Raising the curtain on mathematics identity: The drama of transition to secondary school

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Abstract

Many people reach adulthood having been denied access to positive mathematics learning experiences. At some point during their schooling they seem to have developed a mathematics identity of failure, helplessness or fear. This study aimed to better understand how this happens by focusing on learners' identity construction at a particular time in their schooling: the transition to secondary school. Defining identity as a performance enabled an understanding of identity as situated firmly in the social context. This drew attention to the ways that context shapes identities.

The study followed 22 students through the transition to secondary school. Interviews were conducted and observations made in mathematics classes at four key points during the 18 months in which students transitioned from Year 8 to Year 10. Interviews were also held with teachers and parents of the students. The data were combined in different ways to present the learners' mathematics identities within the metaphor of identity-as-performance. Vignettes play scripts, monologues and more traditional summaries of data were used to illustrate: key elements of the learners' identities; the context (or stage) in which they learn; and the role that others play in recognising (and therefore shaping) mathematics identities.

Mathematics identity performances were found to be constrained by the context in which they were enacted. They were shaped by both teachers and peers, and affected by past performances. Learners in the study were often 'co-performing' other identities (such as 'friend'), and these co-performances at times did not work well with their mathematics identity performance. These co-performances frequently linked to the wider socio-political context of mathematics learning, raising issues of access and equity. Common teaching practices such as streaming by ability and procedural explanations impacted on learners' mathematics identities. In particular a misalignment between what the teachers saw as desirable and what was possible in their classrooms became evident. Furthermore, the ways in which students were recognised by their teachers fed into a recognition cycle which affected pedagogy, students' self-recognition, and their subsequent identity performances.

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Table of Contents

Introduction

As we take our seats in the auditorium we glance across at the curtained stage, but it gives nothing away. What sort of production will we witness here tonight? Our thoughts flick to the billing; let go your preconceptions it said, this show will not be typical. We eagerly await the appearance of the prologue; it will tell us what to expect and how to interpret the performances to follow.

Prologue

In theatre terms the word prologue refers both to the text (or performance) that opens the play, and also to the person who speaks it (Bruster & Weimann, 2004). This is the prologue, but also *I* am the prologue. My voice will be evident throughout. I begin with a short semi-fictional play.

A short play

SCENE: *Four women are in a living room, drinking tea or coffee. Each has a baby either sitting on her lap or having 'tummy time' on the floor at her feet. The sounds of four pre-schoolers playing outside can be heard in the distance. The radio is on in the background.*

RADIO AD: And consolidate all your debts into one package. Only 17.99% per annum.

LISA: Woah! Do people realise how much 18% per year would be?

MOTHER 1: Well, you are a maths genius. Doing a PhD in maths and all.

LISA: I am going to do a PhD in maths education not actual maths… But 18% per annum, why would someone sign up to that?

RADIO VOICE 1: And there are eight more chances to win…

RADIO VOICE 2: *(Interrupting*) Don't you mean nine chances?

RADIO VOICE 1: Oh, yes, nine – I was always useless at maths!

LISA: (*To radio in an exasperated tone*) That wasn't being bad at maths, that was just mis-counting. I hate it when people say things like that.

MOTHER 2: (*With pride*) Well, I never got maths, I don't have that sort of brain.

LISA: You can count to nine though, right?

MOTHER 2: (*Laughs*)

MOTHER 1: So with your PhD are you going to sort out maths teaching? It was so boring at school. Hours of writing notes from the blackboard. And you never use it.

MOTHER 3: I loved maths … Until fourth form when I had Mr Brown. He just ruined maths for me. I didn't even get School C maths.

MOTHER 2: I got left behind in maths at school. I really, really struggled with it. And then I really just got left behind. I didn't enjoy it because I couldn't do it. I was frustrated, I was embarrassed.

LISA: (*Quietly*) I guess that is why I am going to do this research.

END SCENE

The mothers in this play have been denied access to powerful and positive mathematics learning, and this is a tragedy. I have experienced many conversations like this over the years, indicating that this sort of tragedy is a reality for many. These conversations provided me with part of the motivation for undertaking this PhD. I wanted to understand how such emotional responses to mathematics were formed, what it was about people's experiences of mathematics education that generated this sort of talk – talk I never heard in relation to other school subjects. Why was it so easy for a radio DJ to flippantly say they were useless at mathematics in reference to a simple mistake of counting? Why do some people sound proud of not being able to do mathematics? Were people's perceptions of boring, irrelevant mathematics teaching warranted? Could one teacher be responsible for ruining a student's mathematics learning potential? And how might someone's learning experiences generate embarrassment even many years later? These questions all relate (either directly or indirectly) to issues of identity. It seemed logical to me that research into the concept of identity in mathematics was vital to help understand the feelings and attitudes expressed by those I met.

My own background is in teaching. I taught students at intermediate school (Years 7 and 8) for around a decade. As a specialist in mathematics my ultimate aim was to avoid tragedies such as described in the play above. I always tried to instil in my students enjoyment of and competence in mathematics and to set them up for success at secondary school. And yet I did not really know what happened at secondary school for these students in terms of mathematics learning. Was it at secondary school that they formed such strong emotions regarding mathematics, leading to the kind of comments voiced by the mothers in the play? Although at times I taught students who initially expressed negative attitudes towards mathematics, these did not seem to be entrenched or debilitating like those expressed by some adults. I wanted to understand the development of mathematics identity and I chose the transition to secondary school as the context for my research into this.

I do not intend to suggest that it is secondary school alone that is responsible for any or all of the ills in mathematics education. Rather, because I was so familiar with intermediate school it would have been difficult for me to 'make strange' the experiences of mathematics learning in that context. The context of secondary was foreign enough for me to see it through an outsider's eyes. During the process of this research I too made the transition to secondary school with my student participants; and in doing so I had a fresh view of their experiences in this context. Yet many of the findings can also be applied to other transitions and to other mathematics learning contexts.

Finally I am also concerned with issues of equity. The latest PISA results reveal an ever-widening gap in mathematics achievement for New Zealand (Ell, cited in Davison, 2013). Participation in mathematics brings privilege and opportunity (George, 2009; Mendick, 2002), and improving equity of access should be a key task for mathematics education (English et al., 2008). Those students who are less able to construct positive mathematical identities, as they adjust to what it means to be a learner of mathematics at secondary school, may be effectively excluded from mathematics learning. Previous research suggests certain groups in society will be over-represented in this excluded group;

for example: ethnic minorities, girls, those from lower socio-economic backgrounds, and those with lower prior mathematics attainment (Evangelou et al., 2008; Galton & Morrison, 2000; Noyes, 2006; Wylie, Hodgen, & Ferral, 2006). Such research looks at the context of transition as an equity issue; and equally there is much research on identity in mathematics education that is also concerned with equity (Gutiérrez, 2013; Lerman, 2012; Mendick, 2005a; Nasir & de Royston, 2013; Walshaw, 2011). Identity and school transition are important for equity and therefore worthy of continued research.

Research Questions

There is a subtle difference between studying transition via an identity lens and studying identity in the context of transition. I attempted to illuminate both identity and transition issues by switching back and forth between each perspective. My aim was to understand better the effects and processes of transition to secondary school. My aim was also to understand better the concept of mathematical identity and in particular the role it may play in issues of equity. These aims led me to the following research questions:

What types of identities do students enact as they transition to secondary school?

How does transition to secondary school impact on students' mathematics identities?

How does recognition of identities impact on the students' experiences of mathematics learning?

How are issues of equity implicated in identities at the transition to secondary school?

Organisational Structure

A metaphor of theatrical performance is used to frame this thesis. The writing is organised in three Acts, each with five chapters. Act 1, *Behind the scenes*, provides the background to the study. Acts 2 and 3 each contain four chapters which are a mixture of analysis and results. The fifth chapter in each act is a summary discussion.

In Chapter One of Act 1 I review the identity literature within mathematics education. Chapter Two develops the theoretical framework of the thesis using a metaphor of performance for identity. In Chapter Three I review the literature on transition to secondary school, and the contexts for the study are further developed in Chapter Five. The methodology of the thesis is described in Chapter Four.

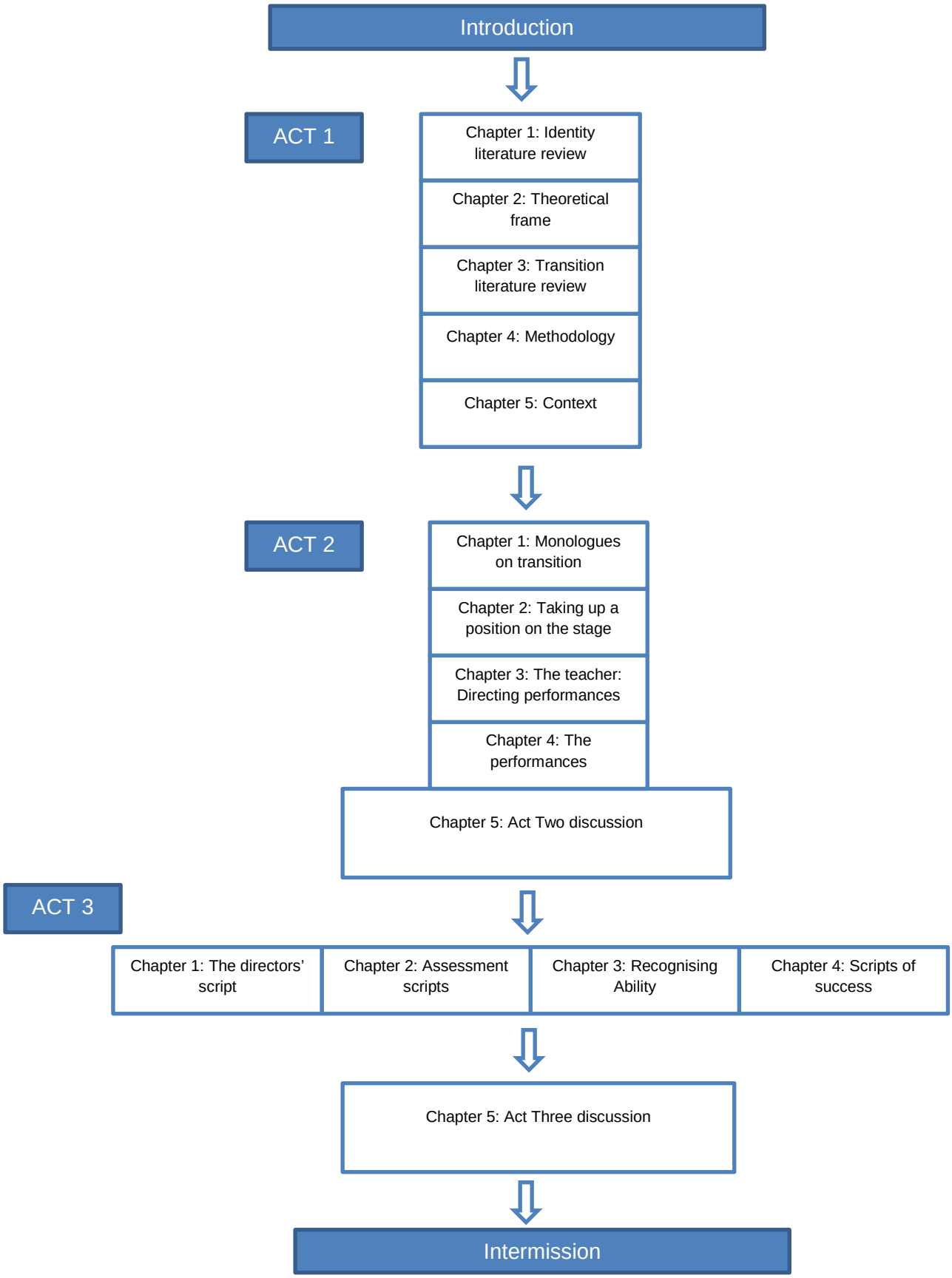
With Act Two, *The performances*, I answer the first two research questions by focusing on the identity performances and the theme of change at transition to secondary school. In this act I proceed in a linear manner, exploring the transition as it happens and building up to a description of the identity performances the students enact. Chapter One uses monologues to look at the moment of transition. In Chapter Two I use positioning theory to discuss secondary school as a stage, whilst teacher direction is examined in Chapter Three. I give examples of some identity performances in Chapter

Four. In Chapter Five I draw together the themes of the previous four chapters and answer the first two research questions.

Act Three, *The audience and the scripts*, answers the third and fourth research questions, utilising the notions of scripts for performance and recognition of identity. I begin with the performances of 'mathematics learner' at transition to secondary school, as given in Act Two, and deconstruct them. I do this by looking at teachers' scripts for performance in Chapter One; assessment scripts in Chapter Two; the recognition of ability through streaming in Chapter Three; and the recognition of 'good at mathematics' by students in Chapter Four. In Chapter Five I use the previous chapters to look at notions of misaligned scripts, impossible co-performances and misrecognising the mathematics learner.

Where one might expect to see a conclusion I have instead written an 'Intermission'. The intermission contains everything one would usually read in a conclusion but I use this terminology because I contend the show is not over. The student participants have not concluded their secondary education and their plotlines have not yet played out. My findings represent beginnings not endings; many questions are raised and future research may take responsibility for the second half of the show.

In order to help the reader navigate this thesis, the following page contains a flow diagram that summarises its structure.


Introduction
ACT 1
Chapter 1: Identity literature review
Chapter 2: Theoretical frame
Chapter 3: Transition literature review
Chapter 4: Methodology
Chapter 5: Context
ACT 2
Chapter 1: Monologues on transition
Chapter 2: Taking up a position on the stage
Chapter 3: The teacher: Directing performances
Chapter 4: The performances
Chapter 5: Act Two discussion
ACT 3
Chapter 1: The directors' script
Chapter 2: Assessment scripts
Chapter 3: Recognising Ability
Chapter 4: Scripts of success
Chapter 5: Act Three discussion
Intermission

ACT ONE

Behind the Scenes

Chapter One: Identity Literature Review

Mathematics education research has traditionally been dominated by cognitive factors (Heyd-Metzuyanim & Sfard, 2012) and the domains of psychology and mathematics (T. Brown, 2008). Over the past few decades there has been an increase in research with a sociocultural focus, often termed the "social turn" (Lerman, 2000) in mathematics education research. Now it could be argued there is another turn: towards the use of the concept of identity in research (Chronaki, 2013). Identity is a rapidly growing area for research in mathematics education (Lerman, 2009, 2012; Stentoft & Valero, 2009).

A focus on issues of identity in mathematics education research is useful for at least three reasons. Firstly it can help us to theorise about mathematics learning in general (Grootenboer & Zevenbergen, 2008) perhaps by deepening our explanations for learning. Identity has been referred to by Sfard and Prusak (2005) as the "missing link" in the "complex dialectic between learning and its sociocultural context" (p. 15). Secondly it is related to issues of power (Gutiérrez, 2013) and access (English et al., 2008) and therefore to equity concerns. Thirdly it helps us to understand the participative experiences of the individual, for example exploring the reasons people may choose to continue or discontinue the study of mathematics (Boaler, Wiliam, & Zevenbergen, 2000). Identity is a lens that is adjustable; one can zoom in to the level of interactions between individuals or zoom out to look at the wider socio-political context (see also Lerman, 2001; Stinson & Bullock, 2012). We can look at the big picture, that is, at issues of mathematics learning in general. We can look at the experiences of specific groups of people and at issues of equity. Or we can look at the individual level, such as trying to understand learners' relationships with mathematics. Whichever level of the zoom, identity provides a lens through which we can analyse, understand and deconstruct a situation (Stinson & Bullock, 2012).

In this literature review I will begin by discussing three works from outside the discipline that have helped to shape identity research in mathematics education. I will then discuss the challenges apparent in defining identity and outline some broad categories of identity definitions, drawing on research within mathematics education to illustrate these. These examples are by no means exhaustive, however it is hoped they will exemplify both the variety of views of identity and also the differing purposes of identity research. As a next step I will explore the ancestry of identity research and the possible impact of this ancestry on the inconsistencies in the ways in which we view identity within our discipline. Finally I will make an argument for the usefulness of one particular category of identity definition, that which is used in this thesis.

Background - Outside the Discipline

Much of the research on identity within mathematics education stems from work outside the discipline, from areas such as sociology, anthropology, psychology, and education (Black, Mendick, & Solomon, 2009; Nasir, 2002). Within mathematics education it is the socio-cultural theories of identity that

dominate (Stentoft & Valero, 2009). For the purpose of this literature review I will begin with three key works that are drawn on by a number of writers on identity in mathematics education, particularly those who take a socio-cultural perspective. The books are: *Communities of Practice: Learning, Meaning and Identity* (Wenger, 1998) and *Identity and Agency in Cultural Worlds* (Holland, Skinner, Lachicotte, & Cain, 1998) and the article *Identity as an Analytic Lens for Research in Education* (Gee, 2000).

