anywhere, she wouldn’t just spend time with them.

R: Same kids who were sent to the isolation room.

P: Yeah.

R: So although you didn’t belong to your mathematics class as a group there was a group that you belonged to in way and that was the group who was sent to the isolation room, is that right?

P: Yeah.

R: Yeah...so that.

P: I was, yeah, one of the teachers at the isolation room, he was, he was best. Yeah I’d rather, I’d rather go up there like I’d misbehave on purpose because I wasn’t learning anything...(indistinct).

R: Okay, thinking about the program that you’re involve and the goals you want to achieve, how is this program similar to school mathematics or how is it different to how you were learning. There are two questions in that one question actually, what are the similarities and what are the differences between TAFE and school mathematics.

P: There is no similarities, it is not the same at all. I didn’t want to come to TAFE and then when I came here I just thought for the first few weeks, I just thought maths was useless,
I just can’t do it, but then it would have been last Thursday I stuck through that booklet and I
did a whole day and one of the teachers said when are you going to get onto another booklet
as if to say you’re not learning, you’re a dickhead, if you’re gonna get anywhere. She said it
to me a few times and I ended up standing up and having a go at her and yeah, she backed off
then. I can’t work under circumstances where someone’s over my shoulder looking at my
work and so I asked politely if I could just work by myself. And then me and my mate I’ve
been mates with him for a year or so, he sits next to me and we help each other through some
stuff. The teacher said we can do that. It’s heaps more fun here 8:30 – 4:30 we just leave at
3:00 the other time is independent study time but um…yeah it’s heaps more fun. Getting
treated like an adult here and getting treated like a person not just another drop kick.
R: And so if your, so if you need support in classroom you’re in now um what do you do
to get that support, so if there is something that you are just finding a bit challenging and can’t
work out with my mate what’s your, what do you do?
P: Two weeks a good example of it. This fraction thing I could not understand and I
asked the teacher and she came and helped me and at that time there was no one sitting near
me and I’m glad of that…I felt a bit laughed at but um…. yeah she explained it to me maybe
six or seven times and I still couldn’t get it and then I just looked at it and stared at it and then
it sort came to me, but um yeah, they don’t, teachers don’t have problems with sitting down
and explaining it how ever many times it takes for me to understand it.
R: And you like that more?
P: Yeah.
Kate
R: At what age did you leave school?
P: Fourteen.
R: What were your reasons for leaving school?

P: I got expelled from the school.

R: Thinking about your mathematics learning at school, what was it like for you?

P: Weird because the teacher was really strict. And he told us off a lot.

R: And so what did you do?

P: I got sent to the office most of time, I had to do my maths there.

R: On your own?

P: Yeah.

R: Can you take me through then a maths lesson your school life. One that you can recall?

P: I don’t know we just go in the class, sit down and then he would start writing out on the board what we had to do. We’d do it, but then if we got it wrong he would put us down and that. Like because we were in Grade 9. That was about it, we did work and went out basically.

R: When you say that he put you down because…?

P: Well he reckoned that the work was easy, but then sometimes when you got it wrong it wasn’t that easy because you didn’t get taught it. I knew nothing about area before I came here.

R: So what did you do then in class?

P: That was when I got sent to the office.

R: That was when you would get sent to the office? My next question is did you feel you had a sense of belonging to your maths class?

P: Sometimes, kind of, but no.

R: When you say sometimes, what were the things that happened that sometimes you
P: When we got a different teacher because he was sick.

R: So what did the different teacher do?

P: Taught us a bit, didn’t yell and scream at us.

R: Did they use the same methods of putting it up on the board and that sort of thing?

P: Kind of explaining what the question is at the same. He’d just write it on the board and say right you’ve got to do this.

R: When you didn’t feel like you belonged what would happen then?

P: It was a different class.

R: So you said that sometimes you felt like you belonged and sometimes you didn’t, and felt like you belonged when you got a different teacher, when he was off sick?

P: Yeah.

R: So now let’s look at when you didn’t feel like you belonged what was actually going on in the class?

P: Like I said before, just getting put down by the teacher.

R: Thinking of your experiences mathematics…?

P: Apart from high school?

R: Whether it be high school or primary school that you can recall?

P: I had a very nice teacher in grade 5.

R: What made that person a nice teacher?

P: She was a mother so it was like easier, she knew how to look after us at the same time as teach us and know that we were only young.

R: So you did connect with her?

P: Yeah.
R: Do you remember how you were tested in school?

P: Basically As all the way up until Grade 9.

R: When you were tested was it a pen and paper test where you were given a sheet of paper with questions on it and you solved it?

P: In primary school yes, but in high school we just had like sheets of paper, and they would just say quiet, put your bags outside, only a pencil and what else you need and that it, you went into the class.

R: Was it at that point that you were told, after that was marked, you were told the results and these were the things you did well in…?

P: You got the sheet back.

R: So the things that you didn't do well in did the teacher provide an opportunity whereby they went back over that with you and helped you at all?

P: Yeah, in Grade 8 but some of the teachers in Grade 9 did but not the maths or science or anything else like that.

R: You said that you had As up until Grade 9 and then did you have a change of teacher or…?

P: I went from Adelaide back to Townsville, a change of school.

R: And that the levels of learning were different or just getting back into another school?

P: They're different.

R: Thinking about the mathematics that you’re learning here as a young person compared to the mathematics that you learnt at school as a school student, what are the similarities and what are the differences?

P: A whole lot different.

R: In what ways? I am trying to understand in what ways is it different because there
seems to be a common…?

P: Well Grade 9 at school I had a lot more questions than this for maths, and here it is like easy. Like basically learning Grade 5 to Grade 8 work. I’m not putting it down, but it is good as well.

R: Is that the program here providing you with an opportunity to go back and revise some things, and do you see that as a good thing for you?

P: Yeah.

R: So that’s something that is quite different, having the opportunity to go back and revise?

P: A little bit yes.

R: Anything else that’s different?

P: The teacher, she’s crazy.

R: Yeah. So do you find that you get the support here if you need it?

P: Yeah, she doesn’t stop saying it.

R: She is willing to help you though?

P: Yeah.

R: So that is something quite different to school?

P: A whole lot, yeah.

R: A positive?

P: Yeah may as well say.

R: Any similarities to school?

P: No.

R: Nothing is similar?

P: We, you have rules but it is not as strict as school and if you’ve had enough of sitting
there for a long time doing work you can at least go for a break.

R: And you like that?

P: Yeah.

R: You can’t do that in a school environment can you?

P: Not unless I took off.

R: Okay.

P: I like to run away a lot.

R: What about the environment here do you find that is different to school?

P: Yeah.

R: Do you feel more comfortable about coming…?

P: Here than school? Yeah.

R: So it is not just the environment, there are a whole lot of things that motivate you to want to come here?

P: It’s everything, it’s the learning and all that. And I realise that I get out of bed and say yeah I can go to TAFE instead of school.

R: And that’s an important point. Any thing else insofar as school mathematics is concerned that you can recall or want to add? I just want to jump back to something, earlier you said that you didn’t know area until you came here, now you understand it. What were your feelings when…?

P: Oh my God it’s easy, why couldn’t I just got taught this a long time ago.

Angelique

R: At what age did you leave school?

P: Thirteen, I was in Grade 9.
R: What were your reasons for leaving school?

P: Probably because I felt that school, even though they educated you, they didn’t teach you what you needed to know in life and um it kind of, I just got into too much trouble, I was getting into and didn’t get along with the teachers and their rules and stuff. That’s pretty much why.

R: What was learning mathematics like for you in school?

P: It was hard, and really complicated because when from Grade 6 to Grade 9 I didn’t really go to school much so I missed out on really simple things like division and multiplication and all that stuff. So when I got to high school their doing like getting into algebra and all this stuff and I didn’t even know what it meant. And I’m like all our teacher would do is write up stuff on the board and if you didn’t know it he would, blah, blah, blah and quickly explain it and that’s it and he would walk off and teach the whole class. Which here it’s better because they start from the adding and the subtracting and then they get up to percentages and because you’re working out of a booklet you don’t ask the teacher for help because it shows exactly what to do so it’s a lot better.

R: So you can go at your own pace?

P: Yeah, because now I understand multiplication and fractions and that type of thing so it’s a lot better.

R: Thinking about a particular maths lesson at school, take me through what you can recall.

P: Okay yeh we’d just walk in sit down with our textbooks, he’d write up all this stuff on the board, go to, you’d have to go the page that he’s written, if it’s like page 236 text blah, blah, blah, you’d just go to that and he says work from your book and then he gives you, writes all the answers on the board and that’s all you do in high school, work from your
textbook. And it was pretty difficult stuff not easy.

R: As a learner of mathematics what affect did that have on you?

P: It was hard because I didn’t know the basics as I said and I didn’t know basics so coming to do all this was hard so I just blocked off. Like I’d just sit there and that’s how I got bad grades and stuff cause I’d just sit there and wouldn’t pay attention. So now yeah, because I’ve realised that I have to get an education and they’re building it from scratch not like at school, they wouldn’t start from scratch. They wouldn’t put me in a numeracy group because they said I was too smart, which wasn’t fair.

R: What’s a numeracy group?

P: It’s like the lower group, they’d have a. They’d have core maths, extension and numeracy and core was in the middle, extension was the high people who were really smart and numeracy was the people who didn’t know much. And I didn’t know much but because I was kind of intelligent in other ways, maths was, yeah they just put me in that class.

R: Did you feel like you actually belonged or?

P: Not really, at all because there was, I’d have my friends that were they were smart they knew maths they really good, get A’s and I was sitting there getting nothing right. Did not feel belonged at all in the class because you know I wasn’t as smart as the other people and I just, I just started sitting there after a while and not paying attention to the teacher, not listening to what he had to say, kids in the class that were like that.

R: So did you turn up for all your maths lessons?

P: In the end I wasn’t really like Grade 8 most of the time I was but then it went to see how I was going and it just went down and yeah when we did have maths as a subject we’d go onto the oval or go to the shops until it was over. And that was quite often.

R: Thinking about how you learnt mathematics at school as a school student
P: That’s because we’d come in and they communicate better, they offer to walk around and help, there’s more teachers teaching the students, so they can help you individually and not all together. And um…

R: That support…

P: It is a lot easier and better here because they start with you even if yeah, they start from counting, if you can’t count they come here and expect you not really to count and then they help you from that.

R: What sort of an impact do you think that has on you as a learner? Or how motivating do you think it is?

P: I think because um, it gives me, it makes me want to learn when I know, when I know what I am talking about and what they’re talking about it kind of gives me the confidence to do it as well, with them in the class to join in so it’s a lot better.

R: So you can actually communicate? And are there enough opportunities for you to be able to do that and feel comfortable about it.

P: Yeah definitely.

R: And you see that that’s important?

P: Cause here I just don’t sit there and think about what’s going on at lunch time or what’s going after school. It’s kind of yeah, I come here cause I want to learn not because I have to.

R: Is there anything else you’d like to add insofar as school mathematics is concerned or your experiences or good things, positives?

P: Not really, not really. I can’t really because I never went it mustn’t cause I can’t remember it mustn’t been too good.
Asia

R: At what age did you leave school?
P: I left Grade 8, thirteen.
R: What were your reasons for leaving school?
P: Because I kept moving around and I went to too many different schools and I just ended up leaving?
R: Thinking back to when you were learning mathematics in school what was it like for you?
P: It was too easy, it was too easy for me to cause like I’ve got a high standard of maths and like they’re on a low standard of maths and so it is too easy for me, and I didn’t like it.
R: So what did you do because it was too easy?
P: I just said I can’t do this work, it is too easy for me and got up and walked out of the classroom and went to my other classes. The teachers didn’t care because like I was an A grade student so.
R: Can you take me through a maths lesson in your school days? If you can’t recall it all just bits and pieces can you take through just a regular maths lesson?
P: A regular maths lesson, we just have to like it was our textbooks, we just had to look up our textbook, go to the page we had to go to and write in our book and work it from there. The teacher hardly ever explained it to us and so it was crap.
R: Was all your mathematics learning like that?
P: Yeah.
R: When you say it was crap, was there another way that you would have liked to learn it?
P: I would have liked the teachers to like tell us about it, like help us work it out and like
teach us how to do it properly. Whereas we never got that.

R: So it was mainly up to you as to whether you got it or not and from the examples in the textbook.

P: Yeah.

R: Were there particular aspects of your mathematics that, were you good at all your mathematics or?

P: I was good at all my mathematics except for percentages, like you go from percentages to putting in decimals points and decimal fractions. So it was really complicated but I ended up learning how to do it.

R: How? How did you end up learning?

P: Well I got one of my carers to sit down with me and I just learnt by myself. Like she helped me just to say whether it was right or wrong but she did an example for me of how to do it and I just did it from there.

R: In your mathematics class did you have a strong sense of belonging to it?

P: No.

R: No, why did you think that was?

P: Because I didn’t like the teacher and I didn’t like the class, like the people I hang around with are in that class and nobody likes talking so (indistinct).

R: Would you have liked to have had a sense of belonging?

P: Yeah I would have.