Wenger (1998) describes learning as happening through participation in communities of practice and the construction of identities in relation to these communities. Those who draw from socio-cultural theories such as Wenger's see mathematics learning as happening through participation in a social ecology and through the processes of identity development and communication (Esmonde, 2009). Learning is "identity-in-the-making" (George, 2009, p. 201). Identity can be defined as "not an object, but a constant becoming" (Wenger, 1998, pp. 153-154).

Wenger (1998) discusses how identity mirrors practice, and outlines identity as being formed through the negotiation of our participatory experiences in various communities, again tying it intrinsically to learning. By focusing on identity one can examine issues of non-participation or exclusion from a community of practice. It is not difficult to see how this view resonates with mathematics education researchers and theorists, as identity can be applied to social views of learning within the local community of the mathematics classroom and also broadened out to the more global idea of belonging to the wider mathematical community.

However, although the concept of a community of practice was developed in a range of situations, it deliberately excluded the context of schooling (Lave & Wenger, 1991). When Wenger (1998) further elaborated these ideas within the location of a claims processing workplace, identity was linked to learning through a process of the novice's induction into a community of experts. The classroom is not at all like this situation as it has one expert (the teacher) and a community of novices. As such the use of this concept to analyse the mathematics classroom has been questioned by some researchers in mathematics education (see for example Boylan, 2005; Kanes & Lerman, 2008). Despite this, it is a concept that remains influential for identity research (see: Boaler & Greeno, 2000; Boaler, Wiliam, & Zevenbergen, 2000; Cobb, Gresalfi, & Hodge, 2009; Goos & Bennison, 2008; Graven, 2004; Nasir, 2002; Solomon, 2007b, 2009).

Holland et al.'s (1998) notion of identity is also culturally situated and formed through social practice. They define identity as people's self-understandings:

> People tell others who they are, but even more important, they tell themselves and then try to act as though they are who they say they are. These self-understandings, especially those with strong emotional resonance for the teller, are what we refer to as identities. (p. 3)

Holland et al.'s conception of identity includes two distinctive aspects which interrelate. These are figurative identities, to do with storylines and generic characters, and positional identities, to do with one's position in relation to another or 'status'. Some researchers within mathematics education have

found this distinction useful. “Whereas positional identity is grounded in specific communities … figured identity focuses on the ways in which individuals enact the less-localised identities, ‘being a maths geek’, for example” (Hodgen & Marks, 2009, p. 33).

However, such a split definition makes an already complex concept even more so. It may be difficult for researchers to operationalise this view of identity. Many of those who utilise the theories of Holland et al. make more use of the notion of ‘figured worlds’ than that of ‘identity’ (see for example Boaler & Greeno, 2000; Esmonde & Langer-Osuna, 2013; Nasir, 2002; Ward-Penny, Johnston-Wilder, & Lee, 2011). Yet others who use cultural historical activity theory (for example Black et al., 2010; Hernandez-Martinez et al., 2011) or positioning theory (Esmonde, 2009) may align themselves with notions of identity from this work.

However, Holland et al.’s (1998) split understanding of identity could be seen to bridge the gap between participative identity such as Wenger (1998) describes and a discursive view of identity such as that of Gee (2000).

Gee (2000) defines identity as “[b]eing recognized as a certain ‘kind of person,’ in a given context” (p. 99). He goes on to discuss four different ways of viewing identity that “interrelate in complex and important ways” (p. 101): The first is *Nature Identity* developed from forces in nature (for example, being a twin or having ADHD). *Institution Identity* is authorised by authorities within institutions (for example professor at university). *Discourse Identity* is about being recognised in the discourse/dialogue of/with “rational” individuals (for example being charismatic). People author their own identities here by creating or recruiting “Discourse identities” to gain a sense of self. They need (but will sometimes fail in this) to be recognised by others as such. Finally, *Affinity Identity* is shared in the practice of “affinity groups” (for example Star Trek fan). Nature and Institutional identities are linked to much research in mathematics education but discourse and affinity identity have not been explored to the same extent (Stentoft, 2007).

These differing views of identity may be used to analyse the ways in which research participants speak their identities (Bartholomew, Darragh, Ell, & Saunders, 2011). Different aspects of Gee’s (2000) definition are utilised in the literature. It is his notion of a ‘core identity’ (albeit one that is ever changing) that is drawn on by Cobb and colleagues (2009) in their development of a tripartite view of identity (see also Gresalfi & Cobb, 2011; Heyd-Metzuyanim & Sfard, 2012). It is Gee’s attention to the discursive nature of identity that is drawn on by others (for example Bishop, 2012). And it is his methods of discourse analysis (see Gee, 1999; Gee, 2011) that are applied by other writers in mathematics education (for example Lim, 2008). However one could argue that Gee’s view of identity, as making a bid to be recognised as a certain kind of person, confers a greater level of agency on an individual than may be possible, given the constraints acting on them.

Note that these different understandings of identity are not necessarily mutually exclusive. In fact Gee’s later work (see for example Gee, 2011) utilises the concepts of figured worlds and positional identities from Holland et al. (1998). Many writers in mathematics education combine the work of the

above authors, for example by using Wenger's 'trajectories of participation' within Holland et al's 'figured worlds' (Boaler & Greeno, 2000); or by viewing learning as a process of identification, from Wenger, while participating in Holland et al.'s 'cultural activity' (Nasir, 2002); or by combining the work of Wenger and Gee to form a new definition of identity (see Cobb et al., 2009).

Writers who draw directly on the work of Wenger, Holland et al., or Gee, are often explicit about the definition of identity being used in the research; however, much of the theoretical and empirical writing on identity within mathematics education lacks a coherent definition (if there is a definition at all), and this has been noted by a number of researchers (Bishop, 2012; Cobb et al., 2009; Sfard & Prusak, 2005). Inconsistencies in definitions perhaps arise from the fact that we draw from so many different disciplines when theorising in mathematics education and in doing so may be combining ideas which are theoretically incoherent.

Defining Identity in Mathematics Education Research

Identity is both very simple and extremely difficult to define. At one level a mathematical identity is simply a sense of the self in relation to mathematics. It is when unpacking what this 'sense' means and how is it constructed, evidenced, expressed or performed that it becomes more complex. The temptation for researchers may be to treat identity as "self-evident" and thus avoid defining the concept (Sfard & Prusak, 2005, p. 15). Operationalising identity in a "tractable, observable, and measureable way" is a challenge (Bishop, 2012, p. 37). I will present examples of identity definitions used by writers within mathematics education who have made explicit the ways in which they view identity. Some broad categories of identity definitions included here are: participative identity, positional identity, narrative identity, discursive identity and psychoanalytic identity.

Participative identity

Participative identity refers to identity definitions which look at the ways in which identity is constructed through participation and engagement in a social group. The main theories that writers draw from in this category are either Wenger's (1998) notion of 'communities of practice' or Leont'ev's 'cultural historical activity theory' (CHAT), often in relationship with figured worlds (Holland et al., 1998).

Jo Boaler brought identity to centre stage in mathematics education with two major investigations. In England she conducted a three-year study of 13-16 year old students learning mathematics in two secondary schools in order to investigate the relationship between teaching approach, student beliefs and student understanding. She found that the different approaches of the two schools encouraged different forms of knowledge (Boaler, 1998, 2000). Subsequently Boaler conducted a study with similar aims in six Northern Californian high schools, interviewing 48 students in advanced placement calculus classes. Here she drew comparisons about the type of person a student could *be* within a traditional or a discussion-oriented mathematics classroom (Boaler & Greeno, 2000). In the analyses Boaler used the concepts of communities of practice (Boaler, Wiliam, & Zevenbergen, 2000) and

figured worlds (Boaler & Greeno, 2000) to theorise about the context in which students develop their identities as mathematics learners.

Another often cited work on identity is the research of Martin (2000). In his study he addressed the questions: "What does it mean to be a learner of mathematics in the context of African American struggle? and (2) What does it mean to be African American in the context of mathematics learning?" (Martin, 2007, p. 147, see also; 2012). Although Martin defines identity as a set of beliefs, particularly about one's ability to use mathematics to change the condition of their life, he also states that "a mathematics identity is expressed in narrative form as a negotiated self, is always under construction, and results from the negotiation of our own assertions and the external ascriptions of others" (Martin, 2007, p. 150). His research into the mathematics experiences of African Americans includes a look at participation in mathematics in a variety of contexts (from the micro to the macro level) and also within "masternarratives" of, for example, failure for African American youth. His analysis he terms a "counternarrative" (Martin, 2000). Martin's work has been taken up by others within mathematics education (for example Chazan, Brantlinger, Clark, & Edwards, 2013; Stinson, 2008, 2013), particularly those with an interest in learning and identity for African American students.

Solomon (2009) applies Wenger's (1998) "social ecology of identity", which includes engagement, imagination and alignment as modes of belonging, to her notion of "identities of inclusion". Engagement in a practice enables an identity of participation; imagination involves standing back from direct engagement and positioning the self with respect to one's own and other practices, thus enabling an identity of learner; and finally alignment enables participation in the broader practices and discourses of a community, which is particularly applicable in the case of mathematics learning (Solomon, 2009). However Solomon is also critical of Wenger's model in other work (Solomon, 2007b), having found that undergraduate students (particularly women) do not always neatly fit his model of participation and engagement, and suggests this model "neglects to explore in detail the nature of identity in multiple, and possibly conflicting, communities of practice" (p. 88).

Solomon (2007a) also studied 13-15 year old British students' accounts of learning and doing mathematics, finding that ability grouping practices played a part in the identity development of some children. She found differences in the experiences and corresponding identities of top set and lower set students and also that gender played a part in these differences. In this work she combined Wenger's model with a CHAT perspective and also used Gee's four types of identity in her analysis. She concluded that "the selective development of participative identities is a product of both pedagogy *and* discourse: what pupils experience in mathematics classrooms will always be coloured by the stories they tell" (Solomon, 2007a, p. 18, italics in original). Her later work increasingly uses the theory of discursive positioning as underpinning learners' development of "fragile" identities (Solomon, Lawson, & Croft, 2011).

Other writers in mathematics education have used a CHAT perspective together with identity. Black (2004) initially investigated students' participation in whole class discussions within mathematics and theorised how, over time, productive or non-productive interactions would contribute to identity

construction and in particular, for some, the development of marginalised identities in mathematics. Her later work on identity (Black & Williams, 2013; Black et al., 2010) utilises Leont'ev's notion of leading activity, along with narrative analysis, and develops the concept of "leading identity" to understand students' future participation in mathematics and career aspirations.

Nasir (2002) also draws on Leont'ev but focuses on "goal-directed activity" to explore the relationship between goals, identity and learning, and also between culture, race and mathematics learning. Her studies focus on the mathematics experiences of minority students, specifically African Americans, in the out-of-school contexts of playing dominoes and playing basketball. In her analysis she uses Wenger's modes of belonging, together with attention to the shifting goals of the participants, to understand identity as a fluid construct that is closely tied to learning. In later work she examines the "emerging tensions" as the students construct and negotiate academic identities (Nasir & Saxe, 2003), and compares high school basketball to the mathematics class by looking at access and opportunities to take on integral roles, and at opportunities for self-expression (Nasir & Hand, 2008). Increasingly, her focus is on issues of power and identity for these students (Nasir & de Royston, 2013).

Positional identity

A number of writers coming from a range of different perspectives on identity utilise positioning theory. Positioning theory examines social interactions within the paradigm of social constructionism (Harré & van Langenhove, 1999). It aims to understand "how psychological phenomena are produced in discourse" (Harré & van Langenhove, 1999, p. 4) and draws on Goffman's (1959) work to analyse social encounters. Although it is not explicitly about identity, the terminology and ideas of positioning have been taken up by a range of writers on mathematics identity. Wood (2013), for example, uses positioning theory to look at "micro-identity", that is identity enacted in a moment of time. Esmonde (2009) comments that "[w]hereas the term *identity* may carry the connotation of an enduring, static, essentialized self, *positioning* points to the ways in which one does not have an identity but, rather, inhabits or invokes multiple identities or identifications"(p. 1012, italics in original). She goes on to explain that individuals do not necessarily have the freedom to construct their identities as they would choose to and that some positions, and not others, are available to students. Esmonde uses these ideas to examine issues of equity in cooperative mathematics learning. In another study (Esmonde & Langer-Osuna, 2013), she and her colleague explored the consequences of students taking up different positions or roles within multiple figured worlds, such as that of the mathematics classroom and that of friendship and romance. The acts of positioning influenced the nature of the learning opportunities for some students. Wagner and Herbel-Eisenmann (2009) draw together the concept of positioning with the notion of stories or myths to understand the way mathematics is talked about and to argue for the need to change these stories and myths about mathematics.

Narrative identity

Another form of identity research also makes use of this metaphor of the story. By narrative identity I refer to those definitions that consider identity to be in the stories people tell, about mathematics for example. Some using this definition draw from the area of narrative inquiry (see Clandinin et al., 2006). For example Kaasila (2007a) uses the notion of "mathematical biography" to understand student or teacher identities in mathematics. He uses narrative analysis methods such as looking for turning points and key episodes in a participant's story (see also Kaasila, 2007b; Kaasila, Hannula, & Laine, 2012).

Sfard and Prusak (2005) by contrast provide a definition of narrative identity that uses the term 'stories' more loosely. They state that identity is the set of stories people tell about themselves and others tell about them, specifically narratives that are "*reifying, endorsable,* and *significant*" (p. 16, italics in original). The job of the researcher is made easier because these stories are not considered to be *reflective* of identity; rather, the stories are the identities themselves. Much work on identity in mathematics education makes use of Sfard and Prusak's narrative identity definition (for example Bishop, 2012; Heyd-Metzuyanim, 2013). In practice, the use of Sfard and Prusak's definition of identity entails close attention to the words used by students and other participants and in this manner is much like discourse analysis (see Heyd-Metzuyanim & Sfard, 2012).

Discursive identity

Writers who take a view of identity as discursive may hold one of two different understandings of the term 'discourse'. Those who draw from Gee (2000, 2011) are likely to be talking about "the spoken and written words, semiotic systems, representations, and gestures of participants as they use language to communicate, interact, and act" (Bishop, 2012, p. 44). For others, discursive identity is a perspective that views "identity as the result of the subject's interpellation[1] into discourse, systems of knowledge, and practice which construct objects" and is inseparable from power relations (Black, Mendick, & Solomon, 2009, p. 2).

Bishop's (2012) study is an example of the former view. Her study within a seventh grade mathematics classroom focused on moment to moment discourse moves that were related to identity enactment. In analysis she also utilised positioning theory to code the interactions between two girls working together on mathematics problems. This "fine-grained" analysis at the micro level accounted for the girls' enactments of identities of "dumb" and "smart".

Lerman's (2009) work on identity comes from the latter discursive approach. He views identity, such as a school mathematics identity, as discursively constructed through the "pedagogic relation" (p.147). He draws on Bernstein to argue that for students to be successful in mathematics learning they "must acquire the appropriate recognition and realisation rules" of the mathematics classroom (p. 151) and that because these rules may be hidden, this can work to disadvantage those students from working-class backgrounds in particular.

[1] See page 22 for explanation of this term.

While Bernstein could be labelled ‘structuralist’, much of the research using a discourse identity is post-structuralist; for example Mendick’s (2002) work on identity. Mendick explores students’ positioning in relation to mathematics through their subject choice, suggesting that this subject choice is both conscious and unconscious and motivated by a series of identifications “which interact with other aspects of their identity such as gender, sexuality, ‘race’, class, age and (dis)ability in complex ways” (p. 4). Her interviews with students also provide examples of stories which work to construct mathematics ability through discourses of mathematics as natural, individual and masculine (Mendick, 2005a, 2005b). Mendick and her colleagues have also investigated representations of mathematics in the media (Mendick, Epstein, & Moreau, 2008) mapping the effects on discourses of mathematics. They continued this investigation by looking at the subject choices of undergraduate students, arguing that “to make yourself through a subject choice, you must be able to construct your identity in relation to the chosen subject” (Mendick, Moreau, & Epstein, 2009, p. 81). Those working within this view of identity often draw from the work of Foucault as they align themselves with a poststructuralist paradigm.

Llewellyn (2008, 2009, 2012) also explores identity from a post-structural perspective. She discusses how the use of words such as “confidence” (Llewellyn, 2008), and “understanding” (Llewellyn, 2012) work to construct the subject within mathematics. She argues that “mathematics, the mathematics classroom and the primary school teacher are determined by the way that they are spoken into being” (Llewellyn, 2009, p. 412). She follows Mendick in arguing that mathematics is constructed as masculine and draws on Foucauldian analysis in order to do this. Writers such as Llewellyn and Mendick also draw on Walkerdine (1989, 1990, 1994, 1998) to explore the ways in which girls are subjectively constructed within mathematics. Although Walkerdine did not write on identity specifically, her ideas have been taken up by writers in this field, particularly those utilising terminology such as ‘positioning’ and the ‘subject’.