R: Thinking about you as a young person now involved in a TAFE program and comparing and contrasting that to when you were a school student in a school learning mathematics…?

P: Here we get more help?
R: Okay in what way? When you say you get more help what is it you mean?

P: Mavis and that will like sit there with us and explain it to us and like help us like they will sit there with us and help us do the booklet. Whereas if in a normal classroom, say thirty of students in there the teacher couldn’t do that and they weren’t allowed to cause like you have to get like tutors or something in. But here it is more better because I am learning more here than what we would in a normal classroom.

R: Picking up something you just said then in the school classroom so they would have to get tutors in…were there people who came in and supported that teacher at all in the school because of the class sizes or…?

P: There were fifty four kids in my maths class and we only had one tutor and one teacher and I would sit up the back of the class in the corner away from everyone. The teacher and tutor would be talking and they wouldn’t give any one help. I ended up getting pissed off and I went to the Principal and told the Principal and they got fired. It was alright…and then I got expelled.

R: So the support that you get here is different to school?

P: Yeah.

R: Now there is something else that you have identified as well insofar as okay, you have got the support, then also there is something with the class sizes that you mentioned in your class at school there was fifty four students, one tutor and one teacher. What is your class size here and how many support people do you have come in?

P: We have three. We have a teacher and two other tutors but like and me. I help the others so it’s alright.

R: So that is something that is quite different?

P: Yeah.
R: Anything else that’s different?

P: Yeah, you’re allowed to smoke here whereas at school you’re not.

R: So you…interesting when you do go and have a smoke is that usually on your own or do you go with somebody?

P: I usually go with like my friends.

R: So there is a sense of belonging, even when it is smoke time people come together, so there is a sense of belonging to that particular group?

P: Yeah, like we’ve got our own little group, like me and all my friends we in one little group, my whole class is just our group and plus two other people in the class upstairs. That’s our group and the other two classes have got their little groups.

R: Similarities between school and here? Similarities between here school?

P: I don’t…nothing.

R: Nothing is the same? What about the way you learn the mathematics here?

P: It’s way better, it’s way better.

R: So you work through the booklets?

P: Yeah, I’ve done all fourteen booklets.

R: Okay, and those booklets there not the same booklets that you have in school, you have a maths textbook in school?

P: Yeah.

R: Insofar as mathematics in school is concerned is there anything else you would like to contribute so that, so that it is a way of supporting young people?

P: Cut down the people in the classes, and have more people there to help them. That is what they need, they don’t need fifty four kids in one class. Say about twenty or something, that’s alright but not fifty four.
Jasmine

R: At what age did you leave school?
P: Fifteen.

R: And what were the reasons for you leaving school?
P: I don’t know I just didn’t like it anymore, there were just people there that, like the school work was easy for me, kind of fine, but just people and trying to get my life on track.

R: What was learning mathematics like for you in school?
P: It was okay but the teachers didn’t really explain it that well to the class, like the teacher that we had. Hardly anyone in our class understood what we were doing.

R: So what did you do when you didn’t understand?
P: We’d ask them but, we just had one big textbook so we would have to go to the beginning of the textbook and reread the, how to do it and that.

R: And did that help at all?
P: Yeah, but still got a lot of questions wrong.

R: How did you go when it came to assessment time or testing time?
P: Hate it.

R: Yeah, um when you were tested how was the testing done?
P: Um…

R: Like how did you know that you failed?
P: Oh, because I didn’t understand any of the questions and just wrote down what I thought it was.

R: Right, and did she provide an opportunity for you to go back over that work that you’d actually got wrong?
P: No.
R: Okay, um were there any good bits about learning mathematics in school that you can recall?

P: Not really.

R: Thinking about a maths lesson when you were in school can you take me through what it was you actually did? I mean I realise that, so you’re involved in this program here, but thinking about a particular maths lesson that you were involved, that you went to? What was it like for you as a learner and what was it that the teacher actually did as a teacher in that classroom?

P: She would just tell us what to do. Like she’d tell us to a page in the textbook and then she’ll not really explain but, just basically. She done it on the board and said oh you do this, this and this. It was really explaining it, it was just the same as the textbook.

R: And so for you as a learner…you have probably already answered this question in the previous question anyway. So for you as a learner what did you do?

P: I’d have to go back into the textbook and try to read over it and read over it again until you sort of understand it.

R: Did you go to anybody else for help at all?

P: Just the person that was sitting next to me, but they didn’t really know much more than me.

R: Um, in what ways did you feel liked you actually belonged to your maths classroom? So I’m talking about there, did you feel like you could, you were a part of it, you could contribute and discuss your maths in the classroom? In what ways did you feel like you belonged or in what ways did you feel like you didn’t belong?

P: I belonged in the way that no one else really understood anything that we were learning anyway.
R: Do you see that as a positive or a negative?

P: Negative in a way.

R: Okay in what way is learning mathematics as a young person involved in a TAFE…?

P: There’s someone that like if you don’t understand the question, there’s someone who’ll be there and explain it and show you how to do it.

R: So that’s something that is different to school?

P: Yeah.

R: Any other things that are different to school?

P: Just the way they teach, like they’re more into it they show us a lot better than how school was.

R: Anything that’s similar?

P: No, not really. I didn’t really find it, I don’t know. Like the work is basically the same but they teach you a lot different.

R: They teach it a lot different so…?

P: They show us how to do it, and explain and still if we don’t understand they will still explain or come to you (indistinct) …and explain it.

Aderley

R: At what age did you leave school?

P: Turning thirteen.

R: What were the reasons for you leaving school?

P: I didn’t get along with the people I went to school with, I had troubles at school.

R: And thinking back to when you were learning mathematics in class, what was it like for you?

P: It was the most disgusting subject I’ve ever learned. I hated it, I really did. I just didn’t
like it at all. I’d rather sit there and do English than Maths. I loved English, hated Maths.

R: Why? What do you feel as a young person, what do you feel contributed to you hating mathematics and not liking it?

P: It was just boring, and the teacher like say they wouldn’t explain the whole subject to you, they just explain parts of it and then I wouldn’t understand most of it anyway and then I would get into trouble for not listening, but the things is they wouldn’t explain the whole thing, so I thought there is no point in me doing something that I am not going to get right.

R: Um where there particular ways, where there times at all when you felt like you connected with particular aspects of mathematics and other times you just didn’t get it.

P: Sometimes I would get it, yeah like, sometimes when the teacher would come up and explain the whole thing to me I would get it. I would do the whole thing really well, but other times I would just flunk out.

R: What did you do when you flunked out?

P: I just sit there and like nothing, looked out the window.

R: Thinking back to a maths lesson when you were in school, can you take me a through a lesson or an instance good or bad of when you were?

P: When I got suspended from the school that I was going to I went to a special school and I was actually doing Year 8 at that time, and I decided that they had taught me of what, like, explained everything to me um I sort of decided this is getting a bit boring I’d like to do something a bit harder and so I was doing Year 10 work and I actually did that so well, it was really amazing actually, I felt it was really weird because I’d never done so well in my life…I was just flying straight through it, it was algebra too.

R: So I sense that, that you had a judging by the smile on your face too you had a sense of achievement with something you didn’t realise you could do so well.
P: Yeah, I can do it. It is just a matter of someone explaining it to me you know getting it in my head. It’s sort of hard to get things through my head sometimes.

R: Okay, so if you were being taught mathematics what are the things that you would expect to get or have given to you from a teacher to help you with your mathematics? What would you expect if you walked into a maths class you were new in, what are the things you would be expecting to have so that you understood?

P: I would like the teacher to take you know more notice of me, like um as in like if something was going on like and she was teaching us something to explain it a bit better to me, because you know they may have learnt it before I might have not. I might not know anything about that subject. You know and to take more notice, I’m new I might not have done it before so, to come up and explain it to me themselves…personal.

R: Any other aspects you would expect?

P: And also not to get annoyed if I ask a lot of questions because that’s usually what I do to try to get it, you know, usually teachers get annoyed by that, that’s why I don’t know things so well because they get annoyed when I ask the questions but I need to ask questions.

R: So they are the two most important things that you see that would help contribute to learning mathematics? And they are very important too.

P: In your maths class can you recall a sense of belonging to your maths class?

P: No not really, I was an outcaste in that class.

R: Using that word, what do you think may have been contributing to that?

P: Because I don’t understand things that people say. Like I was different to everyone else. When someone tells me something I don’t really get it straightaway and have to explain it to me more and because of that you know that’s why I’ve never really got anything right, many things.
R: So that, you felt like you were an outcaste in so far as the teacher was concerned because…

P: And the other students!

R: And with the other students? So you didn’t feel like you belonged to the group and the other students? Okay, were there, can you think of a certain instance where you felt that quite strongly from the students in your class?

P: Usually when I ask questions they’d all sort of look at me thinking you have already asked that question once before, you should have got it by now or…

R: So in a sense it was coming through on both parts from the teacher and the peers?

P: Yeah.

Troy

R: At what age did you leave school?

P: Fourteen.

R: What were your reasons for leaving school?

P: It was just I didn’t get along with anyone, getting into drugs and that and just being stupid.

R: What was learning mathematics like for you in school?

P: Pretty hard because I never actually sat down and set my mind on it. I was always being an idiot with everyone. So now I am at TAFE try on my own, so I can do it. Like I just couldn’t pick up at school because it was just too hard for me. I was struggling real bad.

R: Was that particularly in mathematics?

P: Yeah, maths, I was good at every other subject, like sports, PE, all that kind of stuff, science. I went all good with that, but maths I was struggling, I am no good at maths.
When you say you weren’t good at maths was that when you started high school or when you were in primary?

No, it was really when I started year 7 at high school. It started getting harder.

So that was Year 7 in NSW?

Yeah.

What you can recall, can you take me through a maths lesson in your school life? A particular lesson. How were you taught? What were you expected to do?

Just roll up to class with these thick maths books and you just go, start from the front and go right through, through the whole book in a whole year. I got a bit of help but like I, the way they were explaining it to me, I couldn’t pick up. It was just, I don’t know, it was hard.

So did you all have the same maths textbooks in your classroom?

Yeah.

The things that you found difficult, what did you actually do?

I just caused trouble then, because I couldn’t do it. Caused trouble and got kicked out of school.

You didn’t feel that you got that support from teachers when you were having troubles with it?

(indistinct) …I don’t think, like I just kept on getting worse.

Can you recall any times when you enjoyed doing your maths?

Not really.

In what ways did you feel you belonged in your maths class?

I didn’t feel right in there, never. I’ve never felt right in there because I can’t do it.

Any thing else about your experiences of school, that you think are worth sharing for you as a young person?
P: The best was when I was in Year 6, I got into the rep side for softball out of all the schools in NSW for softball. That was my best experiences.

R: So it was a sense of achievement? Is there particular ways that you would like to be taught so that you can better understand mathematics?

P: Yeah, at TAFE school. Here I can understand them more, they’ve got more time for everyone, you can associate with them and they’re not like teachers they’re more like friends, you know what I mean. You can just communicate them real good, or I do anyway. So that’s how I’d like my maths learned.

R: How is learning school mathematics as a school student similar or different to for you as a young person…?

P: Heaps different, heaps different here.

R: Take me through all the different things?

P: At school I was struggling real bad, but now I think I’ve got older and I’m starting to mature more and starting to sit down and listen more and they just keep doing it and helping me out.

R: So that’s is something that’s quite different?

P: Yeah, I’ll say, different for me.

R: When you say that they sit down and give you the help, what is it that they actually do?

P: Just help you work it out. No one is ashamed or if you’re not the top of class and stuff like that, you know what I mean. I always used to feel real bad, like when we did our maths some had good marks and I would have crap marks. It used to upset me a bit.

R: And now you don’t feel that is the case?

P: I can sit down and try my hardest and no one picks at you.
R: Any other differences to school? Class sizes, teachers, number of teachers?

P: Yeah, more teachers here, more help.

R: Class sizes about the same?

P: Yeah about the same.

R: What about the workbooks that you work through, is that similar or different to school textbook?

P: It is kind of different to what I am used to. Here it’s on paper, then it was in books and you had to bring your book and do it and you would just write it off the board and that.

R: Do you prefer that way it is here?

P: Yeah.

R: Why?

P: It is easier I reckon like I don’t know I just reckon it is easier.

R: You said that in your class you all had the same textbook, is that right in your class at school?

P: Yeah, everyone had the same all students had the same.

R: Here is everybody working on the same workbook?

P: At their own pace and their own level that they’re working here I think. They’re not straining everyone, like at school I was just getting strained and I was just getting confused, I didn’t know like they would try and teach me one thing one minute and another thing the next.

R: And so that is quite a difference, so you can go at your own pace?

P: Yeah.