Psychoanalytic identity

Others who draw from Walkerdine take a psychoanalytic view of identity. Walshaw (2004), for example, attempts “to straddle the ground between Foucauldian poststructuralism and Lacanian psychoanalysis” in order to account for subjectivity and “provide a framework and a language for looking at some unexplained aspects of learning” (p. 122). Walshaw (2005) uses a post-structural analysis to look at gendered mathematical identifications and argues for the use of Lacan’s theories in identity research for promoting equitable mathematics experiences for all groups of students (Walshaw, 2011). Psychoanalytic approaches to identity share an interest in exploring the “interaction between conscious and unconscious processes” (Black, Mendick, & Solomon, 2009, p. 2) and make sense of people as “defended subjects” (Black, Mendick, Rodd, Solomon, & Brown, 2009). These latter authors use Klein’s notion of “phantasy” to understand their own mathematical narratives and in particular their defended identities around the experiences of assessment and selection (Black, Mendick, Rodd, et al., 2009).

Summary

From the variety of identity perspectives described here we can see that identity is a complex concept. What we see when we study identity depends greatly on the definition we use. Yet these perspectives share commonalities also. All arise from the "social turn" (Lerman, 2000) of mathematics education. Identity is seen as being constructed or enacted in a social context, whether that context is 'micro' and focused on interactions between people, or 'macro' and considers wider societal discourses. Identity is generally considered in the plural, that is, people demonstrate multiple identities.

Yet there are also tensions amongst these perspectives (Black, Mendick, & Solomon, 2009). Adopting a particular lens for identity can foreclose the possibility of taking on aspects of another lens. The choice of perspective also has methodological implications. For example, Sfard and Prusak's (2005) definition of identity has been endorsed by many researchers in part due to the ease with which it may be operationalized in the interview situation, however it is less useful for exploring identity constructed through classroom activity (Heyd-Metzuyanim, 2013). A participative notion of identity suggests a need for observational data to be collected, yet makes less sense in an interview situation.

The purposes for which researchers utilise the concept of identity also differ greatly. Whilst identity is seen by some as a means to understand learning in a social context, others see identity as a crucial tool in consideration of equity for mathematics education (Gutiérrez, 2013; Walshaw, 2011). The difference here resides in whether the researcher is using identity from a socio-cultural or from a socio-political paradigm (Nasir & de Royston, 2013). We have seen in the examples above a concern for gender (Mendick, 2005a, 2005b; Solomon, 2007b), class (Lerman, 2009) and race (Martin, 2000; Nasir & Saxe, 2003). Others focus on practices within school mathematics, such as assessment (Black, Mendick, Rodd, et al., 2009) and ability grouping (Solomon, 2007a) and look at how these impact on identity development and issues of access to powerful mathematics learning.

Gutiérrez (2013) distinguishes between the socio-cultural and the socio-political by stating that those coming from a socio-political category view identity as something we *do* rather than something we *are*. This directs attention to a less obvious difference found in the understandings of identity within mathematics education, and one that is not predicated on any of the categories outlined here; that is, whether identity is seen as something we *do* or as something we *have*.

Identity – To Do or To Have?

Many of the theorists drawn on by mathematics education researchers treat identity in terms of an action rather than an acquisition. Wenger (1998) sees identity as "not an object, but a constant becoming" (pp. 153-4). Holland et al. (1998) define identity as "self-understandings" but go on to describe "identity-making processes"(p. 3), which treat identity like a verb. Gee (2000) claims that identity is making a bid to be recognised as a certain type of person. These all describe identity as an action.

Some researchers in mathematics education use definitions that make clear their understanding of identity as something we do. This can be seen in the use of terms such as identity *work*; talking about identity as something we *use*; or describing identity as *enacted* or *performed*. Askew (2008), for example, suggests we attend to social identities rather than an individual's inherent personality traits, shifting the focus to *actions* for analysis.

The notion of identity work implies something that it is difficult. Mendick's (2005a) interpretation of the stories about mathematics given by girls in her study suggests that the process of identifying can indeed be difficult. Those who use the terminology of identity work are interested in the multiple and often conflicting identities people construct. Chronaki (2013) uses identity work to describe teacher change in the context of technology use.

The notion of identity as something we use also makes sense of identity as an action. Kaasila (2007a) and Brown, Jones and Bibby (2004) both draw on Maclure to define identity as "a resource that people use to explain, justify and make sense of themselves in relation to others, and to the world at large" (MacLure, 1993, p. 311, abstract). Similarly Stentoft (2007) argues for an approach to thinking about identities "as something we achieve or acquire along the way and discard or reject when they are no longer salient" (p. 1598) rather than as something we have. This notion of achieving and then discarding identity as required resonates with the notion of identity as something we can use.

Identity as enacted or performed is evident in work that draws either from Gee (2011) or from the work of Judith Butler (1988, 1997). Despite the apparent similarity in language the meanings of the two are rather different. Gee writes of "enacting" identities by speaking or writing in a particular way. In earlier work he uses the term "combination" (Gee, 2000), referring to speaking, acting, dressing, feeling and using objects in order to be recognised as a certain type of person. Butler (1988), in contrast, writes about gender as being *performative.* It is the stylised repetition of acts over time that works to constitute one's identity. She makes clear that identity does not exist prior to the performance; rather it is constituted through performance. Butler is drawn on by some who work on identity within mathematics education (Chronaki, 2011; Gutiérrez, 2013; Hogan, 2008). The language of performance sneaks its way into much writing about identity, even when the identity definition does not specifically understand identity in this way. For example Holland et al. (1998) use the term "dramatized worlds" (p. 53) as another term for figured worlds.

Yet, as mentioned earlier, in the wider literature within mathematics education identity is not as well defined as the examples discussed here would imply. Those who do not clearly define identity for the purposes of their own research may at times draw upon popular notions of the word, even whilst drawing from the work of others with a contradictory definition. In doing so they treat the meaning as "self-evident" (Sfard & Prusak, 2005) and talk about identity in theoretically inconsistent ways.

In their discussion of the postmodern self, Gubrium and Holstein (2001) state that

> we are sustained by the conviction that, deep down, a singular authentic self resides within us … while social life might shape who we are … the popular belief is that a "true self" resides somewhere inside, in some privileged space. (p.1)

These authors suggest that in today's world "identity no longer emanates from within, but penetrates from every angle" (ibid., p. 2) yet go on to argue that despite this we cling to the idea of a core identity or true self.

As researchers we too are exposed to this notion of a core true self and it is easy to slip into writing about identity in this way. For example Gee (2000) defines identity as being a certain 'kind of person' as recognised in the actions and interactions of people in society; yet he goes on to state:

> [A]ll people have multiple identities connected not to their "internal states" but to their performances in society. This is not to deny that each of us has what we might call a "core identity" that holds more uniformly, for ourselves and others, across contexts. (p. 99)

Although Gee makes a case for viewing identity as enacted, the tenacity of the 'core identity' holds firm and can be seen in his use of terminology such as "identity trait" (Gee, 2000, p. 108). This tendency to flick between notions of identity as enacted and identity as internal can be explained by looking briefly at the history of the term identity.

Erikson was "the key figure in putting the word [identity] in circulation" (Gleason, 1983, p. 914). He coined the term "mid-life crisis"' but also described an earlier "identity-crisis" as occurring around puberty (Erikson, 1968). His perspective on identity is around the notion of obtaining a core and stable identity. Popular use of the word identity is often derived from this Eriksonian perspective. However another 'father' of identity was G. H. Mead (Da Silver, 2011), a sociologist writing earlier last century. Mead's perspective includes a notion of identity as multiple, sometimes contradictory, and performative (Lerman, 2012). These two views of identity are distinct, as made clear by Holland and Lachicotte Jr. (2007):

> An Eriksonian "identity" is overarching. It weaves together an individual's answers to questions about who he or she is as a member of the cultural and social group(s) that make up his or her society. A Meadian identity, on the other hand, is a sense of oneself as a participant in the social roles and positions defined by a specific, historically constituted set of social activities. Meadian identities are understood to be multiple [...] and they may reflect, for example, contradictory moral stances. Eriksonian approaches, in contrast, attribute psychodynamic significance to achieving a coherent and consistent identity that continues over the course of adulthood. (p. 104)

Most definitions in the current mathematics education literature fit with a Meadian view of identity. Certainly the notion of "oneself as a participant in the social roles and positions…" are commensurate with participative and positional identity. Identity, in our discipline, is generally agreed to be multiple or referred to in the plural.

Yet despite drawing from theories that align with the Meadian approach, within mathematics education there appears to be a tendency for writers to discuss their research and data as if identity resided within an individual's 'core' and is stable enough to be measured in some manner. Or they try to combine both perspectives together. For example Bishop (2012) defines identity:

> … as a dynamic view of self, negotiated in a specific social context and informed by past history, events, personal narratives, experiences, routines, and ways of participating … An identity also encompasses ways of being and talking; narratives; and affective components such as feelings, attitudes, and beliefs. (p. 38)

Bishop begins with identity as negotiated, storied, participative – all things we *do*, but finishes by describing the internal components of feelings, attitudes and beliefs. Cobb et al. (2009) similarly try to encompass all possible perspectives in their definition of identity, including 'normative', 'personal' and 'core' identities.

I make the case that mixing these views creates inconsistency. If one wishes to utilise a Meadian approach to identity then it is more appropriate to envision identity as something we do. We do identity work, we use identity or we enact and perform our identities.

Mathematics education already has a strong research tradition in the affective domain. There are a number of researchers who look at beliefs, goals, motivation, attitude, and mathematics anxiety, for example, and these are all things that people *have*. Defining identity as something we do entails a different methodology; different aspects of the data will be generative of new understandings about people's experiences learning mathematics. Defining identity as something we do will help us to avoid mixing in notions of a 'true self' or core identity that may occur when describing participants in our research.

In this thesis I will utilise an understanding of identity as something we do. In particular I will define identity as enacted or performed.

Chapter Two: Theoretical Frame

In the last chapter I outlined a range of different definitions of identity. 'Participative identity' makes sense of the communities or contexts in which we create our identities, yet this definition is limited in that by viewing identity as participation in a particular context, it does not always allow for the multiplicity of identities within a singular context. 'Positional identity' makes sense of the ways in which interactions serve to identify others and the ways in which we may accept or reject these positionings. Yet it requires the combining of other definitions of identity, such as narrative or discursive, to generate a fuller picture of identity. 'Narrative identity' makes sense of the way we discursively construct our identity, yet it does not necessitate attention to different contexts. Furthermore, while stories about the self are easily operationalised by the researcher, their construction requires a great deal of sense-making on the part of the story-teller. Younger people or those currently undergoing an experience may not have had the time or maturity with which to construct a sense-making story. 'Discursive identity' accounts for the wider, socio-political context in which we construct our identity and yet it is difficult to work out how to identify such an identity. 'Psychoanalytic identity' provides an account of the role of the unconscious in identity construction, and yet how can we see something so internal to an individual when it may be invisible to the individual themselves? Do we even have the right to make assumptions on their behalf?

By using a metaphor of *performance* for identity I attempt to address some of these issues. This is a framing that also takes advantage of the valuable qualities of these differing definitions. Performances can be made on different stages (contexts) and many different identities may be performed on any one stage (such as the mathematics classroom). One can attend to various positioning acts upon this stage. Telling a story is an identity performance, but it is only one of many kinds of performance. The notion of wider discourses as affecting our identity construction can be captured with the idea of scripts, and we can identify the identities in the performances. Finally, performances may well be driven by unconscious desires, yet analysis of performance identity does not necessitate an exploration of these.

In this chapter I will outline the theoretical basis for an understanding of identity as performance, drawing on the work of Mead, Jenkins, Goffman and Butler. I will describe the processes of identity with respect to mathematics and other identities a Year 9 student may perform. I will follow this with an extended look at this metaphor and a consideration of the stage, the director, the scripts, and the audience. Finally I will discuss the limitations of using this definition of identity.

Theoretical Background

To understand identity I take as a starting point the sociologist George Herbert Mead's theory of the self. Mead (1913/2011) describes the self in a way that incorporates both an 'I' and a 'me'. He uses this artificial split to illustrate the way the 'self' becomes an 'other' to itself:

> The self appearing as "I" is the memory image self who acted toward himself and is the same self who acts toward other selves. On the other hand, the stuff that goes to make up the "me" whom the "I" addresses and whom he observes, is the experience which is induced by this action of the "I." If the "I" speaks, the "me" hears. If the "I" strikes, the "me" feels the blow. (p. 59)

Identity is enacted when the individual finds herself acting with reference to herself in the same way as she would refer towards others. That is, when the self assumes the perspective of another. Mead's theory derives from the understanding that we act and react firstly in social conduct with others and then later in introspective self-consciousness. For example: "the infant consciously calls the attention of others before he calls his own attention by affecting himself and … he is consciously affected by others before he is conscious of being affected by himself" (Mead, 1913/2011, p. 59). This speaks to the very beginning of identity construction by an individual and places it firmly within social interaction before it is internalised.

Goffman (1959) was the first to use the theatre as a metaphor for identity performance. He states that, in a social interaction, an individual acts in a certain way that *expresses* himself. This may be done intentionally or unintentionally and it involves two parts: "the expression that he *gives,* and the expression that he *gives off*" (p. 2, italics in original). In other words, the other party in the interaction plays a key role in the identity performance, that is, to respond to and interpret the identity as expressed.

> When we allow that the individual projects a definition of the situation when he appears before others, we must also see that others, however passive their role may seem to be, will themselves effectively project a definition of the situation by virtue of their response. (Goffman, 1959, p. 8)

Goffman also differentiates between the 'front' where the performance takes place and 'back stage' where the "impression fostered by the performance is knowingly contradicted as a matter of course" (p. 97). However, in my own understanding of performance identity I make no distinction between front and back stage. Rather I understand these as two examples of performance. One is to the audience of another person and the other is to the audience of the self. There may be a number of reasons for these performances to differ. Goffman suggests that "a performance presents an idealized view of the situation" (p. 30) and that this performance "will tend to incorporate and exemplify the officially accredited values of society" (p. 31). I would argue that it is the fact of the other in a social interaction that can cause a different performance than that which might be performed internally to the self. Furthermore, as suggested by Goffman "it often happens that the performance serves mainly to express the characteristics of the task that is performed and not the characteristics of the performer" (p. 67). In this way the 'stage' for the performance and/or external 'director' may constrain the performance and explain differences between those and the private performances of the self.

Finally Goffman (1959) distinguishes between the individual as *performer* and as a *character*. The performer arises out of the interactions involved in staging a performance while the character is the "*product* of a scene that comes off, and is not *cause* of it" (p. 223, italics in original). We can understand a character in terms of *types* of people: you might be a 'maths person' or an 'arty type', you might be 'academic' or 'sporty'. We can think about a character as the way in which someone is recognised through their identity performances. This dynamic between performer and audience is drawn on by those using positioning theory (Harré & van Langenhove, 1999) to analyse interactions and the construction of the self through these.

Butler (1988) also draws on the metaphor of the theatre, using feminist theory to argue that gender is performative. She states that "…the acts by which gender is constituted bear similarities to performative acts within theatrical contexts" (p. 521). She draws from de Beauvior in arguing that one is not born, rather one becomes a woman, and therefore:

> … gender is in no way a stable identity or locus of agency from which various acts proceed; rather, it is an identity tenuously constituted in time – an identity instituted through a *stylized repetition of acts*. (Butler, 1988, p. 519, italics in original)

This theory of gender identity can equally be applied to any identity. The stylized repetition of acts, or performances, work to constitute all our identities. In doing so, these identities become *embodied* and create "a compelling illusion, an object of *belief*" (Butler, 1988, p. 520, italics in original).

To illustrate this idea of embodiment I will give examples of other identities. Recall the actions of a woman in a supermarket pushing an empty trolley back and forth in a soothing manner. This may be an example of the embodiment of her 'mother' identity. Despite the absence of the baby, let alone the pram, the body is acting in accord with her mother identity, having repeatedly acted this in the past. A student walks into a new classroom and sits at the back (or front) of the room, doing so without thought. Their learner identity, be it negative or positive, has become embodied. These are small isolated examples but the reality involves many, many such small acts that work together to create the illusion of a certain type of person – 'mother' or 'disruptive student' for example. Butler's (1988) suggestion that "the body becomes its gender through a series of acts which are renewed, revised, and consolidated through time" (p. 523) may seem extreme when considering 'facts' of one's sex, but are compelling when applied to more obviously constructed identities such as learner identities. Butler considers the theatrical sense of an "act" advantageous as it forces us to revise individualist assumptions. "As a given temporal duration within the entire performance, 'acts' are shared experience and 'collective action'" (Butler, 1988, p. 525). This means that performances by an individual are necessarily social.