R: Any thing else that’s different? How about the environment or the people coming here compared to school? Or the structure here compared to school?
P: It’s different and that’s all it is to me, it’s totally different. I’ve only been here two and a half months and everyone’s pretty cool.
R: Any similarities with school then?
P: No.
R: Any thing that is the same?
P: No.
Damien
R: At what age did you leave school?
P: I left school at September last year, so I was about sixteen, sixteen, and a half.
R: And what were your reasons for leaving school?
P: I had problems in school, and then they said I could leave for a couple of months and then come back the next year. I had an interview with the Principal and that and then they said like you can go to TAFE or something so I came in and chose to go to TAFE and they said next year you can come back or whatever you plan.
R: What was learning mathematics like for you in school?
P: It was easy in some parts. Like all the adding, subtracting, times, long division, pie, and all the algebra and yeah that was pretty difficult for me cause the teachers they wouldn’t five teachers, like they’d put it on the board and tell you to do it and you’d go ah. Yeah so, it was pretty hard.
R: Take me through a maths lesson in your life in your school life.
P: What do you mean?
R: Recall, what was a mathematics lesson like for you in school? What were the things that you did even if you can only remember bits of it? What did you do when you went into class?
P: You’ve got to get your textbooks out like your Year 10 textbook and page they would say like 110 do from them, do A, B, and C and probably have all times and all algebra and whatever, all that kind of plus and adding and all they’d give you a sheet of paper and you’d do all the working out, or do all the working out in your books and they would come and mark you and come past and that is probably about it.

R: In what ways did you feel you were a part of your mathematics class? Did you feel like you belonged?

P: Yeah, cause the teachers would come and give you a hand, and sometimes, off and on, yeah, they’d talk to you, and like you in the class and yeah, they did like me in the class.

R: So you were able to contribute?

P: Yeah.

R: You didn’t have a problem contributing to the class?

P: And they responded to you?

P: Yeah they responded, most times.

R: Can you tell me as much as you can possibly recall of your mathematics experiences at school as a student learning mathematics? It doesn’t necessarily have to be from Year 10 but any experiences at all insofar as whether it be?

P: What kind of experiences?

R: How were you tested? How were you grouped?

P: We were tested and we’d get all the tables and pull them and separate them all so they were all in rows of four about a metre apart from each other and probably two teachers watching to see if any one was cheating and if any one did get caught they’d just get the paper and cross it off and get a circle and they’re out and probably send them to the Principal or something. Yeah that was the same for all testing.
R: Right through high school?

P: Yeah exactly all the same from 8 through.

R: And that was the only way, was that the only way…?

P: That you could be tested?

R: Yeah.

P: Yeah, unless you went in there at lunchtime and did it by yourself or something, that’s another reason.

R: So through the testing you learnt whether you were very good at maths, whether…

P: Or you’re not.

R: And all the things you needed to tackle. So a result of that testing then is the things that you didn’t do well in, did you get the support you needed in order to…?

P: Oh yeah, they would, if they found that you were not so good in division or whatever they would say, ‘did you probably want to stay after class, after school, a couple of half an hours or so and we’ll go through it with you or give you a couple of sheets and you can take it home and see if you can get over it and think it through yourself’. They said that’s probably the best to do it your own self because that’s the way you learn.

R: What about the grouping?

P: Grouping?

R: How were you grouped…(indistinct)?

P: At the start they would probably in from lists of your names going down, they probably go these four people go and sit over here, and these four people sit over here. Or if the teachers are nice they probably say yeah, like you can go and sit with your friends over here. So they’d give you a chance, if you started talking they’d go oh yeah that’s it your out, out here.
R: What about beyond or for example all of Year 10 students so how were all of Year 10 students grouped then?

P: Well it did go down from to I to like the smart people would go to A maths and like average to B and C. They’d do it that way. They would find out who was good at maths and who is okay and who needs more help and they would put them into A group, B group and C group and any one below that they would probably take you to the maths up there, the helping place.

R: And did you see that that was a fair way of…?

P: Yeah that was a good way of doing it, yeah suppose.

R: Thinking about the mathematics you’re learning here as a young person as compared to…

P: Compare it?

R: Compared it, so how, what is similar with what you’re learning here and what is different. This might have something to do with whether it be the teachers, the environment all of those things.

P: For similar it’s the same kind of maths, probably a bit easier these days, exactly the same. But the teachers are different, I think here’s easier to learn because the teachers actually come around and show you what to do, they sit with you and actually show you how to do it when you know it, make sure you know after they leave. That’s different to Merrimac where I went to school and they would show you so you would know, yeah, it’s easier.

R: So that’s different? Any thing else that’s different? Do you feel like you belong here?

Do you have a sense of belonging and coming here?

P: Yeah, probably a more sense of belonging here than was school.

R: Why do you think that is?
P: I can learn easier, the teachers help you more and you just feel like the teachers respect you and you respect them and that.

R: Similarities did you say what they were or not? The maths, did you say the maths was the same?

P: Yeah, it’s different, it’s different, yeah it is the same but it’s different in like some ways, different like problems and it’s basically the same.

R: So do you get a text upstairs to work through or…?

P: No we don’t get a text, we kind of get a text, we get like four books but they’re fairly thick books and they’re like one is for division book, adding and subtracting book and that so if you but all that together it’ll probably be what’s in the textbook so it’s exactly the same.

Trevor

R: At what age did you leave school?

P: Thirteen.

R: What were your reasons for leaving school?

P: I got expelled because I jumped in the pool?

R: What was learning mathematics in school like for you?

P: Hard because they always gave me the hard questions.

R: Why do you think that they gave you harder questions?

P: Because one time I told the teacher to go and get fucked and she didn’t like me so she always gave me all these hard questions.

R: So what did you do?

P: I just packed my stuff and went to the office because I had trouble. I had to go to the office and speak to them and then go back into class and do my work but they kept giving me a hard time.
R: Can you take me through a maths lesson in your school life? How were you taught? What is it that you did when you walked into the classroom? What were the things that actually happened?

P: I just walked in, sat down and I was sitting down rocking on my chair. Everyone else was allowed to do it except me. This was in my maths class, I wasn’t allowed to do nothing.

R: How were you taught in the maths class?

P: Not very good. I went to this place, there was a tutor thing and there was a school ………. High. There was a block way up the end of the hall and you go up stairs and you get tutored by maths, for maths.

R: So if you were having difficulties in mathematics that was where you went for support to help you? Did you find that it helped you?

P: It helped me better than when I was in class.

R: Were there as many students in that grouped compared to in class?

P: Just half our class and a couple of other classes, about three from every other class.

R: What year were you in when you had that?

P: Eight.

R: Year 8. So you felt that that benefited you in your learning of mathematics? In what ways did you feel that you belonged in your maths class? Did you have a sense of belonging there, that you wanted to go there, contributed…?

P: I just wanted to go there to get, like to learn more and that. I didn’t.

R: When you say you didn’t.

P: I don’t know, so I left. I got expelled from there. I am learning more here than ………. High School.

R: You felt like you did belong in your maths class, was that because you were
understanding the maths and could contribute or was it because of your friends?

P: Just because of my friends.

R: That was the motivation for you to go to maths?

P: Yeah.

R: What about when you went to the other maths group for support with your mathematics, did you feel like you belonged there?

P: Yeah.

R: You could talk to the teacher about your mathematics and those sorts of things? So it wasn’t necessarily because your friends were there because…?

P: I wanted to learn.

R: You wanted to learn? A big difference there isn’t there? Can you tell me any other experiences that you had of school mathematics when you were in school? Whether it be the way you were taught or…did you use textbooks or whatever?

P: We were taught with textbooks.

R: How were you tested?

P: What does that mean?

R: How did you know that you weren’t very good at mathematics?

P: Because I tried to fight with her and I couldn’t do it and I got everything wrong and then when I learnt subtraction and addition I could get those things right all the time, but I couldn’t get anything else right.

R: How far back in your schooling can you remember that you were getting some things right…?

P: I was only getting like 50% out of 100%.

R: And that was in your primary schooling as well?
P: Yeah.

R: When the teacher tested you to see how you were going in mathematics so when the whole class did the test, did she the test up on the board with all different headings, subtraction, division, multiplication or was it on a piece of paper?

P: We got the test on a piece of paper.

R: And then they were marked and you got the test back?

P: Yeah, and I failed that.

R: So for how many years, were you, do you think, do you remember how far back you were failing in mathematics, or your tests showed you were failing?

P: I was failing every single bit of mathematics except English.

R: Can you remember back how far?

P: Right back.

R: When you went to high school, say you got all the students in your year, let’s say Year 8, how were you grouped? How were you all put into your class groups?

P: Like how many people? About thirty in each.

R: Were they based on your ability in mathematics or how well you went in mathematics?

P: I think so.

R: Not sure?

P: No.

R: Thinking about the mathematics you’re learning here how is it similar…?

P: Is it similar or…?

R: Or different to school mathematics and how you’re taught?

P: You get as an adult how they get taught. Like at work and there’s better things here,
like you get anything you want. You can have smoke breaks, and the maths is commonsense.

R: What about the support from teachers?

P: You get good support. Every time you get in trouble they try and get us out of trouble and things like and they keep us away from the shops so we don’t get into bad behaviours or anything like that.

R: For you as a learner do you see that it is supporting you a lot more in your mathematics? Have you had to go right back and build up again?

P: Yeah.

R: And that’s been a good thing for you?

P: Yeah.

R: When you’re having some difficulties what do you do?

P: Put your hand up and ask the teacher to come and help me. And she will come down and help me.

R: And what does she do when you say she helps you?

P: If I’ve got something wrong with addition, she will show me how to do and then I will get it right. She will set it out all for me and then I have to do it myself after that.

R: In your groups up here, in the class you’re in, do you move at own pace where you were at before in mathematics?

P: Yeah.

R: Do you think that is similar to school or different to school?

P: I think it’s similar.

R: You could go at your own pace at school?

P: Oh actually no, it’s not similar but you have to go at the speed they tell you to do.

R: Did you find that difficult to keep up with everyone?
P: Yes, because we only had an hour to this test and everyone else had done theirs right on the spot and that’s what the teacher told them to do but I just take it at my own pace and I only got half it done.

R: So what would happen then?

P: I would get a fail.

R: Because you only managed to get through half?

P: Yeah.

R: How did that make you feel?

P: Bad because every time I got home, mum and dad would just chuck psychos.

Diana

R: At what age did you leave school?

P: Thirteen.

R: And what were your reasons for leaving school?

P: I sort of got expelled.

R: Thinking back to when you were learning mathematics in school what was it like for you?

P: Um maths, I don’t know I just thought there was no point to it like were are you going to need this later in life.

R: So when you say you felt there was no point to it…. actually this leads into my next question. When you felt there was no point to it because you didn’t see how it was going to lead you or support you in your future life, what was it that you did in class then? Can you take me through what you actually did as a learner in class but also how you were taught? What did the teacher do?

P: My teacher didn’t like me.
R: How did you know that?

P: Cause they always sent me out and what not.

R: For you as a learner what did you do? What was your regular maths class like when you were in class? What did you actually do, you sat down in your desk and…?

P: The teacher wrote on the board and we had a book that they say exercise this that blah, blah. Yeah and stuff.

R: So when you say you had a book, you had a book, is that a textbook?

P: Yeah everyone had one.

R: And then you transferred the work from the textbook into an exercise book?

P: Yeah.

R: Do you see that that supported you in your maths learning?

P: Suppose like what I know now is from school.

R: Are there other ways that you feel you would have liked to have been taught mathematics compared to just transferring it from a textbook into an exercise book?

P: I don’t know.

R: Okay. In your maths class did you have a strong sense of belonging to your class? Did you feel like you could contribute and share your ways of working things out in the classroom?

P: I’ve always been confident like I’m not worried about saying things in front of people or anything.

R: Thinking about the program here that you are involved in as a young person in TAFE and back when you were in school as a school student, what are the similarities and what are the differences between the two programs?

P: Here at TAFE it is just really too easy for me at least and it’s just so disorganised. The
teachers have no control over the kids or anything, I would prefer to be in school. Yeah, I
don’t know at school I didn’t like it because they were strict and that but now that I am here I
realise why.

R: So that’s a difference?

P: Yeah.

R: Any other differences?

P: No.

R: Similarities?

P: Not really.

R: Nothing is similar?

P: Just desks and the teacher and that sort of thing.

R: What about the mathematics that you’re actually learning here compared to school?

P: School is a lot of harder.

R: You made that point the maths is a bit easier. What about the way you learn it here?

P: They just give us workbooks, that’s it.

R: If you had the choice between textbooks and transferring it to an exercise book and
compared to workbooks do you have a preference which way you would rather do it? Or learn
it?

P: Probably the textbook thing, it is because these workbooks are really easy.

R: When you say they are easy do you go at your own pace.

P: Yeah.

R: You work through them?

P: But most of the stuff here I don’t even bother with it is too Grade 7 for me like.

R: So you don’t feel like you’re being challenged enough?
R: If you had an ideal world for you, what would your learning mathematics be like?
How would you like to learn?

P: I don’t know. I just…

R: The only reason why I am asking is because you made that point that school is more structured whereas here you felt that wasn’t the case so is there, where would be your middle ground, what is it that you would like?

P: To be in a school?

R: School.

P: Yeah.

R: Any other particular aspects of school mathematics that you would like share insofar as you being a learner and how you were taught?

P: No.
Teacher 1

R: In what ways do you as a maths teacher support these young people in their mathematics?