In later work Butler (1997) expands on her ideas of identity with an exploration of power. She draws on Foucault and also on psychoanalysis to argue that "…power that at first appears as external, pressed upon the subject, pressing the subject into subordination, assumes a psychic form that constitutes the subject's self-identity" (Butler, 1997, p. 3). In the theory of Mead this would mean that

the ‘I’ subjugates the ‘me’, that is, the oppression becomes internalised. Butler draws on the “infamous” example from Althusser (1971) whereby a policeman hails a passerby on the street and the passerby turns, thus recognising himself as the one who is hailed. “In the exchange by which that recognition is proferred and accepted, interpellation – the discursive production of the social subject – takes place” (Butler, 1997, p. 5). This theory of interpellation is drawn on by many who take either psychoanalytic or discursive views of identity. It is useful in that it highlights the key role *recognition* plays in identity construction.

Jenkins (2008) discusses, draws on and critiques the work of Mead, Butler and Goffman in his sociological work on identity. In defining identity Jenkins discusses two meanings derived from the Latin root of the word. The first is in the sameness of things (i.e. ‘identical’) and the second is the “consistency or continuity over time that is the basis for establishing and grasping the definiteness and distinctiveness of something” (Jenkins, 2008, p. 17). In other words, identity means both sameness and difference. Jensen critiques the work of Butler in overemphasising the notion of identity as difference. In contrast Jensen suggests that we “recognise that invocations of similarity are intimately entangled with the conjuring up of difference” (p. 23), that is, what members of a group have in common is their recognition of other groups that are different to them.

However, Jenkins (2008) focuses mainly on the processes of identification. Drawing on Mead and others to form a template for identity, Jenkins calls his model the “*internal-external dialectic of identification*” (Jenkins, 2008, p. 40, italics in original). He uses this model to describe the processes by which identities are constituted. Selfhood is “an ongoing and, in practice, simultaneous synthesis of (internal) self-definition and the (external) definitions of oneself offered by others” (p. 40). Finally he makes the point that although distinctions are made between ‘collective identity’ (of social groups) and ‘individual identity’ (of a person), these can be treated as very similar and the processes by which they are produced are analogous.

Drawing the ideas of these theorists together, we can understand identity to be constructed first in social interactions. These social interactions are recognised by the other and they are repeated by the individual over time to become embodied. As first offered by Goffman and then adapted by Butler, the notion of identity as a theatrical performance, or as performative, is a useful way to understand this construct.

A Metaphor of Performance for Identity

As discussed in the last chapter, for Sfard and Prusak (2005) identity is not *reflected* in stories, rather identity *is* the set of stories about a person. Similarly I suggest that identity can be seen not as reflected in performance but that identity is the performance (and telling a story is one such performance). This means the identity exists only in that moment. However the collection of performances work together to constitute an enduring sense of self and these performances are embodied over time. Sfard and Prusak state that identities become familiar and “self-evident” due to the repeated telling and hearing of “identifying narratives” and that the person “eventually becomes

able to endorse or reject new statements about [themselves] in a direct, nonreflective way" (p. 17) and this is similar to the idea of embodiment. However a performative understanding of identity differs further from that of Sfard and Prusak in conceptualising the role of the other. For Sfard and Prusak identity is in part ascribed by others and these ascriptions can be taken up or incorporated into the individual's own stories. They differentiate between first, second and third person identities depending on who the teller of the story is (Sfard & Prusak, 2005). Within a performative identity frame the role of the other is to *recognise* the identity in the performance. The nature of their recognition will influence future performances.

I use performative identity as the present identity performance act, and performance *repertoire* as the collected body of performances given over time. To return to an earlier example, we may perform a positive learner identity by entering a classroom, sitting at the front of the room and promptly taking out all necessary equipment for the lesson. We might participate fully in the lesson by asking questions and contributing to discussion. We might talk about school to others in an effusive manner. We might make plans to enter university and even postgraduate programmes. Each of these performances both alone and taken together may lead to us being recognised (and self-recognising) as someone who loves school or as a 'good learner'.

We give many performances simultaneously. I perform woman, mother, academic, Pākehā, middle class, and many other identities. On some stages some of these performances conflict with each other. I may try to perform 'academic' as I read a journal article while I have a cup of tea at home, only to have my four-year old son drag me to look at his lego creation and demand a 'mother' performance that does not allow any space for a performance of academic. However on other stages these co-performances may very well work together; in writing the anecdote of the previous sentence I provide an example of co-performing mother *and* academic. Similarly in the classroom students are performing their gender, ethnicity, class, and learner identities. They are also performing other identities such as 'friend', or 'cool', or their sexuality, and these may or may not work together as co-performances.

What then does this metaphor of performance for identity look like for the year 9 mathematics student? As Butler argues, gender is constituted through the stylised repetition of acts over time. Similarly I argue we become a mathematics learner in a performative manner; it is through the repetition of performances in mathematics learning contexts that we generate our understanding of ourselves as learners of mathematics. These performances also lead us to be recognised as certain types of learners. For example our performances may include putting a hand up to answer a question during a mathematics lesson, persevering to answer a question, arguing or justifying a solution given. We may perform by working silently and individually or by giving up on a problem after a single attempt. Such performances are enabled or constrained by many factors, including the classroom, the teacher, peers, parents, possible future performances and not least of all by past performances.

The identity performances of a 13-year-old are shaped well before the age of 13. Butler (1993) talks of the first moment of gendering – "It's a girl!" announced at birth. Recognition of identity happens

before any identity is enacted. Parents and other family members recognise and comment on 'character traits' ("she's so shy" for example) throughout an infant and early toddler's life. The way an individual acts is recognised, and performances are generated in response to the recognition until eventually the individual recognises himself in a particular way. "I'm a good tidier," says my son Jeremy as he rushes to collect the dustpan and broom, this identity performance reflecting comments from his mother, grandmother and his kindergarten teachers who have given him a stamp on the hand on a number of occasions for being such a 'good tidier'. One could argue that only at this point of self-recognition are we talking about identity, but an individual is recognised as a certain type of person regardless of a deliberate identity performance and regardless of self-recognition.

Now imagine again a Year 9 student. They are recognised by their Year 8 test mark, their name on the roll, their gender, their age, all before the teacher even meets them. The colour of their skin, the way they speak and general appearance are all recognised as they walk in the door, before they begin their identity performances in the classroom. Eventually they self-recognise as good or bad at mathematics, as a slow learner, as more of an arty type. Their self-recognition comes after seeing themselves through the eyes of others.

The mathematics classroom is not unique in this. On every stage and for every kind of identity this process occurs. The family home for example produces performances through constraining and enabling certain types of performances over others, through family members recognising certain performances in particular ways (such as, "don't be a show off" in contrast with, "aren't you clever"). And performances are repeated across different stages. Those performances produced at home find their way onto the mathematics classroom stage, as do those produced in the playground with peers. Here occurs the possibility of misrecognition: when students perform one identity and it is recognised as another. For example, a student might perform a culturally endorsed identity of humility, and have it recognised as 'unconfident mathematics learner'.

Extending the Metaphor

A performative understanding of identity is not useful solely in understanding identity performances in an individual. It also allows for a consideration of the stage (for example the classroom), the theatre (for example the education system, the high school), the director (such as a teacher), the scripts (for performing 'school student' for example), and the audience (peers, parents, a researcher).

The *stage* is the immediate context for an identity performance. The nature of the stage can be examined with attention to the ways of being it allows. The stage set up for the musical "*Cats*" is necessarily different to that for the production of "*Waiting for Godot*"; neither show could work on the other stage. The ways in which a classroom may encourage particular ways of learning and of being has been investigated by many, often with a consideration of the role of the teacher (director). Boaler's work (Boaler, 1998, 2000; Boaler & Greeno, 2000; Boaler, Wiliam, & Brown, 2000; Boaler, Wiliam, & Zevenbergen, 2000) provide examples of how very different classroom contexts shape learner identities in different ways. Boaler also attends to the differences of teacher *direction* in these

contexts. Understanding identity as *performed* means we can consider the stage but also look at an individual performance on that stage and explore how the stage may constrain the performances of some individuals differentially to others. Further, we can look at various positioning acts (van Langenhove & Harré, 1999) made by other performers on this stage.

However, the stage is a micro-context. The notion of *theatre* allows us to zoom out to the wider context for identity performances. "*The Globe*" is likely to produce something very different to "*Covent Garden*" and again an individual may be someone very different depending on the theatre they act within. Historically women were not even allowed to play the female roles in a Shakespearean play and similarly the nature of the educational structures in many countries may differentially allow certain groups of people to play the role of 'good learners'. Martin's (2000, 2007) work which zooms in and out of micro and macro contexts could be considered as attending to both the theatre and the stage when understanding African Americans' identities as learners of mathematics.

By *scripts* I draw on similar ideas to what others have called 'discourses' and these relate also to "figured worlds" (Holland et al., 1998). Scripts are the ways we may be expected to perform when enacting an identity. Scripts can be impromptu or well worn. People can create new scripts through their performances or they may endorse a script that has been used time and again and be as familiar as any Shakespearean play. Despite the seemingly endless possibilities of performance script it appears there are a finite number of scripts available for any type of identity performance and for an individual to take up. Performing the 'good student' script may utilise 'studious' and 'nerdy' routines but not a 'tough guy' routine. For some students the performance scripts may fall outside their repertoire. Reay's (2002) description of working class 'lad' Shaun could be analysed using the terminology of scripts. Mendick (2005b) used the term 'character'; a rephrasing of her argument would state that performing the mathematician script requires routines of genius and of nerdy, and it is more problematic for girls to perform from this script. Similarly Solomon (2007b) suggests that performing a successful mathematics student requires uptake of the dominant discourses (read script) of speed and knowing the correct answers.

Finally, a major advantage of the performance metaphor for identity is the consideration of *audience*. Although audience may be thought about within an examination of context, in this framing the role the audience plays is highlighted. Within the school situation peers are influential members of the audience and this is under-examined in the research literature within mathematics education. Although utilising different terminology, Esmonde and Langer-Osuna (2013) consider the effects of peers as audience to students' co-performances of 'mathematics learner' and of 'friend'. The audience responds to a performance in the moment and a performer responds to that response. These are not movie or television performances, pre-recorded and inflexible, but performed to a live audience. Albeit to differing degrees, depending on age/experience and reflexivity, we see our performances through the eyes of others, we judge our own performances as they are being judged by others and we may adjust them as we go. Goffman (1959) theorises about "impression management" (p. 183) to describe this process and Gee (2000) writes of making a bid to be recognised as a certain type of person and acknowledges that sometimes this bid will fail. Both of

these theorists endow a large amount of agency to the performer through their descriptions of this process. However, whether the performance is intended and purposeful or unconscious and the performer oblivious, the performance will be recognised in a certain way and an identity ascribed by the viewer.

Limitations of the Metaphor

There are limitations to using performance as a metaphor for identity. Firstly the term is already used in other ways within mathematics education. Performance is often conflated with achievement or attainment for students and with job success for teachers. Because of this there may be instances of confusion or misinterpretation of the meaning of the word 'performance'. If I were to say someone *performs* 'good at mathematics' I refer to the way in which they act during mathematics, the things they say, and the scripts they use to endorse this identity. I do not intend it to mean they have performed well at a mathematics task, although this no doubt would help them consider themselves to be good at mathematics.

This metaphor emphasises performances as being a certain type of person, that is, individual identity, albeit socially framed. It pays less attention to collective identities (Jenkins, 2008), or category identities, for example ethnicity, gender, class. It is to be intended that collective identities are understood in the same way as individual identity. While this may be so, it is difficult for a researcher to observe a participant's performance and suggest they are performing their ethnicity with a particular act. In this manner they risk putting the person into an imposed category and it is not the intention of this framework to promote such a practice. However this again raises the issue of power. People *will* exercise the power of recognising particular performances as being, for example, 'ethnic' ones – we do this almost automatically – and we must be very careful to consider the implications of such recognition.

The use of metaphors in general is limiting. "The very systematicity that allows us to comprehend one aspect of a concept in terms of another … will necessarily hide other aspects of the concept" (Lakoff & Johnson, 1980, p. 10). The notion of identity as performance may hide the relevance of internal aspects of an individual when seeking to understand the drivers of identity acts. Undoubtedly emotion, motivation, beliefs, goals, and other 'affects' will influence identity performances, however analysis that focuses on the performance may underplay these aspects. As such, the use of this metaphor for performance may share some of the limitations of the behaviourist paradigm.

Another implication of using the metaphor of performance is that it may suggest that identity performances are fake or contrived, that the performer is playing a role but this role is not his or her true self. I would like to reiterate that my use of this metaphor does not intend to imply there is a core true self. The performances are the identity and any sense of falseness resides with the audience recognition rather than in the performer.

Additionally the performance metaphor may confer an idea of greater or lesser agency on behalf of the performer. If one considers performers to be playing a role exactly to script then this implies very

little agency for an individual. On the other hand one may consider the notion of a performance to mean that an individual can act in any way they desire at any time. Chronaki argues for the mid-point of these views; “children's identity-work is captured along the terms of a performativity that is constantly informed by history and textuality and is *almost* beyond their agency” (Chronaki, 2011, p. 224, italics in original). An individual’s performance is constrained in many ways: by the stage, available scripts, positioning acts, past performances; and yet they may exercise agency through acts of *improvisation* or *resistance*.

Finally this conception of identity may seem to belie the very meaning of the word identity. As discussed above, identity means sameness (as well as distinctiveness). The definition of identity described here suggests that every performance is unique. Different stages at different times and to different audiences will necessarily yield a distinctive performance. And yet, as we shall see in this thesis, consistency of performance for individuals is more common than difference, suggesting both that the performance metaphor is a suitable one for identity and that there is value in more theorising through it.

Chapter Three: Transition Literature Review

In New Zealand students make a number of significant transitions as they move from early childhood education to primary and secondary school and then on to university. The one educational transition all students make is from primary to secondary schooling. In New Zealand this occurs between Years 8 and 9 when students are usually about 13 years old. In other countries the main educational transition may occur at a slightly different age, but many aspects of the transition are similar.

There is a large body of research on the transition from primary to secondary school. Much assumes transition to be inherently problematic for students. Negative effects of transition found include: achievement loss (Alspaugh, 1998; Anderson, Jacobs, Schramm, & Splittgerber, 2000; Evangelou et al., 2008; McGee, Ward, Gibbons, & Harlow, 2004; Whitley, Lupart, & Beran, 2007), particularly within mathematics (Whitley et al., 2007), discontinuity in learning at transition (Galton, Hargreaves, & Pell, 2003; Hawk & Hill, 2004; Jindal-Snape & Foggie, 2008), including repetition of primary school work (Bicknell, Burgess, & Hunter, 2009; Kirkpatrick, 1997; Way, Bobis, Anderson, & Martin, 2008; Wylie et al., 2006; Yates, 1999), and a drop in motivation, engagement and attitude to schooling (Anderson et al., 2000; Galton et al., 2003; Wylie et al., 2006), specifically in mathematics (Athanasiou & Philppou, 2006; Cox & Kennedy, 2008; Midgley, Feldlaufer, & Eccles, 1989; Way et al., 2008; Yates, 1999).

These studies reflect concerns about transition that are focused on educational aspects and do not capture the issues that may be of concern to the students themselves. Topping (2011) conducted a meta-analysis of international research on transition, including 88 papers from 325 found in a systematic database search. He found that the papers that focused on the teacher perspective reported mostly on subject attainment, whereas those papers focusing on the children's perspective were concerned with socio-emotional issues such as bullying and external support networks. One such study looking at the students' perspective did so by asking students to keep a journal in the first ten weeks of secondary school. Analysis revealed seven themes that helped or hindered the settling into secondary. These included the role of peers, teachers, school support programmes, challenges of new procedures and activities, homework, and feelings of confidence (Ganeson & Ehrich, 2009). Students can have many worries prior to transition, such as of bullying or getting lost, the increased work load and peer relationships (Zeedyk et al., 2003). These social issues may impact on the success or failure of transition for students (Anderson et al., 2000; Noyes, 2006; Osborn, McNess, & Pollard, 2006).