Tch: Well actually, we have our own syllabus here and so what we teach numeracy from Level 1 to level 5 which covers the text from Grade 1 up to Grade 10 at school. Also we provide support for Adult Tertiary Preparation students. And we used to provide support for all the other TAFE students from the other department and also we have nine students in the classroom and it depends on their level and their needs. So usually we do an initial assessment of the student, find out about their needs, and try to satisfy their needs.

R: How responsive do you believe young people are to learning mathematics in this program?

Tch: Very different because we have young students who are very responsive more than a lot in a very short time and also we have students who go outside, and to have a cigarette, not to do any work. If the students are in classroom, if they are interested they learn a lot in a very short time. But unfortunately if they do not want to be there, there is not much we can do. We can not force them to sit in the classroom.

R: Take me through some instances if you can, whereby young people talk about their school experiences good or bad that helped position them in relation to school mathematics.

Tch: Unfortunately, their school experiences are not very positive, not very nice. They usually complain about anything, but some times things are topic, sometimes teachers, sometimes they complain about the pupils among their friends at school. So it worries them a lot. Sometimes I hear, actually very often I hear, why did nobody tell me, why nobody told me this, it is very easy I can do it. Well, I don’t know whether nobody told them before, because I am not in the classroom with them. But sometimes when they listen and you go
through the topic with the students, step by step they get it and they are quite happy about it.

R: Are particular aspects that they specifically identify from within their schooling and learning mathematics at schools, are there things that they, whether it be the way they were taught or whatever, that builds up the good and not so good experiences?

Tch: I guess you know they complain. They are scared to ask in the classroom, they are not going to ask their teachers in the classroom, that’s the one thing. Because when they come over to our department, especially English students and they are young, 15, 16 or 17 years old, they’re not scared to ask any question us any questions even if they have to go back two years, three years ago, five years ago, they still ask us. You know they are not afraid, I just don’t remember this any more. But I guess they won’t do it in the classroom. Then, you know they say the teacher doesn’t help them in the classroom. They complain the topics are too difficult and they don’t too much time to do research for their assignments. I have times when the assignments are not written very clearly and quite often they have mistakes in them. And I guess it puts them off, because it is not easy when you’ve got a mistakes in your assignment, or your homework or in the question it is really difficult for student to discover the mistake and overall it is difficult for us as well. Because you go over and over and I am doing something wrong and then you find out ‘I’m right’.

R: in what ways do you see the mathematics in this program similar of different to school mathematics for these young people?

Tch: Very similar, which I guess here we teach very similar topics, maybe in different ways, but the topics are very similar. What is different is our approach, because maybe we have more time to spend with the students, maybe the students can learn at their own pace, they don’t have to hurry so much, we don’t force them to do one chapter in one session. If they can’t do it is okay, we can split it up. The students are working at their own pace and
they have plenty of time to ask us questions, we try to find enough time to sit down and explain to them every slower, and properly and to go over and over again. We don’t mind explaining things to students the same topic five times because if they can’t understand they can’t gain. Even now we have sometimes we have tutors in the classroom so they can’t understand my explanation they try somebody because they might understand somebody else better. And also it is a one-to-one approach. Like at school in the classroom situation, you’ve got one teacher and 20 or 30 students in the classroom and the teacher usually explains the same topic to 30 students, but in our class it’s more one-to-one where we are usually sitting next to a student and it is much closer on the topic. We are not afraid to talk with them, to say things, to talk about their concerns, about their problems, why they can’t understand, it could happen at school, why they didn’t learn anything at school, why they were so scared, because often they are actually very scared. A lot of them say to me I hate maths, I can’t do it. And they can do it, they need to change their attitude, but unfortunately I don’t know what is wrong with maths but it is a frightening subject.

R: That seems to be one of things that is coming through from the students too, different learning experiences, different teachers, different with tutors and teachers and more of that one to one. So when you actually sit down with the students, what is it you go through, like is there an unspoken way of supporting them in the sense of when you sat down beside them. Is there a procedure that you go through with them?

Tch: It depends on the topic. If it is a topic, which the class is able to do some fantastic work, we just do it. If it is measurement, let’s take an example we measure something, we just measure the lines of the desk, the lines of the classroom, or the lines on the sheet of the paper. We just start, we are just trying to show them what are the differences between the lines, the area, between the volume, and we try to show them all the dimensions. We use concrete
materials if we can and go through everything step by step and slowly because sometimes what they do at school is too quick, it is too fast for the students, they just need time. And also I have from my experiences, I’ve been teaching here for ten years now or may be even more, I see primary school as the biggest problem not so much the high school. I don’t think the kids have the proper base, proper numeracy or maths base in primary school, and then when they come to high school they don’t have the time to go back for them. And of course they stay behind and whilst they are behind they will never catch up. It is too difficult because if they are in high school and they still don’t their multiplication tables, they are still using fingers for basic addition they get into trouble. That is just one part of it. And there is something else and something else. We can go through measurement and if they haven’t got a clue that one metre has got 100 centimetres and they start to do problem solving questions in high school that are more complex, what can you do. Some of them don’t have any, any explanation at all, even if you ask them the area of the window is bigger than the area of the chair they haven’t got a clue. They don’t know what to ask. And of course if they have to grasp high maths, it is very hard, very hard. It is the same like if you give somebody Shakespeare and they wouldn’t know the basic part of it. That’s how it is.

R: In what ways do you see the young people attending the mathematics program, in what ways do they have a sense of belonging or feel as if they are a part of the class group? For them to come to that class group they’re coming and feeling as if they belong because they’re doing something that’s similar and communicating as a class group?

Tch: Yes. Because very often we have two of three different groups in the evening class they are working on the same problem. It is happening but unfortunately it doesn’t very often in the afternoon class because the variety is too huge. It is very difficult not make a group of the students if you put Tertiary Preparation students in the class and Level 1 students because
it is a totally different subject. Two or three totally different subjects.

R: In what ways are young people made aware of their progress in mathematics?

Tch: Well first they get, usually they get the workbooks and their workbooks are their basis and they work through the workbooks with our help. They can see their progress because if they complete one workbook they get another one. If they complete another one they go ahead again. And they can actually see their own progress because when they complete the workbook we sit down with them, we discuss everything, they get the feedback from us here, everyday (indistinct). Here you know where, they know where they need to improve, this bit is not good enough, you still need to work on addition, and you still need work on this and this question to get better. So they get it in their feedback and also if they make a decision to be assessed they do two pieces of assessment. They do two assessment papers and also they have assessment in booklet so when they pass all these assessment and achieve only an acquired outcomes they certificate for their particular level. But they have a choice, they can choose not to be assessed. If they choose not to be assessed they still do all the outcomes, but they don’t have to do assessment papers. They still can go ahead, they are improving, even in their completed Level 2 they can go onto Level 3. It is not problem at all but they will not get a certificate. That’s the difference.

R: So how do they respond when it is acknowledges that they have actually achieved something whether it be a particular concept or the book…?

Tch: They are very happy. Usually they are very happy, they are very proud and they feel very good when they achieve something they didn’t fail. So it is very good for their self-esteem and that is why sometimes they are jumping and screaming, yes I passed, I passed, they are very happy. Even when they complete one workbook and get another one they are so happy as well because feel ‘I’ve done something, I completed something and I am going
ahead. So it is good for their self esteem…(indistinct) because it is really nice to see these young people make progress and feel better about themselves because usually they walk into the class and go I can’t do maths it is too hard, I hate it, I won’t do it. So we actually try to change their attitude as well. Sometimes we have just a nice talk with the student, just to try and tell them ‘well you are good in maths you can do it you just need to change your attitude, just try to see it from a positive point of view and don’t be so angry, don’t set out the goal that you cannot do it. Change your goal and say yes I can do it. If they change their thinking and their attitude usually they pass, they can do it, it is happening.
R: What is the name of the program that you teach?

Tch: It is a Youth At Risk Program and it’s for students fifteen to eighteen years of age who have left school without attaining their year ten certificate.

R: How many hours does the program constitute in a semester.

Tch: The students study six hours of numeracy and six hours of literacy and then plus life skills subjects as well.

R: So when you say six hours of numeracy, is that for the semester?

Tch: That’s per week.

R: Per week? What are the attendance requirements for young people involved in the program?

Tch: Basically there aren’t any prerequisites, we take any kids who really want to continue their education. So this is really a second chance of going ahead and being able to access further courses. So I mean even if a young person comes in that has achieved a Year 10 pass we still put them in because from there they can access further education from this program.

R: In what ways do you as a mathematics teacher support these young people in their learning of mathematics?

Tch: I do not actually teach numeracy in this program, I am not a numeracy teacher in this program, I am a literacy teacher. But as program leader or coordinator, I am sure that the students receive not only outcomes that are very achievable for them, we put in volunteer tutors so that we can give them one on one tutor support. Also we have regular meetings where the teachers, discuss students work and whether they are achieving those outcomes because they have to be supported in any way to meet their different learning needs. We do try to make it vocational based mathematics, so that gives them a meaning for it.
R: How responsive do you believe young people are to this program?

Tch: I think they are very responsive to this program. We have a great success rate with the Youth program. To date we have put through about 2000 young people and we probably have about a 70% success rate where the young people actually go on, with our help into traineeships, apprenticeships, or further TAFE courses. The remainder, they will come back to us because they’ve had a good taste of education and they think okay, we enjoyed ourselves at TAFE and some time they do come back. It might be six months later, it might be two years later. But eventually they do come back.

R: That, would this also require not just the literacy but for their numeracy aspects?

Tch: Yes that’s exactly right. Look I have to be honest most of the young people really don’t even enjoy the numeracy lessons here. You know, it’s just that old habits are just hard to break. You know when they come to us they say, we don’t mind doing literacy but we really don’t want to do numeracy. But because it is a package deal, we find they are succeeding. I think it’s mainly due to the small numbers, we only have fifteen in the classroom usually, and you know with the one on one support. That makes a big difference. I find that most of these kids probably missed out something in primary school and have never been able to grasp it. They’ve missed out on those basics. Once we can go back and take them to the basics then they just go pat with everything then.

R: The pace, you mentioned they had the support here there are fifteen young people in the group with a tutor to support there as well as the teacher.

Tch: Yes.

R: The pace that these young people can move at…?

Tch: I think that’s the lovely thing about the youth program. We direct teach probably for about half and hour and then each student works at their own particular level. After the direct
teaching then each student works at their own particular pace with whatever aspect of the program they are doing. That can be achieved by having small numbers in the classroom and then having the support. Once the kids start achieving there is no stopping them, they’re ready to tackle the next level. That’s really good.

R: So they’re experiencing success.

Tch: Absolutely as soon as they experience success there is no stopping these kids. You know you have kids who come and say wow, I never ever thought I could do that. But by having someone sitting taking the time just makes all the difference. It is all there, you know these kids can achieve but they have to be given time to do it at their own pace.

R: Can you take me through, or take me through some instances whereby young people talk about their school experiences good or bad, that helped position them in relation to school mathematics?

Tch: This is an area that I am quite interested in as well. I have had quite a few discussions with young people under fifteen and well as over fifteen in the Youth at Risk Program and most of the young people say they really enjoyed mathematics in primary until they got to Grade 4. And then from Grade 4 they seem to lose the plot then. I don’t know what that reason is maybe because they are actually being assessed in a different way from Grade 4, I not sure, but they find then that the pressure is really on. That is not only for numeracy it can be for literacy as well. They look at up to Grade 3, they loved school, it was a fun place to be. From Grade 4, 5, 6, and 7 that was when they couldn’t cope because they were put under pressure to achieve the outcomes that were set for them.

R: From then, it’s positioning them so that when they do eventually…?

Tch: That’s exactly right, so I mean so then it feels, they lose self-esteem, they feel they’re a failure. Unfortunately I’ve had some kids that they stupid right back into grade 4 and that
they’re never going to account for everything. And that feeling of worthlessness in the school system then starts to build. By the time they reach grade 8 it is in major proportions because they go from a very small community to a much larger community, so they are completely lost by that stage. Also they find the textbook, they often complain about being taught from a textbook. The teacher will just say, okay turn to page whatever, go through the example with them and then they’re left to their devices. I am knocking the school system because their numbers are just so big in the class and they don’t have the luxury of tutor support so that’s an area that I think really needs to be addressed as well.

R: In what ways do you see the mathematics in this program similar or different to school mathematics for these young people?

Tch: We don’t use textbooks. We start off very small, we take them right back to their primary school mathematics, just to see if there are any gaps that need filling in there and then we build on what they know. Yes we cover the basics in mathematics and then we go on to try to give them hands on mathematics, so there is a reason for them doing it. They’re enjoying it you know. We try to give them real life experience with mathematics that covers all the curriculum requirements but in a fun way or in a way that kids can relate so that there is a meaning for it.

R: So that is something you’re perceiving is different to school mathematics?

Tch: I think so, yeah I think so.

R: In what ways do you see then that young people attending the mathematics program in this course have a sense of belonging or feel a part of the class group?

Tch: In the actually classroom?

R: Well if you see that there are other ways they have a sense of belonging I would like know about it.
Tch: (A) they all come to us thinking that that this is our last chance of having and
education. They have all been through the school system and been disillusioned at some time.
And so that straightaway, they have something in common. They very quickly form a very
tight close knit community. Mainly because of similarity in their backgrounds and also
similarities in their future. They all know that if they get through this program they’re goal
setting for the future. So I think that in it self is bringing them back to (indistinct).
R: You’ve identified those particular aspects of students developing or experiencing that
sense of belonging. Bringing it back to the mathematics in the room…?
Tch: Okay I think basically the fact that they realise for once they are not the only ones who
have difficulties with mathematics. And so it is a lovely sense of belonging and feeling
comfortable in the classroom where you’ve got ten students who are flying ahead of them. So
because we assess them and put them at their particular level in mathematics then they feel
comfortable in the knowledge that there might be fifteen students at their level. So then that’s
encouraging them to try different things without the fear of failure, and without being
ridiculed, because I think that’s important to young people.
R: So with their peers, and this has been identified with the students that yes we get the
support with the tutors and teachers in the group, but they’ve said we also have a sense of
belonging because the person who sitting beside us…
Tch: Peer tutor, yes that’s exactly right.
R: They’ve identified that that is also way of them belonging because they are
communicating about something that is mathematical but they wouldn’t normally connect
with.
Tch: That’s right. That’s exactly right and we encourage that too because I think peer
tutoring definitely has a lot of benefits. And even if a young person is unsure and thinks that
he might copy that person’s work at least he is coping it. Providing it’s the right way of doing it, but even then it's a way of learning, you know by copying things. So you know I haven’t got a problem with that at all.

R: In what ways are young people made aware of their progress in the numeracy component.

Tch: The teachers actually have benchmarks that they assess them at different levels. I think the way it is done they have to proceed through five or six booklets and each one is a ‘J’ mark on their assessment schedule. We give them an assessment, which we don’t call them an exam, it is just a letter of how their going. They do that midway through and once they achieve that then we go onto more interesting things for them. So the first five booklets that they do are just the basic numeracy or mathematics things. We assess on that and when we are confident they can achieve that then we go onto the more varied forms of things for them.

R: A ‘J’ mark can you explain that?

Tch: ‘M’ is not yet competent, ‘J’ is competent. I don’t know why they brought that in. I think it was to get over the P for pass and F for fail.

R: What are student reactions when they get a ‘J’?

Tch: They’re ecstatic. You know as I said, they are so used to failures in their life, when they get that ‘J’ they think wow, this is terrific can we do the next one? So immediately once they get that positive feedback, okay what’s next? They're ready to take on the world then. I think a lot of these young people at risk here haven’t much encouragement along the way. I know young man said to me when he received his certificate ‘Wow this is the first certificate I’ve ever received, I can actually pin that on my board with all my suspension certificates and exclusion certificates’. He was just so proud. I thought isn’t sad that he has gone all through school and surely there must have been something at some time that he could have given him
a pat on the back for.
R: What is the name of the program you teach?
Tch: Certificate in workplace vocation practices and far as I know.
R: Do you know how many hours that constitutes a semester for attendance?
Tch: For the kids? I am actually not sure, I think they’re allowed two to three days off in the whole course. I just came in a month into the actually program so I am not quite sure of the details that they came up with in the beginning. But I know they’re allowed about two or three days off in the entire length of the course. They go for fourteen weeks and they come here from 8:30 to 4:30 Thursday, Friday.
R: In what ways do you as their mathematics teacher support these young people in their learning of mathematics?
Tch: Generally I have tutors and things to assist me. We always split up and I might go with this sort of group of kids that I know or they like to leave the room or something like that and Carol will work with the kids that she knows or something, and Bill will work with others. Generally we have a tutor for two or three of the kids and we all work together and try to get those two kids focussed on us so that they don’t leave for starters because that’s a big plus there because they generally leave all the time. Sometimes we try to hone in on who has got the actually ability levels, where we try to put them together. So we teach like ability levels, but it doesn’t work, not with those kids because they don’t want to move over, they want to be with their friends and they don’t want to feel segregated, so I don’t do that. Generally I’ll teach to the class and the tutors will, I’ve got to look and eye contact each other, if I know they won’t get it, I’ve just got to go and just sit with them and work through that with them. Generally we just let them go and they feel free to ask us anyway. They don’t feel threaten to ask us a question.
R: And is it like that from the very beginning or is that something that…?

Tch: From the morning you mean, or the beginning of the course? Well I wasn’t here for the first month, so I have sort of come in in the middle. When I was first there, I am sure they were a bit apprehensive to ask me anything. I was always there, but they would always go to the safety net of the people who have been there from the beginning, like their tutors. But now, now is not a problem.

R: So that rapport has been built up?

Tch: Yeah. Over time at first there was really no respect just generally. If I wanted to ask them anything or if you told them to do anything, it would be like, bleep, bleep, bleep, bleep they’d go at you. Now they’ll apologise or they’ll say I’m just joking you know, yeah I’ll do it sort of things. They actually want to do it for you now. They’ve actually matured, I’ve seen them mature over the month and a half or something that I have been here. They ask for assistance so they need it, some of them won’t but you know who they are now, since I’ve worked with them for so long.

R: How responsive do you believe the young people are here learning mathematics in this program?

Tch: Very responsive actually. But as the day wears on they’re lax, goes down the drain. In the morning if I was to go and put a whole white board of sums on the board and right I want you to sit there and start they would actually probably do it. But I find that too structured and too teacher orientated and too do here at TAFE. It’s something you would do more in a classroom and that’s why these guys aren’t at school because they don’t like it. Even though they would do it, I don’t do it because they would dislike it more than anything. I usually let them warm up, what was the question? I’m getting off track.

R: It’s all part of it though.
Tch: Yeah, you generally have to let them warm up and start really slowly. Like they are suppose to be in the class at 8:30, but they don’t get in there until after 9:00.

So that just goes to show they are not the type of kids that run by regimented time sort of time frames. So they come in and you warm them up by saying get your pink maths booklets out work through this section because that is what we are doing to day. And then generally half of them might do it and the others might be looking or knowing that is going on. Then I’d slowly putting something on the board or then I’d say look I’ve done this worksheet at home, have a go. The ones of higher ability I download things off the net, that is for higher level, Year 11 sort of thing. Like I’ve got to level to them as well because they would finish it in two seconds. Some of them are eighteen so you can’t be too babyish either. So yeah, to maths more I feel because they complain about english while they are in there. So I’m lucky this is maths, because english seems to be a lot harder for them, for most of them. Pretty much they warm, you lump it on them and then they get sick of it and then you’ve got to stop. That’s in a summary.

R: Can you take me through some instances whereby young people talked about their school experiences good or bad that has helped position them in relation to school mathematics?

Tch: A lot of it has got a lot to do with being able to communicate with their teachers I feel. But I think to do with the teacher personal, they take the teacher’s attitude towards them personally, they’ve taken it internally and so they’ve thought well I’m not going and doing anything to you either and I’m going to be difficult and I’m not going to do anything so that’s actually hindered all their learning. No instances for mathematics specifically though. But generally when they talk about their schooling, they talk about how they hated their teachers, that’s the main thing. How they picked on me because of my older brother or they pick on me
because I’m known to be bad. (indistinct) but they assume that I have. That’s the general story consensus among all of them for everything. That’s pretty much it.

R: In what ways do you see the mathematics in this program similar or different to school mathematics?

Tch: Different because you can go anywhere with it. It’s had in company to work, it was already run in a way which I wouldn’t have probably done in the beginning if it was me personally, too much structure is enough for my liking. I’m just not ordered, I don’t where all the kids are at specifically, exactly but that’s okay they’ve just gone and given them pretty much everything all at the beginning and said right go through it. Whereas I would have probably given them one strand of mathematics at a time and like work through that and then done the next one and whatever else with that. It’s the same as school in that you cover the same content, but different, they get more help, more one on one because there are actually more people, ratio teacher to eight students I guess and different because they don’t have to do this today. They don’t have to get that worksheet done and handed in and they actually just work through on their own I guess at their own pace and they are allowed to take it home.

R: In what ways do you see young people attending the mathematics, the program have a sense of belonging or feel that they belong to the class group?

Tch: How do they belong?

R: Yeah, do you see that they belong?

Tch, Yeah they do.

R: Belong would be whether it be in the mathematics component only, are they communicating with their peers or it might be a broad.

Tch: General…when I first came it was very, you could tell they must have been very new, they were all very separate and now they are all actually started to hang around together out of
school as well. Like I can gauge from their conversations. They actually like coming and sit in their own sort of seats, they don’t move around all the time, they’ve got their own part of the room that they like to stick to. During their other subjects that we do on Thursday afternoons I put stuff up on the wall that they have actually done, just so they feel like they own the room, and like it’s our room with our things up around the room. They generally, I think feel safe. They like it in that room, that’s their room.

R: And what about insofar as their mathematics in concerned? Do they feel when it is time for doing mathematics do they feel a sense of belonging at that point in time because everybody or their peers are working on mathematics?

Tch: Yeah. I think so.

R: Do you see instances whereby they’re supporting one another when they’re having problems?

Tch: All the time, like that is a constant thing. That’s a constant thing. There are certain children in the group who are just way beyond the Level 2 maths that they’re doing and won’t even need to be asked. They actually go around themselves and sit between the teachers and they actually tutor them and help them doing the worksheets. Not even getting angry and they think they can manage the problems and actually go and help them. They are so patient, whereas everything else in their life their not so it is actually quite so it is actually quite interesting to watch. And then the other kids who have trouble know who to go to as well out of their friends. Yeah, they do all the time, and if they don’t know they’ll help each other anyway. They tend to copy the wrong answer, not being mean, but they copy the wrong answer they won’t know but here have a look, this is how I did it.

R: So how does that make you feel as the teacher in the classroom?

Tch: I love it. I think it is fantastic that they are interacting like that. Because generally I
think they learn better off their peers, because you see they speak their language and they do off their teacher. I just find myself not as the person who’s going to teach them everything, I think of myself as the person who provides it all and then says right I am here if you need that extra assistance. Here it all is, work it out.

R: Do they, do you openly give them permission or is it something that just happens?

Tch: That they help each other?

R: Yeah.

Tch: No I’ve never said it, I’ve never said not do it and I’ve never said too do it. Sometimes I do say, if I’m with that person, that person I actually gone and said so and so can you do and help blah, blah, blah. But they would have done it anyway so they would have actually looked up. Yeah, it is nothing that has ever been said.
Tch: 6-program manager

R:   What is the name of the program that you coordinate?

Tch: I am the program manager of the adult literacy and numeracy department at the . . . Institute of TAFE which is held on four campus, . . . , . . . , and . . . to a degree. Also I am a coordinator for the LANT program or the LLMP program which is held at the moment at the Coolangatta campus. So we have five coordinators, as I said I’m the coordinator of LLMP, . . . is the coordinator the Youth Program, . . . is the coordinator of literacy, . . . is the coordinator numeracy and . . . is the coordinator of disabilities. Overall I am the program manager as well as the coordinator.

R:   In what ways are the young people here in this program upstairs get supported in their mathematics learning?

Tch: I don’t have any direct experience of them working mathematics, I haven’t taught the mathematics, I only see what happens. I guess they’re supported in ways that they’re supported indirectly in a number of ways in the program. These kids come to us with all sorts of problems not just numeracy problems. Their life difficulties have an impact on everything else that they do here. So for instance, the kid that I just took to . . . Wasn’t going to be learning any maths this afternoon. She was able to do that considering what had happened to her. We support them in any way we can just with their general being if we can, with some one to talk to over issues that affects them. I am blown away by the life experiences of these kids, it’s just, and it’s in a world that’s so removed from mine that it never ceases to amaze me. But yeah, just talking to them, listening to them, letting them share stuff if that’s what they won’t to do. That’s all part of the role, but I would certainly never pry. If they come to you with stuff and talk about it, that’s all well and good. I guess I haven’t got a lot to say about numeracy because I don’t really know what goes on.
R: How responsive do you believe the young people are to learning mathematics in this program?

Tch: I think that the program helps them to be responsive to learning in general. So whether it is mathematics or numeracy or even any of those life skills, just the fact that the groups smaller we really try to listen. We really try to be there. I think that makes learning easy, a lot more pleasant and easier I guess. Most people, the ones who work in the youth program, are attuned to the kids needs and so they do try their best to realise that these kids are not the general kids who are out there. So they try as best they can to make the learning as easy, I don’t mean easy as in difficult or easy, but is easy for those kids and as pleasant as they can and as interesting as they can. Not everybody succeeds to the same degree, and I am not saying that and I am not saying that we’ve got all the answers or that we provide the best learning situation that there is. Most people are sympathetic to these kids and really want to do something to help them.

R: Take me through some instances whereby young people talk about their school experiences good or bad that help positioned the young people in relation to school mathematics? But that can be generalised in a way so in a sense their school experiences help position them in relation to school. So for example if its been a really good experience insofar as their school mathematics concerned their positioning then in that classroom is more positive and compared to somebody who’s struggling other issues are coming so their positioning is possibly, or they may well be positioned whereby they might be excluded or marginalised.

Tch: I’m not sure what the question is. I know you’ve talked, and given me a lot of information. Can we get back to the question again?