Research has identified that some groups of students more than others appear to experience more adverse transitions to secondary school (Galton & Hargreaves, 2002). Students from low socio-economic backgrounds or ethnic minorities (Evangelou et al., 2008) tend to make less positive transitions. Marginalised groups in society experience less successful transitions to secondary school as shown by declines in their standardised test scores (Galton & Morrison, 2000). Maori and Pasifika boys in New Zealand, by Year 10, were more likely than Pākehā or Asian students to have experienced a decrease in performance (Wylie et al., 2006). Furthermore, at transition, the gap widens between high and low achieving students (Cox & Kennedy, 2008). In this manner "school

transfer acts like a prism, diffracting the social and academic trajectories of the children as they pass across it" (Noyes, 2006, p. 59). Those students who enter secondary school already disadvantaged in some way experience greater disadvantage through the process of transition.

Literature within the New Zealand context suggests that transition is usually unproblematic, but not for all students. Similar to findings of international research, transition may serve to widen existing achievement gaps. Cox and Kennedy (2008) undertook a Ministry of Education-funded project to address the lack of New Zealand-based research on transition. The project, *Students' Achievement as they Transition from Primary to Secondary Schooling,* was longitudinal and focused on achievement in mathematics, reading and writing of students at the end of Year 8 through to the start of Year 10. This study was able to quantify changes in achievement, but did not offer explanations for the widening achievement gap that differentially affected some groups over others (Cox & Kennedy, 2008).

Another New Zealand longitudinal study, *Competent Children Competent Learners Project* (Wylie et al., 2006), took snapshots of students' schooling experiences at two-yearly intervals from early childhood through to secondary school. The data from the children at ages 12 and 14 captured some of the experiences of transition. This study found engagement and performance prior to transition to be more indicative of post-transition engagement and performance than the transition experience itself, although a decrease in engagement overall was noted. Furthermore, concerns about differential experiences of transition for some groups, such as low decile or Māori and Pasifika students, were raised (Wylie et al., 2006). This study did not focus on mathematics in particular.

Bicknell and colleagues have looked at transition in the New Zealand context particularly in mathematics (Bicknell, 2009; Bicknell et al., 2009; Bicknell & Hunter, 2008; Bicknell & Riley, 2012). In one study looking at the transition to secondary school, they focused on the experiences of 'gifted and talented' students in mathematics (Bicknell & Riley, 2012). They used Anderson and colleague's (2000) framework to examine preparedness, support and the success or failure of transition. They found evidence of secondary schools using "fresh start" practices which indicated some mistrust between sectors and often led to repetition of content. However in general they found most students experienced transition without having major problems. This finding was consistent with other New Zealand-based research.

Bicknell et al.'s (2009) research also noted a number of changes in the nature of students' mathematical experiences between Years 8 and 9, before and after transition. The students in Year 9 reported increases in working alone or independently, only occasional group work opportunities, differing interactions with the teacher such as having to raise their hand, and streamed classes. They speculated that these differences in classroom environment and culture may impact on students' mathematical identities. Help-seeking and learning from mistakes in Year 8 led to a positive sense of mathematical authority and identity, whereas in Year 9 the teacher was predominantly positioned as the mathematical authority. This research provided a detailed description of the ways in which primary and secondary schools represent very different contexts for mathematics learning.

The changes occurring at transition are also documented in the international literature and other New Zealand studies. Examples of these changes include: change in the physical environment; (Bicknell & Riley, 2012; Pointon, 2000); increase in subject differentiation and tracking; greater emphasis on rules for behaviour; more competition and focus on relative ability; more distant relations with teachers (Anderson et al., 2000); more individualised instruction and whole class teaching (Whitley et al., 2007); difference in discipline and expectations of independence (Jindal-Snape & Foggie, 2008); and increasing focus on individual performance (Williams & Boman, 2002). In New Zealand, primary and secondary schools seem to serve different functions for the learners and embody different cultures (Ward, 2000). Primary schools tend to be more child-centered, compared with the subject-oriented secondary school, where students are taught by subject specialists. Specific to mathematics, research examines the changes in relationships with the mathematics teacher and the classroom culture (Athanasiou & Philppou, 2006; Doig, Groves, Tytler, & Gough, 2005; Midgley et al., 1989), and pedagogy (Attard, 2010; Friedel, Cortina, Turner, & Midgley, 2010; Sdrolias & Triandafillidis, 2007; Tytler, Osborne, Williams, Tytler, & Cripps-Clark, 2008).

Such changes in context mean that students will necessarily change the ways in which they perform their mathematical identities. Yet there is relatively little research on transition using an identity lens. Some research takes an Eriksonian identity perspective, seeing school transition as occurring at a time of significant identity formation for students and arguing that this process affects their response to transition and to schooling in general (Tytler et al., 2008). Further, Osborn et al. (2006) suggest:

> Transitions from one context or setting to another may be highly significant with regard to exploring changes in identity and construction of self, in particular in the way the self is represented and understood, both by the individual and by others. (p. 415)

These authors argue for a knowledge exchange between home and school, including listening to children and their parents, in order to understand shifts in identity and to make transition more successful in the long term.

Lucey and Reay (2000) also approached their study on transition to secondary study via an identity lens, albeit one that used discourse and psychoanalytic perspectives. They focused on ways in which anxiety figured in children's narratives of transition, yet they did not assume anxiety to be wholly negative, rather viewing it as a part of growing up and identity development. They argued for the importance of employing a methodology that does not rely on retrospective accounts, instead focusing on students while they are living through the process of choosing a secondary school. These authors discussed the impact of choosing a school within the constraints generated by a highly competitive secondary school 'market'.

Hernandez-Martinez et al. (2011) also look upon the transition from school to college (pre-university) as a question of identity and draw from Holland et al.'s (1998) concept of figured worlds. They see transition as a time in which students can develop in response to the academic demands of the new institution. They challenge those practices which aim to make the new institution more like the old one

as it may inhibit students 'stepping up' and embracing new opportunities. They argue that: "transition can be viewed as growth of identity, largely due to the challenges and demands that the new institution poses, where the chance to become a new person can be exploited by many learners" (Hernandez-Martinez et al., 2011, p. 119) and suggest that the literature on transition should be re-read in this light.

However these key studies are based elsewhere in the world, largely in the UK, where transition to secondary school may be inherently more stressful than the experiences New Zealanders face. Only a very few focus explicitly on mathematical identities.

The move to secondary school brings with it both systemic and contextual changes. Yet these descriptions can only suggest possible reasons for drops in achievement or motivation in mathematics. Utilising identity as a lens with which to examine students' experiences of transition can help us gain a closer understanding of students' localised perspectives of transition as well as further our understanding of how students construct and perform mathematical identities at this time of change.

The dominant question posed by researchers looking at transition appears to be: "How can we ensure success at the transition to secondary school?" But this question blinds us to other questions that could be asked of the situation. Questioning instead how the changes occurring at transition may affect identity performances by students and why these performances may be affected differentially may provide educators with an alternative perspective not gained by measuring 'success'. Research garnering the perspectives of students both before and after transition is essential to gain a sense of the changes in identity that may occur. It would also be useful to capture the perspectives of the students' teachers as they recognise these identity performances. In this way we may gain an understanding of how students perform successful mathematics learner at transition to secondary school, and also of others' recognition of these performances. This could inform the ways in which primary teachers prepare students for secondary school mathematics and the ways in which secondary teachers embrace or challenge the mathematical identities students develop during primary school.

Chapter Four: Methodology

Ontology and Epistemology

Methodology is informed by the researcher's ontological and epistemological position. In situating myself ontologically I suggest that the social world is not 'out there', rather it is constructed by the actors within it. This view is best described as "constructionist" (Holstein & Gubrium, 2008, 2011). In line with constructionist ideas, research is not conceived as a way of objectively finding out the one truth, rather it is also constructed:

> Educational research is, unavoidably, a rhetorical affair. Like any other texts, research texts - reports, articles, instruments - are 'fabrications'. Their truths and findings are put together - that is, built or woven … to achieve particular effects and structures - rather than artlessly culled from a pre-existing world Out There. (MacLure, 2003, p. 80)

The 'world as constructed' and 'research as fabric' are both tangible metaphors, the implication being that the world we are creating is seen as a physical one. Lakoff and Johnson (1980) discuss how theories are often conceived of using the metaphor of buildings. The very word 'constructionist' is a part of this metaphor. In this ontological view, as humans we construct our world, as we also construct our theories about it. Much of the literature on identity, as reviewed in Chapter Two, talks about identity as constructed within social interactions, and thus fits with this ontology.

Wortham and Jackson (2008) tease out the value of constructionist research, particularly for education and for issues of learner identities. They argue the importance of such approaches lies in the ability to help understand and change the constraining or enabling outcomes of educational processes. In particular this approach to research may illuminate the way in which both the social organisation of schooling and learner identities are constructed in order to "help education better achieve its transformative potential" (Wortham & Jackson, 2008, p. 107). Research within a constructionist paradigm seeks to understand experiences of people in the world; it does not seek to find out universal truths about the world. In particular it aims to understand how people create that world. This is useful in that it enables us to imagine alternative constructions or ways to deconstruct and in doing so transform social orders.

However, in order to achieve metaphorical coherence I more specifically locate my ontological position using the performance metaphor. The social world can be conceived of as performed (rather than constructed) and created through the repetition of performative acts. Law and Urry (2004) use this terminology. The act of research in particular creates the reality it seeks to investigate. These authors apply their arguments to methodology specifically. "So what of research methods? Our argument is that these are *performative.* By this we mean they have effects; they make differences; they enact realities; and they can help to bring into being what they also discover" (Law & Urry, 2004, pp. 392 - 393, italics in original). By investigating mathematical identity performances I am helping to

make them a reality. By asking questions about certain types of mathematics learners I help to make those 'types' of mathematics learners exist.

All actions, interactions and performances, including the actions of research, work to constitute the social world. How then can we come to know and understand this world we create? We must interpret it, and this leads to my epistemological position.

Interpretive practice attends to both how we construct our identities and what identities we construct (Holstein & Gubrium, 2011). Denzin (2001) describes interpretive research as beginning and ending with the biography and the self of the researcher. His version, called 'interpretive interactionism', "aims to construct studies, performances, and texts that make sense of and criticize the postmodern period of human experience" (Denzin, 2001, p. 34). He outlines steps for interpretive research which include deconstructing and analysing the phenomenon, capturing multiple instances of it, "bracketing" or uncovering essential features, and re-contextualising the phenomenon into the social world.

The phenomena that is interpreted in this research is two-fold. Both transition and mathematical identity have been deconstructed, analysed, captured, bracketed and re-contextualised. The deconstruction began with an analysis of the prior research on each phenomenon and by viewing each through the lens of the other. Multiple instances of mathematical identities in transition to secondary school have been captured through interviews of students, teachers and parents, and through classroom observations at various points of the transition. By viewing identity as a performance, and looking at the process of transition in this way, I reduce the experiences to their essential features. These essential features are the multiple, repeated and contrasting performances of identity at transition. These features are then reconstructed and re-contextualised into the social world; that is, the process of transition and the construct of identity are discussed and theorised in light of these features.

To summarise, we performatively construct our social world through interaction and then we interpretively understand that world. The action of research constructs the world at the same time as it aims to interpret it. In the following sections I discuss the methods I used and explicate the ways in which I interpreted the phenomenon and helped construct the data I collected.

The Producer and the Critic

Before discussing my methods in detail I want to "interrupt" (MacLure, 2003) with a further exposition of myself in my research. My influence on both the data and the results produced by my analysis has been substantial; I was "caught in the circle of interpretation" (Denzin, 2001, p. 43). Observations were filtered by my perspectives, and interviews were co-constructed by my participants and me. I was the (or part of the) audience for every identity performance in this thesis. I argue that different audiences will engender different performances and yet I could never see performances given to audiences devoid of myself. I could hear a review of performances from teachers, parents, even peers; but I must bear in mind that these reviews were themselves performances to the audience of me. Furthermore I was a special kind of audience member – the critic. I took notes, I recorded

conversations, and I made judgements. I was also the producer; I caused the performance on the interview stage to take place.

Furthermore I was a special kind of audience member – an expert. I have experience in the roles played within this production. I have been a mathematics student and also a mathematics teacher at Year 8. This means I could relate to the performances given but also that I filtered my interpretations based on my own experiences. These experiences will have affected my recognition of the identity performances I observed.

Additionally I was also a co-performer. I performed my 'researcher' identity on the various stages of this thesis – in the classroom and the interview room. At times I was recognised as a researcher and at other times I was positioned otherwise, as a teacher assistant for example. During interviews with teachers I was, at times, positioning myself otherwise also. I was performing 'teacher' rather as well as 'researcher', trying to convey I was one of them. Similarly when interviewing the parents I also performed 'mother', often bringing up my own children so as to present myself as similar to them.

Finally, I am the narrator. Throughout each section of this chapter I reflect further on the ways in which I am present in (and author of) the data produced and analysed. I reflect on my own performances and the ways in which they may have been recognised. Further to this, in the results sections I have at various points interrupted and disrupted the research text (MacLure, 2003) and at these points discussed and highlighted myself in the research. At other times I may be invisible in the text, however as argued by Stronach and MacLure (1997), "the writer is never more present in the text than when she seems to be absent" (p. 35). I wish to make clear that I am present in all the data to follow.

Outline of Procedures

Phase	**Date**	**Data Collection**
Phase 1	December 2011	Interviews with student participants (end of Year 8) x 22 students Interviews with teachers of the two Year 8 classes Classroom observations (x 4)
Phase 2	March – April 2012	Interviews with student participants (start of Year 9) x 21 Classroom observations (x 17)
	April – June 2012	Interviews with parents/caregivers of student participants x 8
Phase 3	July – August 2012	Interviews with student participants (middle Year 9) x 22 Classroom observations (x 17) Interviews with Year 9 mathematics teachers of student participants (x 16)
Phase 4	March – April 2013	Interviews with student participants (start of Year 10) x 21 Classroom observations (x 15)

Table 1: Outline of data collection times and procedures.

I conducted 86 student interviews, 8 parent interviews, and 18 teacher interviews. I completed 53 classroom observations.

The Cast[2]

I recruited students from two intermediate schools at different locations in the city. I assumed that having students from two different schools would counter the effects of any peculiarities one school might have. I chose schools that might allow for a diverse mix of participants. I obtained consent from the principals of the two schools. The principals asked for volunteers within their Year 8 teaching staff.

Having obtained consent from the teacher of one class in each school I visited the classroom of each and spoke to the students about my research project. I sought ten to fifteen students from each class. This large number was to protect against attrition. Eleven students from each class volunteered.

These 22 students included 9 girls and 13 boys. Their ethnic backgrounds were: New Zealand European/Pākehā, Māori, Samoan, Tongan, Indian, Chinese, Malaysian, German. When I designed my study I did not set out to gain a representative sample. I assumed my sample would be large enough to include a range of ethnicities, achievement levels, social class background, and a fair number of each gender in the participants, but too small to be able to make any generalisations based on these groups.

Whilst the 22 students formed the core participants of my study, I also sought other audiences for their identity performances. The two Year 8 teachers were interviewed about their interpretations of the students' relationships with and experiences of mathematics. I invited the students' caregivers to be part of the research and eight of them consented to participate, five mothers and three fathers. The following year the Year 9 teachers were asked to participate in the research and 16 of these consented to be interviewed. Two Year 9 teachers consented to be observed in their classroom while teaching mathematics but did not wish to be interviewed. One teacher asked to conduct her interview via email.

The 16 teachers who undertook the interview did not initially volunteer to be part of the research. Often, experienced or highly competent teachers participate in research; these teachers, in contrast, were ordinary teachers. They were selected by virtue of having received a research participant in their mathematics class. Nine were NZ European/Pākehā, the others were born and educated in Niue, Korea, Russia, Iran, Fiji and two in South Africa. Ten were female and six were male. Six had mathematics degrees; the others majored in science, psychology, business/commerce, German or English. There was a range of experience levels including two first year beginning teachers and one department head.

I also observed in the classrooms of 15 of the 16 Year 10 teachers involved in my study. I did not seek interviews with these teachers as the study ended early in the school year and I assumed these teachers would not have had the chance to get to know their students very well.

[2] See appendix I, page 181 for a list of the participants.

In total I had 22 students, 2 intermediate school teachers, 8 parents, and 16 Year 9 mathematics teachers contribute data for this study. One student missed the interview and observation at Phase Two as, tragically, his father died at this time. One student moved schools at the end of Year 9 and I was unable to gain consent from her new teacher to complete her Phase Four interview and observation. Otherwise there was no attrition.

Observations

My experiences within education as a teacher and as an occasional observer in secondary school classrooms led me to expect that observations of mathematics lessons would not tell me a great deal about students' identity. I assumed that interviews would glean much more relevant information. The primary basis for including observations in my study design was so that I would have a shared understanding of the situation each research participant described in interview. For this reason I did not undertake any form of systematic observation. I made field notes of events and situations that interested me and I paid particular attention to anything my research participant said or did.