R: Take me through if you can whereby young people talk about their school experiences
good or bad that helped positioned them in relation to school mathematics?

Tch: So are you asking me to give you instances where they’ve provided positive positioning?

R: Positive or negative and again I realise this is not confidential information I want, but it may well be that they have shared an experience with you. For example, one the teachers said, the child said I never learnt area when I was at school. The reasons why didn’t learn area, or one of the reasons why I had trouble was because I had trouble with multiplication table, and then of course it builds up from there.

Tch: I don’t know that I can give you examples. I know that I hear kids say that they basically no good at maths. And I hear them repeat that back to me quite often. I do a lot of initial assessing so I also find that when I tell them that they’ve been successful or that they’re really good at that, and I’ll put you in the top class, then they get really surprise. It is lovely to see, they get quite a buzz, they really do. They are not used to anybody saying gee you did that well. It doesn’t happen very often I don’t think and for a lot of reasons. I am not trying to bag the schools, I’ve been there I know what that’s like. But they don’t hear it very often, no. Maybe even relative to those kids, what I’m doing or what they’re doing for me may not be all that terrific when you compare it back into what they’re doing in the schools, but that experience of success and being told that you’re okay and actually good at something is actually new for them. So I don’t think I’ve answered your question.

R: In one part you have, even with the initial assessment. Whereby the example you have just provided. They’re being positioned in a way where they view themselves quite negatively insofar as mathematics is concerned.

Tch: Definitely.

R: And then coming here you do the initial assessment and then you’re saying they are
going there, that’s where you are talking about their reaction there.

Tch: Yeah. They’re quite blown away. I had this kid I had yesterday who I did the same thing with down at Coolangatta. She was shocked. She couldn’t wait to get outside and tell her grandma. And it just so happened that a mate of hers from another school, a previous school that she had been to was there, she told her as well. It was kind a lovely to see in a way.

R: I am sure it is. In what ways do you see the mathematics in this program similar or different to the mathematics that young people learn at school?

Tch: With the limited experience I have there. The answer will be limited. But I see it as more relevant to their lives because I have my owns kids studying maths at school and the stuff they do, half the time I don’t even know what it is about. And I passed Year 12 mathematics but a long time ago. But a lot of it just doesn’t seem relevant and it is a lot slower here I guess. There’s not as much to be covered and there is more time for people to spend with kids to actually work things through. That’s is what they need.

R: So it is the pace?

Tch: It’s the pace, it is the content, it’s not the pressure on them to really whiz through, or feel that they are not in the successful class. They’re just in the class here and they work with people. We try and match people up so they can help each other. Better kid with another kid if that’s possible. I just don’t think there’s the stress on them and the stigma again at the same time.

R: In what ways do you see that young people attending the program here have a sense of belonging or feel a part of the class group?

Tch: I guess they feel that all the time that’s pretty obvious. They feel a sense of belonging to this place, it’s kind of there’s. They’ve claimed it. Sometimes that’s a bit of a problem with
the adults who are here. But they kind of have their bit and they claim their little territory.
Yeah, I think they feel really secure here. Certainly feel secure with the staff, and even with
the kids. There is obviously from time to time but yeah, mostly it is probably one of the few
places where they feel reasonably secure. Because some of these kids don’t feel secure in
their homes and they didn’t feel secure at school.
R: Do you think they would see the fact that they do feel secure here it is the motivation
to come here as well?
Tch: The motivation to…?
R: To actually come here two days week or is it three days week…?
Tch: Two this group goes for two.
R: The fact that they feel secure or feel a sense of belonging here is that also the
motivation to come?
Tch: Yeah, definitely, definitely. And they, yeah. There’s kids they feel comfortable with. It
would be silly to think that they could come to bully every kid. Of course there’s problems
but by and large, they feel more comfortable here I would think than at school or at home or
even in some other places. So yes, the fact that they think they’re getting something at the end
of this that there is something to work towards and that mostly people are good here and the
kids are good here, that’s all motivation for coming.
R: In what ways are the young people made aware of their progress in mathematics?
Tch: I suppose I am not really familiar with that. I’ve talked to some of the teachers about
getting kids to self-evaluate. I think that’s really important, so that even if they don’t, or we
don’t feel that necessarily even achieved a huge amount, if they feel they have that is probably
more important than if some else does. And the other thing is they can actually think well
okay, I know that I’ve gotten here which is good, I’ve attend for a number weeks, which is
great, and yeah, I can do this, I can do this now, I couldn’t do it before. They usually have an initial assessment at the beginning so they can see the areas where they need to work at. And yeah, they should be able to look at that at the end and say that I’ve able to do this, this and this. Yeah, I think their self-evaluation is more important than our evaluation or our assessment in you like. Yeah I think that is much more important. I think that’s important for all us. If we keep looking to other people to say we’re okay, then we need to be able to say we’re okay ourselves because our opinion is more important than anyone else’s. But that’s just me being me.
As a tutor what is your role as part of the mathematics program?

To be with the students and to help if they need help. Not to interfere, but to encourage them to keep working because they loathe it, because they’re not good at it. The students that I have are usually the lower achievers and because they’re not good they’re loathed to do it. So there needs to be encouragement and to be there to help them. And they sometimes are allowed to use calculators and sometimes their things need to be done without them. They look on the calculator as an umbilical cord, something they can really rely on. So they really don’t like to have to work without it. Not all of the children are like that, just the ones that I have in my group.

In what ways do you as the mathematics tutor support these young people in their learning of mathematics?

I would help where they need help. I can’t do the work for them. If I can see they’ve made mistakes I say let’s go back and have a look at what you’ve done here. Mind you, most of the stuff that I do with them is fairly basic, so it is not something that should be beyond them or beyond their age of learning. A lot of it is they don’t understand the symbols. They don’t realise that you can’t, or they don’t seem to realise in a subtraction sum, just because 6 won’t come out of 4 they can turn it around and take 4 out of 6. So some of them don’t have the fundamental concepts.

When you say that you sit with them and support them and if you see at some point, they haven’t got it, what is it that you say or what is it that you do?

Well let’s go back and look at this, you can see at a glance that it is not right. I then go back, then take them through, and say to them, you can’t, must take the bottom number from the top number, and what you do is borrow from next door. Whereas the method for
subtraction now is that, you take that from the top number instead of taking from the bottom number. I have to remember to do that. Instead of that being 6 from 4, it becomes 6 from 10, you can’t turn it around and do it the other way. Something as simple as that, you know I have had experience, it’s not all of them I must add, but it is some of them. You can’t just say well that’s wrong the answer is such and such.

R: Why?
T: They’re not going to learn anything really. You know, if they’re going to at this late stage, and they’re fifteen or fourteen year old some of these children, and they really can’t understand that you can’t take a big number from a small number, you’ve got to make some allowance for them. They really haven’t got the basic things, so if I do it for them they’re not going to learn how to do it and often times you need to just have a piece of paper and do another one so they can, you know it is not in their booklets.

R: So when you do that you get them to work on, you just do one up quickly on a piece of paper and get them to work through it and then you sit there and they show you their working through on that particular subtraction.

T: Yes. Division is another thing that a lot of them have difficulty with, simple division. You know that, and these are some areas where they don’t let them use calculators, the concept needs to be understood.

R: What is it that the young people do, or what is it that you do when you are sitting with one or two of them, at what point is it that you leave that particular person and move onto to somebody else.

T: When you see that they are coping and they’ve just got everything is right then you can just move quickly around to somebody else and very often you end up back with the one person who has great difficulty.
R: How responsive do you believe young people are in learning mathematics in this program?

T: If they had their choice they’d leave it I think. You know, the cleverer ones just breeze through, but the others, I think they’d (indistinct) as do anything rather than do mathematics.

R: Take me through some instances whereby young people talk about their school experiences good or bad that helped position the young people in relation to school mathematics?

T: A lot of these children I think they’ve been in big trouble at main stream schools. A lot of them find great difficulty in sitting still and I can imagine that they’d spend a fair bit of time in isolation in the classroom where they, A because they’re disruptive. And they talk to each other, which in a classroom situation is untenable for a teacher. You can’t have one child disrupting the whole class, and you can see why it happens. But here, although you don’t, I am probably more of a disciplinarian than, Rhonda has a great rapport with the students and also Robyn, who I tutor the young students with. But I am probably more, I’d like them to sit still and listen, you know or sit still and read, but you know you have to stop yourself from interfering and a lot of them swear a great deal and you just don’t chastise them, just let it wash off you like water off a duck’s back. But, I think a lot of them have had bad experiences from school, they’ve, and a lot of them have probably got themselves into a culture where they’re not at home some of them. They’re living away from their families, you know I don’t think a lot of them see a need to learn, they can survive without it. A lot of them are here only because their funding will be taken away if they don’t come to TAFE. So they’re, it’s totally different and I think they get the support here from the teachers because, it is loosely based rather than disciplinarian and the structure of the classroom of a main streamed school.

R: Have any the students expressed individually about their particular experiences of
mathematics in school?
T: Not really, but those one’s that I usually tutor, you know some of their mathematics is almost nonexistent. They would have been elided, they were just passed over. They have had to have been. Although they do have in mainstream schools recovery programs where they try but if the children are not willing or if there is not some incentive to do it, I think sometimes they get wrong footed to the extend where they can’t allow themselves to agree to learn anything I think. Otherwise they wouldn’t be, a lot of these children are out of the mainstream schools, and for some reason they’re here. Otherwise they would be in schools because they’re not old enough to be anywhere else. I think that they, but they’re loathed, they don’t very often tell you a lot of really personal stuff, unless you ask them. And very often they would be evasive.

R: In what ways do you see the mathematics in this program similar or different to the mathematics these young people learn at school based on your experiences?
T: The students that I’ve had with the mathematics have been very low leveled and it’s simple, simple stuff. They’ve never got to the higher level of book to pass through, A because they’ve never passed through the first book. So it is a bit hard to judge how they’re going with, in comparison to mainstream schools. But here they get, once they become ‘J’, they get a ‘J’ for joy because they’ve passed that level then they can go on, and they can then start another outcome. I think there is probably in that there is more scope to feel they’ve achieved, you know, even if it is only at a low level. And there is nothing like having a little bit of joy in your life to achieve something to make you want to go on and do something about it. But some of it is quite basic stuff.

R: So they’re working at their own pace?
T: Yes, there is no pressure, you know if they do one page or they whiz through a whole
book that’s fine. Just to have achieved a level of doing is quite good.

R: What is it that they do when they do get to the end and they have that sense of achievement?

T: They just love to have all the, in their folders they just love to have the pages and the ‘J’. They just find that that is a great goal for them. It is a visible sign, instead of getting a report card at the end of the term which you’ve got A, B, or C for maths whatever the grading is in mainstream schools, they can see if they’ve worked hard this week, they’ve got a ‘J’. They’ve got something to show for it. So I think for them it is very important.

R: In what ways do you see that young people attending the mathematics program here have a sense of belonging or be a part of their class group here?

T: It’s hard to pinpoint how they feel a part of the group. But there is a camaraderie amongst them that they are a part of the whole class, whether it be doing maths or English or computers or whatever. They also have friendships amongst them. I was sick that last time I was here at class and I was sitting two boys and another one came up and he wanted to borrow money. You could see that he was loathed to lend it but because he had it his conscience overcome and eventually he gave the boy the dollar that he wanted. He was going to pay it back tomorrow, I don’t know whether it was or not. So yes, there is a sense of family there, and when they’re doing they all do maths, do they all do English or whatever is a part of their thing.

R: Do they support one another when they are doing they’re doing their maths.

T: Yes. If you see two of them sitting together side by side, one will lean over and say so and so this. So they self tutor to them. They have their favorites, their likes, the ones they like to be with and so forth. But they accept that from each other.

R: In what ways are young people made aware of their progress in the mathematics
program?

T: There’s visible evidence with the sheets with the’J’s and also going through the booklets and so they start off with the, once they’ve the lower levels they can then progress through up until, I don’t know how many is there, half a dozen…?

R: Seven.

T: Yeah, seven levels. Which some of them achieve in a breeze and some struggle through and I had one boy who never got past the first book. And he was one of the older students. He really couldn’t see any point in doing it. He came because his parents thinking, and he had to come to get funding, but other than that he was always looking for an excuse to go off, to leave early, he had a bus to catch. At first he wouldn’t even speak to me but eventually he was a very quiet sort of kid and eventually he did.

R: So what did you do for him? What was he telling you that he was achieving even if it was the tiniest of steps?

T: You never criticise or put them down, because they are fairly fragile individuals a lot of them. But at first he couldn’t speak to me, but eventually he got to telling me different things about his family and what his mother did, and what his father did and stuff like that. He didn’t even like me sitting beside him at first and I had to be very careful how I approached him and he even spoke quietly. He wasn’t a loud child at all, although he was almost he was still only like a little runt. He was a tiny little fella, I don’t know what happened to him. I haven’t seen him this year. He came to accept the fact that I was there to help him and not criticising him.

R: So it became, insofar as him understanding that he was making progress, you supported him in the way that (indistinct)…as time went on.

T: He accepted, there was that acceptance.
R: Perhaps that understanding whereby he was making progress regardless of how small in mathematics, but also within the fact that you showed that acceptance that this person can be here to help me if I need it and watch over me. With the other children in the program how are they all made aware of their progress? Through using the ‘J’? That’s how they’re made aware of their progress?

T: Yes, they all have their own folder. They don’t take them home because they can be lost and so forth. Rhonda collected them up and the end. But they love their folders to be full of things that are ‘J’. ‘J’ for joy, once they’ve got a good outcome that’s it.
T: As a tutor what is your role as part of the mathematics program?

T: As the tutor I just quietly stay in the background and as an extra to the teacher. She can direct me to any students who are having problems, or who are not moving as quickly as some of the others. But it is more my looking myself and just doing a general sit down and how are you going. After a while, after a few weeks you get to know the ones that you sort of need to … but you don’t show your favouritism by spending all your time, you do keep a balance.

R: In what ways do you as a mathematics tutor supports these young people in their learning of mathematics?

T: Just sitting quietly going through the paper. A lot of the times they rush, they don’t read the questions so we take it back to basics, read the question maybe once or twice first, look at the question, summarise what the answer might be going to be and then we actually set out a plan on how to work out the answer that they want. Then if they have difficulty I will just make up some similar ones until they get the hang of it. You can see when they grasp it in their eyes, or when they saying yes but still struggling with it.

R: When you’re providing that support have they asked for it? You mentioned that you stand back and then you initially just observe…?

T: Observation is a big thing, and you can see somebody who is struggling or apparently switching off because their thoughts are wandering away to somewhere else because they haven’t grasped it because they can’t move on any further. They’re not used to asking for help the ones who are here. But if you quietly do it, I don’t know behind the scenes sort of thing, just sort of slowly, if you sit in beside them and then when they’ve got your trust and they know that you are not putting them down or saying you’re really stupid because you didn’t
get it first time around then they will start to come and seek you out. But initially they won’t, they’d rather sit there.

R: Why do you, from your perceptions, why do you think they don’t like initially asking for help?

T: I don’t know, but my opinion would be and it might not be a correct opinion, but my opinion would be coming through school with classes of 30 or 35 in them. If they did initially put their hand up to get help and because they haven’t got right back to the basics I think that part of the answer would be explained to them. Sometimes, with most of these kids they haven’t grasped the basics and they don’t even know their times tables, so they can’t even take in what an ordinary class teacher is saying to them because they can’t relate to it.

Whereas a bright child who has kept and didn’t get the answer to one or two little things they know what the teacher is talking about all the way through and then they fine tune it and say you have to do this. These kids, it is just a jumble of words because they don’t even grasp the basics and you have to walk them right through it.

R: And that has an impact on them?

T: Well they shut down after a while. They’re not going to put their hand up and be told words that they don’t really know and get further bamboozled and just think well while did I ask. Often the teacher is very busy, and I am not saying anything about the teachers, but with the current work, they haven’t got the time to go back to. I’ve heard teachers offer to take children through in their morning tea of lunch break and things like that but often these kids have sort of dropped back that far behind and get another life in the playground and they’ve got more important things to do in the playground than take the teacher’s offer.

R: How responsive do you believe young people are to learning mathematics in this program here at TAFE?
T: Very responsive.

R: In what ways do they indicate this, what is it that they do?

T: Because of their worksheets, how they start off at the beginning of the intake and by gradually working with them you can see they can grasp this and they think, is that all there is to it? Then they move on to the next section. Yes, just the slow improvement in their worksheets, the speed with which they get through them and their knowledge just spreads right out. It does not just become adding and subtracting, they can divide, they can look at areas, and they can, you know.

R: Take me through some instances whereby young people have talked about their experiences of school mathematics that helped position them in relation to school mathematics?

T: I am not quite clear.

R: For example, if a student has shared a particular experience of a concept or a mathematical problem and they didn’t get it in school and did that position them by them not getting in school, did that position them in the classroom whereby they didn’t really feel like they were achieving? And so have there been moments where young people have actually shared those experiences here?

T: Yeah, and sometimes they’ve taken on the responsibility themselves, and say I used to just sit up the back and draw because they didn’t know where to start and it was so far advanced, and by missing the basics, I keep coming back to them, that they just missed out on the basics they cannot understand from there. A lot of them don’t even know their times tables, they don’t know what seven sixes are or five threes are, they’ll five times to get fifteen by threes. But even that they are speeding up because they’re seeing the value of knowing that quick background of information to help them on their way.
R: Have you had any young people share good experiences of mathematics?
T: Not in this, in schools yes. For the average student I think maths is fine and there are some fabulous teachers out there, but not for these ones, it’s not a fine line, it is a very thick line between.
R: In what ways do you see the mathematics in this program as similar of different to the mathematics; these young people are involved in school?
T: It is so much a lower level.
R: Here?
T: Yeah here.
R: When you say that what do you mean?
T: I used to be in behaviour management at Benowa High School so that meant all of these ones that used to get expelled from class or sent out of the room, they used to come to my room and I’d work with them. They’d either be there for up to a day or a week depending and often I would just sit with them and finish assignments with them because they might be there because they might be there because haven’t finished an assignment for weeks and just don’t care. And then they go back with their assignment finished and things like that. So I have worked with a lot of ordinary children who were just naughty for a day or two and I found it quite a struggle going through their Grade 10 maths book with them and I’d often have to ring the maths teacher to come up and spend five or ten minutes with them because it was beyond me. Yet I am more than capable with coping with this, but mine is not just straight maths tutoring here, it is a blend of, being with the kids, it’s a relationship thing.
R: It is important that you identified that because that is something that has come out with the young people, the support there, and the tutors.
T: It’s more of a support system and the maths comes second. Well that’s the way I work,
others may not work but I prefer to get to know the student really well, look for their good points and empower them and praise them wherever I can. If I do go crook it’s over and done with and forgotten and the next time you are exactly the same with them. Yeah, it is more relationship building and then once that’s built you can have really big break through.

R: Talking about, you mentioned that…

T: Well the relationship builds while you’re working on the maths with them originally and then once the relationship is established it becomes much more mathematics in the tutoring side, but the relationship is never lost, it’s there.

R: Do you feel with that relationship these people, these young people are starting to build up a sense of trust?

T: Definitely, most definitely.

R: One of things that came out on many occasions was that they are treated like human beings, or their adults. They feel that, and they talk about that trust when you’re working with.

T: Yeah, and that’s their perception and that’s where they are in the school, that’s right but for me to say generally that’s definitely not the case with them. Well, if I were one of them I would get that feeling.

R: Well again it is their reflections of their experiences.

T: Yeah and they are very definite reflections. From their perceptions they would be quite accurate because I have seen them discarded and people can’t be bothered with their behaviour. They’ve got too much to, the teachers, they really have got too much to do. They can’t work like this, so I think hand in hand with the regular schooling I think this is a definite need to pick up the ones that slip through.

R: I just want to come back to the mathematics that the young people work through here. Can you explain what they actually work through here?
T: I don’t set any of the work, all I know is they have booklets. They have seven booklets. To be assessed they must complete the whole seven booklets. But where the work comes from or who sets it originally I don’t know. I just work from the booklets, with the students. I don’t question that part of it. I mean any body could see that it is quite low mathematics but when they start to get it, that the light and you know, the feeling that they get, you know, from working it out on their own is magic.

R: In what ways do you see that the young people attending the program here have a sense of belonging or feel a part of their class group?

T: There is a lot of peer groups here. Before in high school they were probably the half a dozen outsiders or something. They just didn’t get it or their behaviour ostracized them a bit but here they’re all that way. So yes they can relate really well. I think that has a fairly calming effect. When they first, at the beginning it is quite erratic when they’re sorting themselves out, when they come from different school and different things, but when they start interrelate they realise they’ve all had the same experiences and that makes a closeness for them. After a while I’ve seen one helping another one that’s moved along a bit quicker and things like that. I’ve never seen that happening in the school classroom.

R: So they support one another in here?

T: It’s a real bonding because of their experiences through school.

R: So there’s a sense of belonging insofar as communicating mathematically. So for example, if they’re helping their peers or if they’re sitting with a group and there might be four of them working on same problem and one might guide the other three or …

T: Yes and they’re happy to take that guidance on.

R: And so the mathematics in that sense is part of developing purpose?

T: Yes, they need a sense of purpose and then it’s all built around the purpose and the
R: In what ways are the young people made aware of their progress in the mathematics?

T: In the maths, we have like I said seven booklets and they work through. It is signed and date and then we get them to put their signature on it as well so they’ve okayed it that they’ve worked through and so they feel they are a part of the assessment process and the sheet of paper is taped on the front so they can see what book they still need to work on. The first one or two is sort of slow progress, but when they see the columns starting to fill they will often volunteer to take a book home and work on it so they can get their columns filled up quicker. It’s an ongoing effect, the more they get done, and the more they want to be there.

R: So it becomes, because they’re seeing their progress…?

T: They’re filling in all those blanks.

R: And the enthusiasm starts to build?

T: And they want work through the thing as quick as they possibly can.
Appendix 8: Information Letter and Consent Forms for TAFE Director, Staff, Students, Parents and Carers
Dear . . .

I am seeking the support of your TAFE College in relation to a study I am currently researching. The aim of the study is to identify through young people’s reflections of their experiences of school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those, which exclude students from actively participating, and learning.

This study is being conducted for the purpose of meeting the higher degree, of a Ph.D. The supervisor and therefore chief investigator involved in this study is Dr Robyn Zevenbergen. Dr. Zevenbergen holds the position of Senior Lecturer in Mathematics, School of Education and Professional Studies, Griffith University, Gold Coast Campus.

In this study, I am researching the issues in the practices of school mathematics which enhance student learning and those, which exclude students. The purpose of this research is to establish several key issues. These are: what are the practices of school mathematics which enhance and support young people in learning mathematics; what are the practices of school mathematics which exclude young people in their learning of mathematics; and how are young people’s reflections of their experiences similar or different when participating in the Youth Reconnected Program at TAFE.

The commitment of school personnel includes volunteering to take part in the research and the time for one focused/open-ended interview in Term 2. This is sufficient to provide data to
be used in the study.

The procedures to be undertaken in your college will involve a case study approach, as this approach offers a rich source of information and highlights specific aspects that are relevant to this study. The research technique used will be focused and open-ended interviews. The intention is that the reflections from young people will provide a rich understanding of their experiences of school mathematics. Similarly the reflections from teachers will provide supporting evidence of their perceptions of the TAFE program and the young people attending the program.

This project is for the purpose of research and not part of the curriculum or school activity. There are no foreseeable risks to the participants of this study.

Benefits from this study may include a more in-depth awareness of the issues associated with how and why school mathematics supports particular groups of young people and excludes others. Furthermore, it is hoped that this study will identify how further education and training programs of numeracy support young people who have left school. Feedback will be provided in the way of a summary of the overall outcomes of the research work.

In the event of participants needing to contact the Chief Investigator (s) about any matter of concern regarding the research she can be contacted - ROBYN ZEVENBERGEN Griffith University – Gold Coast Campus – telephone: 07 55528632 or BRONWYN MCMAHON Griffith University – Gold Coast Campus – telephone: 07 55528144.
Participation in this project is voluntary and refusal to participate will involve no penalty, and participation may be discontinued at any time without penalty or without providing an explanation.

The University requires that all participants be informed that if they have any complaints concerning the manner in which a research project is conducted it may be given to the researcher, or, if an independent person is preferred, either

The University’s Research Ethics,
Kessels Road, Nathan, Qld 4111, telephone 07 38756618; or
The Pro Vice-Chancellor (Administration), Bray Centre, Griffith University,
Kessels Road, Nathan, Qld 4111, telephone 07 3875 7343.

Confirmation of support for this project is required no later than Friday 3rd May 2002.

Thank you for your assistance with this research project.

Yours sincerely

..............................................

Bronwyn McMahon
School of Education and Professional Studies
Griffith University – Gold Coast Campus
PMB 50 Gold Coast Mail Centre Qld 9726
Telephone: 07 55528144
Email: b.mcmahon@mailbox.gu.edu.au
Dear .....................

I am seeking your support as a TAFE teacher of numeracy in relation to a study I am currently researching. The aim of the study is to identify through young people’s reflections of their experiences of school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those, which exclude students from actively participating, and learning. Your reflections from a teacher’s viewpoint on TAFE mathematics and the perceptions of young people attending the program are important for this study.

This study is being conducted for the purpose of meeting the higher degree, of a Ph.D. The supervisor and therefore chief investigator involved in this study is Dr Robyn Zevenbergen. Dr. Zevenbergen holds the position of Senior Lecturer in Mathematics, School of Education and Professional Studies, Griffith University, Gold Coast Campus.

In this study, I am researching to identify the issues in the practices of school mathematics which enhance student learning and those, which exclude students. The purpose of this research is to establish several key issues. These are: what are the practices of school mathematics which enhance and support young people in learning mathematics; what are the practices of school mathematics which exclude young people in their learning of mathematics; and how are young people’s reflections of their experiences similar or different when participating in the Youth Reconnected Program at TAFE.
The procedures to be undertaken in your college will involve a case study approach, as this approach offers a rich source of information and highlights specific aspects that are relevant to this study. The research technique used will be tape recorded focused and open-ended interviews. The intention is that the reflections from young people will provide a rich understanding of their experiences of school mathematics. Similarly the reflections from teachers will provide supporting evidence of their perceptions of the TAFE program and the young people attending the program.