My assumption was wrong in some cases and right in others. Having conceptualised identity as performative it would have been much more useful to have video data to analyse the nature of the performances in the classroom. Yet gaining consent from all the students in 17 different Year 9 classes (and again in Year 10) would have been prohibitive. Had I trained a camera on my participant only, then all confidentiality of their participation in the project would have been compromised. Furthermore in the majority of cases the students spoke very little during mathematics classes and I was able to follow many events and 'performances' in the classroom through manual, on site note-taking. Yet my note-taking was always what I personally found interesting. Had another researcher been in the room they may have taken different notes.

Prior to any observations I emailed the student to inform them I was coming in to their class. I was usually admitted to the classroom before the lesson began and I chose a seat in an unobtrusive position. Reactions to my presence were mixed. Some students barely noticed me at all while others spoke to me and questioned me.

> The teacher introduces me: "Is she your boss?" asks one student, "Is she a student teacher?" asks another. (Field notes, Mantua Girls, 15/03/2012)

Students' assumptions about my role in the classroom were also indicative of the way in which they positioned the teacher, as noted by the above comments.

Sometimes my participants did not see me in the room (particularly if they were late to class); some studiously ignored me and others made a point of acknowledging my presence. The teachers sometimes introduced me as a 'guest' or an 'observer' and sometimes did not acknowledge me at all, leaving students to think what they would. The presence of an extra adult in a classroom taking notes is not unusual in many New Zealand classrooms and sometimes there was another 'extra' in the classroom along with me, a student teacher or teacher aide for example. In one classroom I was

assumed to be an IT auditor, there to observe appropriate use of I-pads by the students. However, it can be assumed that my presence would have influenced the performances of the teacher and students and the research participants in particular.

During interviews held after each observation I tried to ascertain whether my presence had made any difference to the 'typical' situation. Did the teacher put on a special show for me? Or did it seem to be a usual lesson? Whenever the teacher approached my research participant to help them with their mathematics work I wondered if they did so self-consciously, aware that I would be focusing on this interaction. At times I wondered if the student was receiving more attention from the teacher than they usually would.

There were times when I felt that the ambiguity of my role had an effect on students' behaviour, as seen in the following extracts from my field notes:

> A boy throws a mandarin peel at another. This boy sees me looking at him and puts the peel in the bin. (Field notes, Messina, 02/08/2012)

> Student: "What the fuck?" T doesn't hear but another student looks at me and then says: "Don't swear." (Field notes, Sardis, 27/08/2012)

I also wondered whether my research participants' behaviour was much altered due to my presence. Were they quieter than usual when I was in the room? Did they work harder? There were times when I felt sure that my being there must have limited the students' participation in class, but I was able to check this during the teacher interviews. Many of the students in my study happened to be 'quiet' class members who did not often contribute to class discussions, according to their teachers, so my presence appeared not to be the cause of this.

I acknowledge the awkwardness in having a researcher in one's room watching (and ultimately judging) one's practice. I tried to portray myself as a teacher, 'just like them' when I arranged a time to observe, but in reality I was not performing my teacher role in this situation. I was there to collect data for a research project that was somewhat vague in terms of areas of interest. This vagueness was not due to deception, but rather due to the exploratory nature of the research. During some observations the students were disobedient and some teachers had difficulties managing behaviour. This may have been exacerbated by my presence. For example during one observation the teacher approached me to talk briefly. A student took this opportunity to run out of the classroom and the teacher was required to run out after him.

Soon after each observation I arranged an interview with the student. At this time I was able to ask them about any particular events as well as more general experiences of mathematics learning.

Interviews

Interviews formed the majority of my data. The interviews were one-to-one and semi-structured. At each interview I had a list of questions but I also asked other questions exploring avenues that came

up in our discussion. I asked students about their past experiences of mathematics and about their predictions for the future. I asked about classmates and what made someone seem good at mathematics. I asked students to talk about other subjects also and in this way was able to ascertain the relative ranking mathematics held for each student. I also asked students questions about their thoughts and predictions for secondary school[3].

At subsequent interviews I first asked questions regarding the transition to secondary school and interesting events or changes since the last interview. I also included some questions that were the same or similar to those asked at prior interviews in order to compare responses over time, for example: "How does mathematics compare to other subjects?" or "What do you need to do to be successful in mathematics this year?" I also based some questions on ideas that emerged as my theorising over performative identity developed, for example at Phase Three: "How do you usually act in mathematics class?" I also dropped questions from the schedule that did not produce much of a response. For example at Phase Three interviews the question: "Can you tell me about something funny, interesting or embarrassing that has happened this year," did not elicit stories as I expected.

However, in general I attempted to phrase my questions in such a way as to elicit a story (Hollway & Jefferson, 2000). For example, with the prompt: "Tell me about the first day of maths this year" I expected to gain a more specific story than I would with the prompt: "Tell me what maths is like this year" Despite this approach some of the students did give generalised responses to this specific question and described a typical mathematics lesson. Others gave answers that were narratives: sequenced, chronological, often emotive and with an evaluative component to them (Mishler, 1986; Ochs & Capps, 2001). I surmised that where students gave a narrative answer it indicated they had engaged in sense-making processes regarding the event and also that they took on a more central role in the event (Bruner, 1991; Kaasila, 2007a).

My interview questions for teachers attempted to garner information about Year 9 students in general as well as the student participant in particular. I also asked teachers about their past experiences of teaching and learning mathematics. With the parents I asked about their child's early mathematics learning experiences and their expectations and experiences of transition to secondary school. I also asked about the parents' own mathematics learning experiences. As with the student interviews, these were all semi-structured; I asked other questions based on replies given. The responses of teachers and parents gave me insight into the ways in which the students' identity performances were recognised by these significant others.

The interviews of students lasted between 10 and 27 minutes, most typically around 20 minutes. The parents spoke at most length in response to each question, at times talking for five minutes or more without pause. Their interviews ranged from 13 to 43 minutes. The teacher interviews ranged from 20 to 42 minutes.

[3] See appendix II, page 182, for a list of starter questions at each phase.

These interviews were very interpretive (Denzin, 2001). As my participants spoke I was interpreting their meaning in a particular way that may or may not have been as they intended. I tried to speak back to them my understanding of what they were saying in order to give them the opportunity to correct me if wrong. However, given the asymmetrical power relations inherent in the research interview (Kvale & Brinkmann, 2009) it is possible that the participants may not have always felt comfortable about correcting me.

Such interpretation and misinterpretation is normal in an exchange between two people. If the interview text is read as a co-construction between the interviewer and the interviewee then my interpretations and misinterpretations are part of this text. The interview is a means of generating knowledge rather than uncovering knowledge (Kvale & Brinkmann, 2009). The interviews were a means to elicit students' identity performances and if I subsequently misrecognised these performances then this is still part of the data (Nikander, 2012).

A strength of this research design is the revisiting of students four times during their transition to secondary school. Studies only looking at retrospective accounts of transition do not appreciate the lived experiences of the students (Lucey & Reay, 2000). Also, having a series of interviews helped me to build rapport with my research participants (Grinyer & Thoman, 2012). They may have felt more comfortable about sharing sensitive details as our relationship built. The knowledge that they would have to face me again may have worked to make their performances more considered, as they would be accountable to these in the next interview.

Having multiple interviews also generated the space for the participants to contradict themselves from one interview to another. On the other hand the first interview responses may influence subsequent interviews (Mishler, 1986). Yet multiple accounts also "splinter the dogmatism of a single tale" (Grumet, 1991, p. 72). Within my theoretical framework, a story or generalised account is a current identity performance (see for example: Ochs & Capps, 2001). If the story changes then one's identity is changed. If the story remains the same then the identity performance is consistent. I will expand on this further in Act Two, Chapter Four, page 89.

Finally the multiple interviews enabled me to see some evidence of the impact that doing research like this has on the lives of the participants. Talking at regular intervals about one's mathematics experiences provides a form of accountability. One participant reflected on this:

> I: My last question for you is: have - like in all the times that I've interviewed you, have your feelings for maths changed at all?
> C: Um, yeah, getting interviewed it's like I think - 'Cause I want to do better so I can, like tell you more about what I've done and how I've gotten better. (Ryder, Phase 4)

Transcriptions

I audio-recorded the interviews on a digital recorder and transcribed them in full myself. The transcriptions were made primarily to provide a record of the interview that would be easy to re-read

and refer to. However I often referred back to the audio-recordings as these were the 'true' record of the interviews. The audio-recording captured hesitations and inflections of voice that aided my understanding of the students' meanings in ways that my transcriptions did not.

To interpret the interview quotes used in this thesis, refer to the following transcribing codes:

Code	Meaning
/	to indicate the speaker was interrupted by the other speaker.
//	to indicate both speakers talking at the same time.
…	to indicate a pause (more dots for a longer pause)
–	to indicate a change in topic mid-sentence
When quoting the interviews in this text, I used […] to indicate a piece of the interview had been omitted (as distinctive from a pause). I prefaced dialogue with either the initial of the student or the letter 'I' for myself.	

Table 2: Transcribing codes

Because I did not intend to conduct a close linguistic discourse analysis on the text I did not measure the length of pauses, nor did I get a colleague to perform an inter-transcriber reliability check. However I checked the transcriptions myself against the audio-recordings at least three times.

Once completed and checked the transcriptions were offered to the participants to check. I suggested to participants they could add or change the text if it did not reflect their meaning. After Phase One interviews were completed and transcribed I arranged a time for the students to read the transcripts to make any changes they wished. Only one student wrote an additional sentence to one of her answers. No one made any erasures of text. After the interviews at other phases students were again asked if they'd like to read their transcripts but most declined. Some asked for them to be emailed to them so they could read them later, but none returned them with any changes. Of the caregivers and teachers most did not want to read their transcript. Of those who did, none returned any changes. Two of the adult participants commented on the discomfort or embarrassment they felt at reading their spoken word in written form, and referred to the way they often changed topic mid-sentence.

I transcribed each set of interviews before conducting the next phase. The act of transcribing helped me to interact with my data for a second and third time and allowed me to consider follow-up questions that had not occurred to me at the time of the interview. This first wave of analysis informed my selection of questions for all participants at the next phase as well as selecting individualised, follow-up questions for each participant.

Data Analysis

I began informal analysis even before transcription, that is, during the act of data collection, when listening to interview responses. At many points in the interview my asking for clarification was an invitation to them to join in the analysis and at some points they collaborated here. I also began analysing while conducting observations in the classrooms. Peppered throughout my field notes are analytical comments or questions that move beyond the recording of events, movements and utterances that were the primary task of observation.

When formally analysing the data I began with a process of data reduction before undertaking thematic analysis. Kvale and Brinkmann (2009) write about the "1000-page question" (p. 189), suggesting it is too much data to be handled in a meaningful way; similarly the entire data set in this research would have generated too many codes to keep track of. I began by considering a sub-question, and then I extracted from the data everything pertaining to this question. Many of the sub-questions I asked of the data related to the initial research questions. For example, "How did the stage of secondary school affect identity performances?"; "How did students (and teachers) talk about being 'good' or 'successful' at mathematics?" I coded this reduced set of data for themes in the manner of Braun and Clarke (2006). Having obtained the themes I returned to the full data set and did key word searches (using the find function on MSWord) to uncover any further data related to that theme. Finally, I used vignettes to illustrate some themes, and for this purpose the data was further explored in order to create a fuller picture.

To illustrate the process I will use an example: *How did the students talk about transition to secondary school?* In order to explore this question, I extracted every mention of secondary school from the students first interview (Phase One) and used nVivo to manage this data. I coded all the comments thematically (Braun & Clarke, 2006). In order to get post-transition responses I needed to analyse interview responses which were about the transition, as opposed to mathematics learning and other more general items. I firstly looked at the responses to interview questions such as "How is high school going?" I coded these responses and then used the common codes to further explore the data. For example many students mentioned liking their teacher, so I returned to the full data set and extracted every mention of mathematics teachers and analysed whether these mentions were similarly positive or provided contrast. I also looked to find data to support (or contrast) the findings from Phase One. For example many students said, prior to transition, that they expected the work to be harder, so in the post-transition interviews I extracted every comment that was related to the level of difficultly of the work, and then analysed these comments. In this manner the analysis was an iterative process, repeating until no new data about the topic was uncovered.

However not all data was analysed by starting with a sub-question. Some themes became apparent during the informal analysis. Themes such as seating, pedagogy, assessment, streaming and grouping were topics that appeared to me to be significant to the process of transition to secondary school. The importance of these themes is subjective. It is my past experiences of teaching and my theoretical understandings derived from literature that led me to recognise these themes as

significant, and I acknowledge that another person may have generated some different themes even through interaction with the same data.

Although the pursuit of a particular theme or question meant a subjective reduction of the data set, the next steps of the analytical process were more rigorous. The entire data set was regularly consulted to ensure any findings were explored in relation to the whole. Furthermore I tried to be reflexive in this process. For example, while 'testing' was a theme that emerged from analysis of all mentions of secondary school, when I looked closely at the comments related to this it transpired that I was the one who usually brought up and pursued this line of discussion. At Phase One the students were not overly concerned about testing or assessment, even though I felt it to be pertinent. For this reason I did not include the theme of testing in the monologue I constructed about transition anticipations (see Act Two, Chapter One, page 57).

The presentation of data in thesis chapters formed the next stage of analysis. In line with my performative metaphor, I call this stage metaphorical analysis (Gordon, 1996). By this I mean that the process of fitting the data to the structural metaphor I have employed is also a form of analysis and furthermore it performatively produces the findings (Law & Urry, 2004). For some topics and in some chapters I created a play from observational data or a monologue from interview data that supported or illuminated the findings from interviews. This process worked to *construct* the data differently to a more conventional reporting of results[4].

Throughout the analysis process I used the lens of performance identity. This means that I 'saw' the data in this prescriptive way, and furthermore that only some aspects of the data were 'seen' or even recorded/generated. While using this lens has meant some aspects of the experiences of transition to secondary school mathematics are illuminated, other aspects are hidden. In this manner the data has been produced by the metaphor I have used – as well as being analysed using it.

Presentation of Results

Often I present results conventionally for qualitative research. I use interview quotes, field notes of observations, and also counts of the number of people who spoke about a particular theme in a particular way. Elsewhere, however, I produce text that departs from these more conventional approaches, by using plays and monologues. In doing so I rise to Denzin's (2001) challenge to "experiment with alternate ways of presenting information" (p. 153).

To create a play I have taken excerpts from interviews and from field notes and combined them to capture some essence of the data. For example in the next chapter (see page 48) I take all the parent's comments related to school choice and put them together in a fictional setting where they might be talking to each other. In reality these comments were spoken to me in interview. Other plays are taken directly from notes made during observation in a classroom (see for example page 71).

[4] See also (Kelly, 2011) for a discussion of the use of metaphor in theses.

Where changes have been necessary I have used italics to indicate that these words come from me and not a participant[5].

The first chapter of Act Two contains a number of monologues (Saldaña, 2003). Here I have combined a large number of comments from interview participants into one voice. These monologues present the common themes found in the interviews. Again italics are used to indicate where I have used my own words to keep the flow of the monologue. However, the entire monologue is a fiction in the sense that it implies one voice while the reality is many. I do not mean to imply that the experiences of transition are the same for everyone, rather that everyone's experiences work together to form a singular story, and although there may be differences within the story it coheres as a whole. This mirrors, in a small way, the means by which meta-narratives are generated in society, or rather, how we perform the world and create the world in these performances.

Such presentation of the data achieves a number of effects. First it adheres to the theme of theatrical performances and therefore strengthens the metaphor. Secondly it makes the data less disjointed and easier to read. It generates "dramatic impact" (Saldaña, 2003, p. 221). Finally it creates an illusion of coherence. The data appears to be telling the same story and I acknowledge that this notion of coherence is itself a fiction. However some researchers within mathematics education use and justify fictional work in the presentation of their research (see for example: de Freitas & Nolan, 2008; Hannula, 2003). Further, MacLure (2003) discusses the way in which any text is a fabrication that works to achieve particular effects and structures. It can be argued that all research text is a fabrication, or fiction (Denzin, 2001), carefully contrived.

Authenticity and Trustworthiness

How then can we trust this data? Schoenfeld argues that research should be judged on at least three criteria. These are: trustworthiness, generality and importance (Schoenfeld, 2007, 2008). Trustworthiness addresses the question of whether one should believe what the author says. Generality, or scope, refers to whether the research can apply to other situations or contexts. Finally importance addresses the question of why one should care (Schoenfeld, 2007).

Trustworthiness

Trustworthiness addresses issues that would be described as validity and reliability in a positivist paradigm. In order to be trustworthy a study needs to have: descriptive power, explanatory power, replicability, rigor and specificity, and finally multiple sources of evidence, or triangulation (Schoenfeld, 2007).

The descriptive power of this research lies in the power of the metaphor of performance for identity. This lens for identity has a greater degree of descriptive power than other identity lenses. It is a lens with an automatic zoom so attention can be as easily paid to the wider (macro) context of

[5] See "Opening Up the Research Text" (de Freitas & Nolan, 2008), for a discussion of how the use of narratives and fictions can explore social justice issues and "playfully take-up and interrogate the research paper from divergent positions" (p. 4).

mathematics learning as to the micro context of the individual. This means we can attend to the types of identity performances that are enabled and constrained, and also the co-performances an individual may struggle with.

The metaphor utilised in this research also endows the study with potential for theorising about why students may opt out of mathematics learning or form negative identities. An understanding of the constraints of the stage or of difficult identity performances may be illuminated with this metaphor. While the study is not longitudinal enough to make full use of this power, it does have explanatory value.

This study is replicable. Identity is clearly defined and re-useable by any researcher in a similar context of transition. The analysis is subjective in the ways described in the above sections; another researcher is likely to generate different themes from their data. However, the analysis was rigorous and the results match well with findings of other researchers who apply different lenses to their data.

Holding four separate interviews lent accountability to the interview situation as students had to re-present themselves to me on a number of occasions. By interviewing their teachers and some of their caregivers and by observing them in the classroom I was able to 'triangulate' the data the students performed in interviews. This means we can place increased trust in the students' interview data.

Generality

One of the major limitations of any context-specific study is the seeming lack of generality. The data is generated by a limited number of participants from one city in a small country and as such cannot be said to be generalisable to the wider, global population. Furthermore these students volunteered to be part of my research. It is possible that they are, in view of this fact, 'people pleasers' to a greater degree than other students. Those who did not choose to volunteer may have been less likely to perform in the ways they suspected the interviewer wanted.

Yet this is a limitation that does not apply to the teachers in my sample. The study contains teacher participants who did not volunteer. They kindly agreed to participate once they were already almost de facto participants. Coming from nine different secondary schools and teaching a range of ability levels, with a range of personal levels of mathematics knowledge and teaching experience, they form a diverse group. I argue that this makes any consistency in their interview responses likely to be more generalisable to the wider population of New Zealand secondary school mathematics teachers.

As the director, critic, producer and significant audience member, I was very intertwined with the research. Another researcher following similar methods would undoubtedly have generated different data. The students, teachers and parents would have performed differently to a different interviewer (audience).

However, the findings of this study raise questions for the teaching and learning of mathematics that can be asked of any context and any students or teachers. In this way the study is certainly generalisable.

Importance

This thesis addresses issues of equity in the learning of powerful mathematics through a focus on identity at transition to secondary school. By gaining an understanding of how students may form positive mathematics identities we can better adapt secondary educational practices to enable this for all students. By understanding why some form a negative relationship with mathematics or opt out of further learning in mathematics we can again adjust practice to work towards its prevention. Such understandings are extremely important, and constitute the way forward for mathematics education research (English et al., 2008).

Ethics

The University of Auckland Human Subjects Ethics Committee granted approval for this project in full on 14 September 2011 (approval number 2011/7559).

Chapter Five: Context

We may choose to outline the context of a study in a number of ways. We may look at the physical or structural context or we may look at context in a more abstract way. Within the metaphor of performance identity the macro-context can be seen structurally as the *theatre* and the micro-context as the physical *stage* on which identities are performed. Here the theatre is the New Zealand education system, and the various stages are the classrooms of primary and secondary school. Figured worlds (Holland et al., 1998) in contrast, are a more abstract way to consider the context. A figured world is "a socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (p. 52). Pertinent to this study are the figured worlds of *mathematics learning* and the global context of *consumer choice* within a notion of the marketisation of education (Youdell, 2011).

The students in this study make their transition to secondary school within the structural context of the New Zealand education system and step from one distinct stage to another. In doing so they must make a *choice* of which secondary school to attend. That is, their transition is made within the context of choice, a context that has not always existed historically.

In this chapter I will discuss the aspects of the wider context of the New Zealand education system, (the theatre), and the figured world of choice that pertain to transition. I will then outline the different stages upon which students perform their mathematics learner identities.

The Theatre

In this thesis the theatre in which productions are made, plays are conceived and performances are staged is the New Zealand education system. I briefly highlight key features which have relevance to transition and to the identity performances that I will be discussing further later.

Most New Zealanders start school the week they turn five years old, although schooling is not mandatory until the age of six. Prior to starting school children may have been enrolled in early childhood education; starting school is usually the first educational transition children face. Primary school is from Year 1 to Year 8, although many students, particularly in the city, attend an intermediate school for Years 7 and 8. This was the case for all the students in this study, and therefore going to secondary school constituted at least their third educational transition. Secondary school is from Year 9 to Year 13. In Years 11, 12 and 13 students sit national assessments. For most this is NCEA (National Certificate of Educational Attainment) although some schools opt to do international assessments such as Cambridge or IB[6].

The New Zealand Curriculum (Ministry of Education, 2007) is a document that encompasses Years 1 to 13, providing what is meant to be a seamless educational framework. The curriculum contains eight

[6] Cambridge (or IGCSE) and International Baccalaureate (IB) are alternatives to NCEA provided at some schools.

levels through which students are expected to progress. However, the lived curriculum is a little different. Primary schools tend to teach the child according to the level they are assessed to be at. Secondary schools teach the same level to every student within each year. This means at Year 9 there are likely to be some students repeating content, and others who have missed content through their transition. External NCEA assessments also drive the curriculum in secondary schools. Schools plan the syllabus from the top down and what students are required to know for NCEA assessments will find their way into the programmes for Years 9 and 10. Furthermore in most secondary schools in this study, NCEA mathematics and/or Cambridge exams were offered to some students a year earlier than the typical Year 11.

A factor impacting on the lived curriculum at the level of primary school has been the nation-wide numeracy development project[7]. The NDP was first implemented in 2001 in a number of schools, with the other primary and intermediate schools in New Zealand joining the project over the next decade. The project was implemented as a professional development programme for teachers. Teachers in New Zealand primary schools are generalists and many do not hold any specialisation in the area of mathematics. Research associated with the numeracy project suggests the mathematics skill level of primary teachers is weak (Lomas, 2009). The NDP provides a scripted way of teaching mathematics (or 'numeracy'), as laid out in the supporting resource books. However, schools may follow the project to varying degrees and the two intermediate schools in my study had differing levels of uptake of NDP. Generally primary schools in New Zealand teach children in ability groups, as promoted by the project. The child's 'ability' is often determined through a numeracy assessment.

Choice

State schools in New Zealand have an enrolment zone. This means all students who live within the zone must be admitted by the school if they choose to attend there. However students may apply to attend a school outside their zone if they satisfy the admission criteria. The criteria are more or less stringent depending on the popularity of the school. In city areas there are both co-educational and single-sex state schools that students may enrol in. Otherwise students may attend a private school and pay fees. In this manner, at transition to secondary school the students and their parents are faced with having to choose a secondary school from a number of different options. Such choice reflects international trends of the marketisation of schooling and the pitching of education as a consumer choice (Youdell, 2011). In making their choice parents and students may become anxious to make the right decision so as not to become educationally disadvantaged (James et al., 2009; Lucey & Reay, 2000).

One factor parents take into consideration is the decile rating[8] of the school. Students from schools in the highest deciles are more than three times more likely to leave school with a university entrance

[7] See www.nzmaths.co.nz for more information on the NDP including a description of strategy stages and examples of resource books.
[8] A decile rating gives an indication of the number of students a school draws from low socio economic communities. Decile one schools are the ten percent of schools with the highest proportion of students from these low SES communities and decile ten schools are the ten percent with the lowest proportion of students from those communities (Ministry of Education, n.d.).

qualification than students from schools in the lowest deciles (Ministry of Education, 2008). But there is large variation between schools; a school's decile rating is therefore not necessarily an indication of (or a limitation on) student achievement. However, a recent study found that the decile rating of schools correlated to mathematics teachers' university levels in the subject. Only 4% of secondary mathematics teachers at top decile schools have not studied mathematics at university level compared with an average of 50% at low decile schools (Barton & Sheryn, 2009).

The parents I interviewed demonstrated the conflicted aspects of making the right choice of school for their children. I present some of this data in a short play below:

Ruminating on school choices[9]

SCENE: *A meet the teacher event at a secondary school (Odeon College). The lights go up as a group of eight parents are chatting near the fundraiser BBQ tent.*

GARRY: I spoke to a lady and she had her kids in *Odeon College* for one year and then decided to shift them.

ME: *Oh, where did she shift them to?*

GARRY: She put her kids down in *Cinematia High* for a year and they floundered-

CYNTHIA: That's the choice I wish I'd made actually.

GARRY: Three and a half thousand kids in there and they just couldn't deal with it.

SANDRA: Um, initially I thought *coming here* was going to be a big problem because *my boy* wanted to go to *Cinematia*, because um, the intermediate where he went, there were only seven kids who went from *there* through to *Odeon here* because of the zoning – we were right on the edge of the zone. And he made quite a few friends at intermediate, all of his friends ... yeah, all of them were going to *Cinematia.*

BLAIR: *My daughter's* decision stemmed from the fact that she had a group of friends that she was with at Intermediate.

SANDRA: We talked about it, talked about it um, and then we reached a compromise, said that he, ah, logistically, we had two children going here – to *this* school, *and we didn't want* one going here and one going there. However, if he really was unhappy or disliked it immensely well then we would be happy with him to go to *Cinematia* next year.

AARON: Obviously you don't want them all going off in different directions.

BLAIR: Now both *my girls* went to different schools

AARON: *Oh, well, my girls are* quite close in age and quite friendly. Um, and, I mean we're very happy with *this school,* it's a very good school and the alternative would have been… I'm sure she'd have been fine there too. I don't think it's made a huge –

[9] *Note: All comments come directly from interviews with parents – the character ME is myself. The only changes made are in italics in order to hide the identity of the schools spoken about or to keep the flow of conversation. These parents actually sent their children to five different secondary schools, although for the purpose of this play I have written it as though they are all at the same school, a fictional 'Odeon'.*

	would have made a huge difference.
SANDRA:	We really like *Odeon* and I particularly like how they stream *here,* they only stream for *maths* up until Year 11 and then they only stream English and Maths.
GARRY:	And the principal is really good.
MAREA:	In the end I just went on um, the academic results *here* are higher, and I said if it's not *working* out you can just transfer.
CYNTHIA:	*Cinematia* offers NCEA **and** Cambridge.
AARON:	We didn't, you know, think it through to any great extent academically.
BLAIR:	She had friends that she was going to be *here* with and that was probably going to make it an easier transition from intermediate to secondary.
ANANDITA:	Um, yeah we had two choices between *Cinematia* and this one. I kept asking a lot of people and they said *Cinematia* was not so good now.
CYNTHIA:	It's a very, very hard place to fit into. *At intermediate school my boy* was trying to be friends with a group of kids who'd come right through kindy together.
ANANDITA:	And I went myself – I would just go around the area and just see the children and I found, you know the children were much more well behaved *here*.
GARRY:	*The principal* don't muck around, he don't take any slack from them.
ANANDITA:	*Yes, that's p*robably what I saw and so I just decided to go with this school. Because um, studies *are* the main thing for *my daughter* and we had a big problem when we came here, again, second time to New Zealand and we lived in *South Auckland* and she went to *primary school* and she had big problems at school there because the children were not very obedient to the teacher and they were bullying her a lot you know and so I did do my homework, I went so many times to both the schools to see how they were behaving you know [laughs] things like that.
ME:	*Did many of her friends from intermediate go to Odeon with her?*
ANANDITA:	No, no unfortunately, no. Everybody went to *Cinematia*.
	END SCENE

From the parents' talk we can see that friends and siblings have a big influence on school choice. Other factors include the school zone, perceptions of academic performance of the school, the exam programme offered and behaviour management. But also, much decision-making seems to involve a *sense* of the school rather than any *evidence* and is perhaps based on rumours and speculation by other parents, as indicated by Garry and Anandita's comments. It appears that the students' opinions have been considered regarding school choice. We can also see how both parents and students might be defensive or unsure about this decision. As students begin secondary school, therefore, they are already implicated by their choice, perhaps ready to defend it, regardless of their early experiences there.

The Stage

We all perform our identities on the stage of our immediate surrounds. I will be considering the stage of the intermediate school classroom, the stage of the secondary school classroom, and the stage of the interview room. Of course the participants in my study perform their identities upon many other different stages at other times including home, the playground or between classroom spaces at school, and within various other community groups such as church, Saturday netball, drama club, at a soccer game, music class and more. They also perform their identities through social media such as facebook, twitter, or when texting friends. It is clear when looking at such a diverse list of contexts that the performances could be very different depending on the stage upon which they act. Yet there will also be consistencies in performances across the different stages and it is both the consistencies and inconsistencies that generate data for this study.

Scene one: Intermediate school

The curtain opens to the scene of a large classroom. The walls are full of colourful posters and students' work. Geometry projects depicting a variety of house constructions sit high above the windows. Computers line one wall and desks are arranged in groups of six with chairs positioned so that students are seated facing each other. There are approximately 30 students in the room, aged 12 to 13 years old, of a variety of ethnicities. Some are working together at desks and tables, others are accessing computers and a small group sit in a large space on a mat, facing the teacher. There is a buzz of sound in the room; students speak to each other in quiet tones.

The above captures the scene of both intermediate school classrooms in my study. The school located in a suburb to the west of the city I will call Western Intermediate; the other, being located in a more central suburb I will call Central Intermediate. Both schools are mid-decile with a roll of 300-400 students.

There were some differences in these schools. The class at Western Intermediate was one of two 'gifted and talented' classes. This meant the students in the class had attained a higher score in placement tests than their peers, who were placed in other classrooms. However, there was still a large range of mathematical achievement in the students of this class. Central Intermediate had no class like this; all classrooms were mixed ability. At Western Intermediate the desks were not assigned to students; they had cubby-holes for their belongings and the desks could be accessed by different students during the day. At Central Intermediate students had their own desks containing their belongings, but I noticed students often moved around to sit at the desks of other students. There were more computers at Western Intermediate and they were in a more prominent position than those at Central. However during observations in both classrooms more than half of the students in each class accessed a computer during the lesson.

Both classrooms had students grouped by 'ability' during mathematics. In Western Intermediate the groups were allocated according to results gained on an asTTle[10] pre-test on a topic (during the time

[10] asTTle is a nationally standardised achievement test.

of my observations this was algebra). In Central Intermediate the groups were formed by results from a GloSS[11] test. In both cases the groups were somewhat fluid, membership changing each term. All students appeared to be aware of which groups were the top and bottom ability. In both classrooms the students were taught mathematics by their own teacher rather than being cross-grouped as is the practice in some other intermediate schools.

In both classrooms students moved around the room a lot, often discussing with or questioning a peer about some aspect of the mathematics task. The teachers in these classrooms, by contrast, were only available to the group with which they were working at the time. Both teachers spent time with two groups during the lesson, but more than half the class did not have access to the teacher for the majority of the lesson.

The lessons in each classroom followed a similar structure: a warm up activity, such as ten questions written on the board or a times-table speed challenge, was followed by the teacher informing students as to what each group was to be working on for the rest of the lesson. Students then moved from desks to different places in the room. Some worked at the computers, some sat at desks or tables, and some were 'on the mat' with the teacher. Half way through the lesson the students moved on to a different activity. Almost all the students talked with their peers as they worked.

Scene two: Secondary school

The curtain opens to an austere classroom in which all desks are placed in rows clustered in twos and threes, facing the whiteboard at the front of the room. The walls contain one or two posters and the schedule of topics to be covered for each year group, detailing when each topic test will occur. The room is silent, except for the lone sound of the teacher explaining an algebraic concept written on the board. There are about 25 students in the room, a mixture of ethnicities. The students are all copying the equations and working from the board, heads bent over their work and occasionally glancing at their neighbour's work or raising their hand to answer the teacher's questions.

Although not all of the seventeen Year 9 secondary classrooms were exactly like the scene described above, it can be seen as the standard from which they diverged in some way. This description is based on the impression I gleaned from my observations in general.

The following table details the particulars of the secondary school mathematics classrooms observed in this study.

[11] GloSS is a diagnostic numeracy test administered one-to-one by the teacher

School	***General description***	***Classroom type***
Messina (4 classrooms observed)	Co-ed state school, mid-decile, Years 9-13, large school	Girls class, Stream 2 (of 10)
		Boys class, Stream 4 (of 12)
		Boys class, Stream 6
		Boys class, Stream 8
Philippi (3 classrooms)	Co-ed state school, mid-decile, Years 9-13, medium sized school	Top band
		Top band
		Main stream
Mantua Girls (3 classrooms)	Girls state school, mid-decile, Years 9-13, medium sized school	Top band class
		Mainstream class
		Low band class
Sardis (2 classrooms)	Co-ed state school, mid-high decile, Years 9-13, medium sized school	Top band class
		Mainstream class
Padua	All boys state school, high decile, Years 9-13, large school	Stream B (2nd of 16 streams)
Arden	Co-ed state school, low-mid decile, Years 9-13, large school	Stream 4 (of 10)
Elsinore	Co-ed private school, decile not given, Years 1-13, Small school	Mixed ability class
Verona	Co-ed state school, mid-decile, Years 9-13, medium-large sized school	Top stream class
Venice	Co-ed state school, high decile, Years 9-13, medium-large sized school	Stream 5 (of 9)

Table 3: Secondary schools and mathematics classrooms included in the study.