This project is for the purpose of research and not part of the curriculum or school activity. There are no foreseeable risks to the participants of this study.

Benefits from this study may include a more in-depth awareness of the issues associated with how and why school mathematics supports particular groups of young people and excludes others. Furthermore, it is hoped that this study will identify how further education and training programs of numeracy support young people who have left school. Feedback will be provided in the way of a summary of the overall outcomes of the research work.

In the event of participants needing to contact the Chief Investigator (s) about any matter of concern regarding the research she can be contacted - ROBYN ZEVENBERGEN Griffith University – Gold Coast Campus – telephone: 07 55528632 or BRONWYN MCMAHON Griffith University – Gold Coast Campus – telephone: 07 55528144.

Participation in this project is voluntary and refusal to participate will involve no penalty, and participation may be discontinued at any time without penalty or without providing an explanation.
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The University’s Research Ethics,
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The Pro Vice-Chancellor (Administration), Bray Centre, Griffith University,
Kessels Road, Nathan, Qld 4111, telephone 07 3875 7343.

Confirmation of support for this project is required no later than Friday 3rd May 2002.

Thank you for your assistance with this research project.

Yours sincerely

…………………………………………

 Bronwyn McMahon
School of Education and Professional Studies
Griffith University – Gold Coast Campus
PMB 50 Gold Coast Mail Centre Qld 9726
Telephone: 07 55528144
Email: b.mcmahon@mailbox.gu.edu.au
Consent form for Principal of TAFE

The aim of the study is to identify through young people’s reflections of their experiences of school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those, which exclude students from actively participating, and learning.

I understand that I am not required to participate in this research project if I do not wish to do so and that I can withdraw from the study at any time without needing to explain my reasons for withdrawing. No loss of benefit or treatment will occur as a result of my withdrawal nor penalty be incurred

Feedback from this study will be provided to participants involved in the study in the form of a summary of the outcomes of the research work.

In this study, confidentiality of the data will be maintained. As this study seeks the viewpoints of young peoples’ experiences of school and TAFE mathematics there is no purpose in recording specific names of participants, school and TAFE College.

All participants will be offered the opportunity to remain anonymous.
All information will be treated with the strictest confidentiality
Interviewees will have the opportunity to verify statements when the research is in draft form.
I have read the information sheet and the consent form. I agree to participate in the investigation why young people opt out of school mathematics and how they are supported in further education and training and give consent freely. I understand that the study will be carried out as described in the information statement, a copy of which I have retained.

I realise that whether or not I decide to participate is my decision and will not affect my studies, my treatment, and my continued role as a principal/teacher. I also realise that I can withdraw from the study at any time and that I do not have to give any reasons for withdrawing. I have had all questions answered to my satisfaction.

Signatures:

………………………………………………………………………………
Participant

………………………………………………………………………………
Date

………………………………………………………………………………
Investigator

………………………………………………………………………………
Date
Consent form for TAFE teacher

The aim of the study is to identify through young people’s reflections of their experiences of school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those which exclude students from actively participating and learning.

I understand that I am not required to participate in this research project if I do not wish to do so and that I can withdraw from the study at any time without needing to explain my reasons for withdrawing. No loss of benefit or treatment will occur as a result of my withdrawal nor penalty be incurred.

Feedback from this study will be provided to participants involved in the study in the form of a summary of the outcomes of the research work.

In this study, confidentiality of the data will be maintained. As this study seeks the viewpoints of young peoples’ experiences of school and TAFE mathematics, there is no purpose in recording specific names of participants, school, and TAFE College.

All participants will be offered the opportunity to remain anonymous.

All information will be treated with the strictest confidentiality.

Interviewees will have the opportunity to verify statements when the research is in draft form.

I have read the information sheet and the consent form. I agree to participate in the
investigation of why young people opt out of school mathematics and how they are supported in further education and training and give consent freely. I understand that the study will be carried out as described in the information statement, a copy of which I have retained.

I realise that whether or not I decide to participate is my decision and will not affect my studies, my treatment, and my continued role as a principal/teacher. I also realise that I can withdraw from the study at any time and that I do not have to give any reasons for withdrawing. I have had all questions answered to my satisfaction.

Signatures:

……………………………………………………………………………………
Participant

………………………………
Date

……………………………………………………………………………………
Investigator

………………………………
Date

Dear TAFE participant
I am seeking your support as a young person who has experiences of school mathematics and participating in a TAFE numeracy program. The aim of the study is to identify, through your reflections of your experiences of school mathematics, how school mathematics supported or conversely did not support you in your mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those which exclude students from actively participating and learning. Your reflections from a participant’s viewpoint about school mathematics are important for this study.

This study is being conducted for the purpose of meeting the higher degree, of a Ph.D. The supervisor and therefore chief investigator involved in this study is Dr Robyn Zevenbergen. Dr. Zevenbergen holds the position of Senior Lecturer in Mathematics, School of Education and Professional Studies, Griffith University, Gold Coast Campus.

In this study, I am researching to identify the issues in the practices of school mathematics which enhance student learning and those, which exclude students. The purpose of this research is to establish several key issues. These are: what are the practices of school mathematics which enhance and support young people in learning mathematics; what are the practices of school mathematics which exclude young people in their learning of mathematics; and how are young people’s reflections of their experiences similar or different when participating in the Youth Reconnected Program at TAFE.

The commitment from your involves volunteering to take part in the research and the time for one tape recorded focused/open-ended interview in Term 2. This is sufficient to provide data to be used in the study.
The procedures to be undertaken will involve a case study approach, as this approach offers a rich source of information and highlights specific aspects that are relevant to this study. The research technique used will be focused and open-ended interviews. The intention is that the reflections from young people will provide a rich understanding of their experiences of school mathematics.

This project is for the purpose of research and not part of the curriculum or school activity. There are no foreseeable risks to the participants of this study.

Benefits from this study may include a more in-depth awareness of the issues associated with how and why school mathematics supports particular groups of young people and excludes others. Furthermore, it is hoped that this study will identify how further education and training programs of numeracy support young people who have left school. Feedback will be provided in the way of a summary of the overall outcomes of the research work.

In the event of participants needing to contact the Chief Investigator (s) about any matter of concern regarding the research she can be contacted - ROBYN ZEVENBERGEN Griffith University – Gold Coast Campus – telephone: 07 55528632 or BRONWYN MCMAHON Griffith University – Gold Coast Campus – telephone: 07 55528144.

Participation in this project is voluntary and refusal to participate will involve no penalty, and participation may be discontinued at any time without penalty or without providing an explanation.
The University requires that all participants be informed that if they have any complaints concerning the manner in which a research project is conducted it may be given to the researcher, or, if an independent person is preferred, either

The University’s Research Ethics,
Kessels Road, Nathan, Qld 4111, telephone 07 38756618; or
The Pro Vice-Chancellor (Administration), Bray Centre, Griffith University,
Kessels Road, Nathan, Qld 4111, telephone 07 3875 7343.

Confirmation of support for this project is required no later than Friday 3rd May 2002.
Thank you for your assistance with this research project.

Yours sincerely

………………………………..

Bronwyn McMahon
School of Education and Professional Studies
Griffith University – Gold Coast Campus
PMB 50 Gold Coast Mail Centre
Qld 9726
Telephone: 07 55528144
Email: b.mcmahon@mailbox.gu.edu.au
Dear Parent or Carer

I am seeking your support as a parent or carer of a young person attending a TAFE numeracy program I am currently researching. The aim of the study is to identify through young people’s reflections of their experiences of school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those which exclude students from actively participating and learning.

This study is being conducted for the purpose of meeting the higher degree, of a Ph.D. The supervisor and therefore chief investigator involved in this study is Dr Robyn Zevenbergen. Dr. Zevenbergen holds the position of Senior Lecturer in Mathematics, School of Education and Professional Studies, Griffith University, Gold Coast Campus.

In this study, I am researching to identify the issues in the practices of school mathematics which enhance student learning and those, which exclude students. The purpose of this research is to establish several key issues. These are: what are the practices of school mathematics which enhance and support young people in learning mathematics; what are the practices of school mathematics which exclude young people in their learning of mathematics; and how are young people’s reflections of their experiences similar or different when participating in the Youth Reconnected Program at TAFE.

The commitment on your part includes allowing the young person who is in your care to volunteer to take part in the research and the time for one tape recorded focused/open-ended
The procedures to be undertaken will involve a case study approach, as this approach offers a rich source of information and highlights specific aspects that are relevant to this study. The research technique used will be focused and open-ended interviews. The intention is that the reflections from young people will provide a rich understanding of their experiences of school mathematics.

This project is for the purpose of research and not part of the curriculum or school activity. There are no foreseeable risks to the participants of this study.

Benefits from this study may include a more in-depth awareness of the issues associated with how and why school mathematics supports particular groups of young people and excludes others. Furthermore, it is hoped that this study will identify how further education and training programs of numeracy support young people who have left school. Feedback will be provided in the way of a summary of the overall outcomes of the research work.

In the event of participants needing to contact the Chief Investigator (s) about any matter of concern regarding the research she can be contacted - ROBYN ZEVENBERGEN Griffith University – Gold Coast Campus – telephone: 07 55528632 or BRONWYN MCMAHON Griffith University – Gold Coast Campus – telephone: 07 55528144.

Participation in this project is voluntary and refusal to participate will involve no penalty, and participation may be discontinued at any time without penalty or without providing an explanation.
The University requires that all participants be informed that if they have any complaints concerning the manner in which a research project is conducted it may be given to the researcher, or, if an independent person is preferred, either

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Confirmation of support for this project is required no later than Friday 3rd May 2002.
Thank you for your assistance with this research project.

Yours sincerely
………………………………
Bronwyn McMahon
School of Education and Professional Studies
Griffith University – Gold Coast Campus
PMB 50 Gold Coast Mail Centre Qld 9726
Telephone: 07 55528144
Email: b.mcmahon@mailbox.gu.edu.au

Consent form for young person as participant

The aim of the study is to identify through young people’s reflections of their experiences of
school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those which exclude students from actively participating and learning.

I understand that I am not required to participate in this research project if I do not wish to do so and that I can withdraw from the study at any time without needing to explain my reasons for withdrawing. No loss of benefit or treatment will occur as a result of my withdrawal nor penalty be incurred.

Feedback from this study will be provided to you as a participant involved in the study in the form of a summary of the outcomes of the research work.

In this study, confidentiality of the data will be maintained. As this study seeks the viewpoints of young peoples’ experiences of school and TAFE mathematics there is no purpose in recording specific names of participants, school and TAFE College.

All participants will be offered the opportunity to remain anonymous.

All information will be treated with the strictest confidentiality

Interviewees will have the opportunity to verify statements when the research is in draft form.

I have read the information sheet and the consent form. I agree to participate in the investigation why young people opt out of school mathematics and how they are supported in further education and training and give consent freely. I understand that the study will be
carried out as described in the information statement, a copy of which I have retained.

I realise that whether or not I decide to participate is my decision and will not affect my studies, my treatment, and my continued role as a principal/teacher. I also realise that I can withdraw from the study at any time and that I do not have to give any reasons for withdrawing. I have had all questions answered to my satisfaction.

Signatures:

.................................................................

Participant

..............................

Date

.................................................................

Investigator

..............................

Date

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Consent form for parent or carer of participant

I am seeking your support as a parent or carer of a young person attending a TAFE numeracy program I am currently researching. The aim of the study is to identify through young people’s reflections of their experiences of school mathematics how school mathematics supports or conversely does not support young people in their mathematics learning. The intention is to develop an understanding of the practices of school mathematics which enhance student learning but also those, which exclude students from actively participating, and learning.

I understand that I am not required to allow the participant in my care to participate in this research project if I do not wish them to do so and that I can withdraw them from the study at any time without needing to explain my reasons for withdrawing. No loss of benefit or treatment will occur as a result of my withdrawing them nor penalty be incurred.

Feedback from this study will be provided to you as a participant involved in the study in the form of a summary of the outcomes of the research work.

In this study, confidentiality of the data will be maintained. As this study seeks the viewpoints of young peoples’ experiences of school and TAFE mathematics there is no purpose in recording specific names of participants, school and TAFE College.

All participants will be offered the opportunity to remain anonymous.

All information will be treated with the strictest confidentiality.
Interviewees will have the opportunity to verify statements when the research is in draft form.

I have read the information sheet and the consent form. I agree to allow the participant in my care to participate in the investigation why young people opt out of school mathematics and how they are supported in further education and training and give consent freely. I understand that the study will be carried out as described in the information statement, a copy of which I have retained.

I realise that whether or not I decide to allow the participant in my care to participate is my decision. I also realise that I can withdraw the participant in my care from the study at any time and that I do not have to give any reasons for withdrawing them. I have had all questions answered to my satisfaction.

Signatures:

Participant

Date

Investigator

Date