In many of the secondary school classrooms I visited I noticed the walls were very bare in comparison to the intermediate schools. In most of the secondary classrooms there was an outline of the topics and tests for the year on the back wall. There were usually a few professionally printed posters and little else. Jewitt (2005) discusses how the (English) classroom is a constructed site built with values and purposes, and shaping the work and behaviour of teachers and students while also being shaped by "those who act in and on it" (p 310). Jewitt's research pays particular attention to visual displays in the classroom and the ways in which these signify appropriate learning, communicate expectations and are identity-building or identity-confirming. In only a handful of classes that I observed was there student work on the walls.

However there were a variety of modern technologies visible in the classrooms. In one school every student had an iPad. All classrooms had a whiteboard at the front of the room and some also had a smart board or a data projector. The teacher's desk usually had a computer (or cable for a laptop) which was used mostly to send the attendance to the office.

Lessons at secondary school followed a consistent pattern. A “Do now” problem (or set of exercises) would be on the board to provide students with practice of yesterday’s lesson (or to occupy students as they waited for classmates to arrive). After marking/discussing/clarifying these the teacher would follow with a demonstration and explanation of the new concept to be learned. There would usually be some discussion and then students would continue with exercises from a textbook, worksheet or written on the board. This pattern is remarkably similar to the description of “usual school mathematics” given by Boylan (2010), of mathematics classrooms in the UK.

Finally, almost all the schools engaged in the practice of streaming. In some schools (Messina, Padua, Arden and Venice) the Year 9 classes were ranked completely from a top class to the bottom. Other schools were banded (Phillipi, Mantua, Sardis), with a top band of two or three classes and a bottom band, often called learning support, and a middle band of mixed ability. At Verona the classes were banded and then re-streamed for mathematics. One school, Elsinore, had only one Year 9 class and therefore streaming was not possible.

Scene three: The interview room

The curtain opens and lights go on to a Pākehā woman in her thirties sitting at a desk. She is tidily and professionally dressed, yet not quite in business attire; she looks like a teacher. In front of her are two items: a small recording device and a paper with questions written on it. She is smiling. There is an empty chair on the other side of the desk, as though waiting for an occupant.

Most of the data for my study was generated on a stage like the one described above. Students performed their mathematical identities for me in an interview room and the performances on this stage differed from those enabled by the classroom stage. There were asymmetrical power relations operating in this room. I was the adult and authorised by the teacher. I had the agenda and the audio-recorder. I did my best to make sure the students felt comfortable and safe. I always positioned myself near a window where my actions could be observed from outside. I did my best to appear unthreatening. Who I was and who I appeared to be will have affected the performances by the students. Yet I had little control over the stage itself. The location for interviewing was always chosen by the teacher.

At Central Intermediate I was given a neighbouring classroom to use. This was a large empty space and seemed to be often used by various teachers and classes for differing purposes. I wondered what other types of identity performances the students had given in this room. The combination of my past experience as a teacher and the fact that this was a classroom may have worked to position me away from the researcher role. Possibly the students saw me as the teacher of this room.

At Western Intermediate I was given the teacher’s office, adjacent to the classroom. This was a small space, crowded with piles of test papers and folders and a variety of files. I sat at the teacher’s desk and this may have positioned me (literally) on the side of the teacher. Again I wondered what sorts of identity performances were typical in this room. Were students usually allowed in? Were students disciplined in this room? Again I felt positioned as a teacher on this stage.

The students from both schools acted towards me as if I were a teacher. They were respectful, used quite formal language, and were generally positive about their own teachers – perhaps feeling as though I was a member of the teacher team rather than a neutral researcher.

The interviews I conducted at the nine different secondary schools were in a variety of different spaces, according to what the teacher felt appropriate. These spaces included: the library, HOD office, a spare room where students did catch-up tests in mathematics, a computer suite, an empty classroom, a dedicated interview room, a mathematics staff office space. In two cases I conducted interviews in the student's own home, directly following my interview with their parent. In each case the space I used for the interview may have impacted on the identity performance given by the student, yet it is almost impossible to know exactly how their performances may have been affected. I was less 'at home' at the secondary schools and felt less likely to be positioned as a teacher.

Summary

In this chapter I have differentiated between the theatre: the macro-context of the educational system in New Zealand, and the stage: the micro-context for identity performances. I have also looked at context more abstractly through the concept of figured worlds.

I have argued that students and their parents make the transition to secondary school within the figured world of consumer choice. However the main figured world at play here is the world of mathematics learning at school. Adopting the terminology of Holland et al. (1998), this world can be described as peopled by the "characters" of teachers and students who engage in "meaningful acts" centred on the teaching and learning of school mathematics. Holland et al. argue that "many of the elements of a world relate to one another in the form of a story or drama, a 'standard plot' against which narratives of unusual events are told" (p. 53). In this way the notion of figured worlds fits well with the metaphor of performance.

As discussed in Chapter One, many researchers in education have taken up the notion of figured worlds to understand the classroom context, and define the classroom as a figured world. However, I argue that the classroom is better conceived as a *stage* for performance. The figured world at play here is *mathematics learning*. Mathematics identities are constructed within this world, and performed on the stage of the classroom. However I argue that students enact multiple identity performances on the stage of the mathematics classroom and these performances are drawn from multiple figured worlds.

Context is complex. By differentiating between structural contexts, such as the theatre and the stage, and abstract contexts, such as the figured world of mathematics learning, we can attend to the different ways these contexts impact on students' identity performances. We can also look at the different ways in which identity performances are recognised and also the types of roles students have access to upon a different stage or within a different context.

The New Zealand Educational theatre recognises decile, ethnicity and gender performances – whether these are consciously performed by the student or not. At primary school students are positioned on the intermediate school stage into top, middle or bottom ability groups within their class for mathematics. At secondary this type of recognition continues through the practice of streaming; yet here the top stream students are placed on a different stage and given a separate director for their subsequent performances.

Different contexts also make available different roles for students to perform. I discuss these in Act Two.

ACT TWO

The Performances

Chapter One: Monologues on Transition

In this first results section I present data on students' experiences of transition. I look specifically at the ways in which they anticipated the transition in the first interview (at the end of Year 8) and their first responses to transition in the second interview (held in the first month or two following the start of secondary school). The students were performing for me on the stage of the interview situation. This is a stage that none of them had ever performed on, yet they called upon the scripts of past performances done at other times, upon other stages, and to other audiences. I felt that what they said to me reflected the sorts of conversations they were engaging in with other adults in their lives at this time. Although their performances regarding the learning of mathematics differed somewhat, those performances expressing their anticipation and transition experiences were much more similar.

I have presented the data as two generalised monologues to highlight the parallels in the performances of the 22 students. I follow each monologue with a breakdown of the themes and the number of students who made a comment regarding each theme. I engage in analysis of the data and tie it to the literature on transition.

The third part of this chapter is a final monologue, this time representing the Year 9 teachers' perspective. I asked the teachers about the students in my study and also about Year 9 students in general. Their responses reported here are more general than specific and speak more about their expectations of Year 9 students' performances than their recognition of the identities performed by the particular students in my study. Nevertheless, the contrast between their monologue and the students' monologue is informative.

Anticipating the Transition[12]

I'm quite excited about going to secondary school, I will like *it*, just the atmosphere of being in a high school and feeling older! It'll be fun *and* I'm looking forward to it, just for, like, the experience. *A* lot of my friend's older *siblings* say it's cool and stuff. *I'm especially* looking forward to being in a new place, because I've been here for two years and you come here every day just thinking, oh this is the same thing every day. *I realise* it will be a bit overwhelming at first, but I think I'll start to enjoy it after a few weeks, 'cause new people everywhere will be good. Yeah I think it's not going to be a problem, finding friends, fitting in, *and* learning the new subjects. I should get used to it pretty fast.

I went to the open day*. The school* had one thing for the students where you went *during the day* and you participated in some classes and then um, I went later with my mum and dad because they hadn't seen the school. *At the open night* they just talked about the subjects and the curriculum and extra curriculum and that. *At the open day* the kids looked pretty focused, I got a pretty good vibe from the school*. I thought,* yeah I like the school. We went to a few of the classes and it was really cool. In the

[12] Note – normal font indicates actual utterances spoken by my participants, italics are my own words in an attempt to keep the flow of the monologue.

science room we set our hand on fire – it was so cool! They have this big machine where you get to make your own key chains and things, and every single kid got to make their own key chain. And we all got to play in their big sports – like their new gym, and we got to go to all the classes and sit in on what they were doing. It was good, yeah. It, it seems like a really good school to go to, after going to see that.

It's definitely going to be a bit more complicated and a bit more advanced than what we're doing now. But that's kind of the reason we're getting prepared. I'll probably find it hard, like the homework and stuff. I'm not good at homework. And ... yeah, the school work'll be, I think it might be harder. *I'm sure it will be* challenging. 'Cause all the Year 8s, my friends who are Year 9 now, came back and told us how much homework there is. So three hours of homework every night and I've got to get prepared to do that. I think there might be a bigger work load, that's what I've heard from people who've gone to high school. Basically I think they're going to be really challenging us, like trying to get everything stuck in really fast so we're, we're prepared for life and everything.

But also, I think it'll be easier, yeah, easier with the teacher, 'cause you can just go up and talk to her, 'cause she'll be, she'll be – I think she'll be or they would be expecting to show help. *At high school* their teachers are set for your level. And so they're just at your level so they can help you and teach you. I think it will just be quite good having the specialised teachers for each subject. Just 'cause some teachers now, they're really good at one subject, but they're not so great at another, but when you go to high school they're good at one subject and that's the subject they do, so when you get taught, you sort of get taught like ... by the best I guess, sort of. *Yes getting* a different teacher for different subjects, that's sort of what I'm looking forward to. *They will be like*, professionals in maths and stuff. But apparently they don't really teach you, apparently they just give the work to do and explain it, so it's kinda gonna be like, 'ok, I don't know how to do that,' yeah I think it's going to be quite a lot different to what it has been here. I think we'll be doing more from a book than from the teacher. 'Cause ... yeah that's what my sister found out as well, they do quite a lot of book work and sheets and things. *But I still* think it'll be good, yeah, the teachers seem really like, nice, and they'll like ask you lots of questions and make sure you understand how to do all the equations and stuff.

I'm just really excited to be going and learning that stuff for myself and learning *the* more advanced maths that you do in college. I think high school's not going to be a big problem. I think I can do the work.

Fourteen students out of the 22 spoke explicitly about being ready for high school, looking forward to it and being able to cope. Also 14 stated that they were expecting harder work. Five said they thought the teachers would be good or better than intermediate and another five were expecting an increase in homework. Of those with older siblings, six mentioned what these siblings thought of secondary school, and the other three only mentioned their siblings as being part of the reason they chose to go to that school. When I asked about the open day or school visit all of the ten who had attended it

spoke about this experience in a positive way. Another six had visited the school on another occasion, which also seemed to give some comfort pre-transition.

It appears these students have not read the literature describing transition to secondary school as being a negative and highly stressful experience. Their performances more closely reflected the nervous excitement found by Lucey and Reay (2000) in their study of primary school children about to start secondary in the UK. Attending an orientation visit and having older siblings did seem to lead to greater preparedness for transition, as consistent with the Bicknell and Riley (2012) study in New Zealand. They also viewed the challenges of harder work and having subject specialist teachers to be positive changes, despite much literature talking about these changes as problematic. This supports Hernandez-Martinez et al.'s (2011) view of transition as an opportunity rather than a problem.

Overall these students at the end of Year 8 performed identities for me that I recognised as 'grown up' and 'ready for the challenge' of secondary school.

Successful Transitions

Oh, *high school is* really good, *yeah*, it's going good. It's a lot better than intermediate. It's more fun and the classes are like, they're not exactly easier but I just like the classes more. It feels better than intermediate because you feel more independent. I don't know why, I just find it better. I have more friends. I don't know I just prefer it over *intermediate school*. It's just, I learn a lot more and it's ... more grown up. It's, like, more fascinating. It's a challenge and I actually find it interesting.

The first day was scary 'cause I didn't know anybody. I was just walking around. But we just hung out with our form class, so, I got to know a lot of people in there, so it was cool*. I remember* when I found out what class I was in I was just nervous – 'cause I knew no-one, so it was kinda scary that I had to like make new friends by myself. So I just hung out with my brothers and my cousins that come to the school. And, yeah (laughs) I got lost heaps, because it's such a big school. *All in all it's* pretty good, it's not as scary as I thought it was (laugh). Yeah, settling in pretty easily actually, so yeah, it's cool.

I remember being really nervous about what class I'd get put into, like hoping I'd be with all my friends. *At first it* was pretty weird. I didn't know anyone in my class and a lot of them were already friends with each other 'cause they'd known each other since primary. I didn't really know anyone. Like there's some people from my class last year, but not really close friends. But yeah, I've made quite a lot of good friends. Because when we go to options we're not in the same class so I make new friends in options. Yup, I have a lot of friends now.

The work, well, it hasn't been as hard as I expected, but that's probably just because it is term one. It's, it's much harder than intermediate I think, but it's alright. There's lots of homework and a lot of assignments, but sometimes the homework isn't as bad as what people say it is.

There are nicer teachers. You don't see them every day so you kinda, build a better relationship with

them. I feel pretty lucky because they're all pretty nice. They all let us learn by ourselves and they help us. *The maths teacher* is really good. She like, teaches it to you, like, easy so you, you get to understand it. Just sort of explains it in a friendly way. I'm learning heaps. She teaches it in a different way which makes it funner, easier. She makes up little stories to do it. But the teacher can be laid back and strict at the same time, on different days. *The teacher* did seem kind of strict, in my opinion. *But I think* we've probably got one of the better math teachers.

When I interviewed the students soon after they began secondary school, their interview performance reflected the performance they gave in the first interview (Mishler, 1986). They had performed grown up and ready for me, so they were perhaps more invested to show a successful transition in this second performance. Almost all the students were positive about their transition experience. Only one student did not speak positively; his replies were somewhat neutral.

The word "good" was used by 12 students when I asked them how things were going at secondary school. This response however may have been similar to the typical reply to the question: "How are you?" "I'm good/fine," is a common response regardless of the reality for the replier. I imagine these students had often responded to concerned adults asking them: "How is high school going?" and the "It's good," reply may have been somewhat superficial.

I gained a better understanding of the way things were going for students when they spoke about friendships. Those who either said they had a lot of friends or had made new friends seemed to be having a more successful time than those who were isolated from friends in their classes. Friends, knowing people and meeting people seemed very important in the transition, and this reflects the research (Ganeson & Ehrich, 2009; Lucey & Reay, 2000; Topping, 2011; Wentzel & Caldwell, 2006).

Twelve students said they had great teachers (for mathematics) and three commented that their teacher was strict. The literature on transition describes the importance of forming good relationships with the teacher (Attard, 2010; Ganeson & Ehrich, 2009). These students appear to recognise this importance, although it is hard to imagine how they could have possibly formed such relationships so early in the school year considering the limited time that they had with each teacher. The student who spoke about forming better relationships with teachers *because* you don't see them every day is perhaps revealing more about negative relationships with teachers in the past. The few students who spoke about their teacher being strict may have found settling into secondary mathematics learning more difficult (Ganeson & Ehrich, 2009).

Seven students thought the work was harder than intermediate while four found it easier than expected. It should be noted that students were expecting the work to be harder and this may have influenced their replies. The literature on transition to a new school has generally described work as initially easier or a repetition of past work (Bicknell et al., 2009; Kirkpatrick, 1997; Way et al., 2008; Wylie et al., 2006; Yates, 1999). Similarly, students *expected* homework to be more challenging and four students confirmed this, saying the homework was harder, more plentiful or better.

Five students made a point of saying they were finding secondary school better than intermediate. It appeared they were determined to give a strong performance of having made a successful transition. During interviews I was very aware that the students knew this was what my research was all about. For some, part of this performance required the casting off of their Year 8 identity – and perhaps they felt the need to denigrate their intermediate experiences in order to do this.

It is also interesting to note the talk of fear after transition but not before. Research has found students do have many worries, such as bullying or getting lost (Ganeson & Ehrich, 2009; Zeedyk et al., 2003). At the first interview either the students had not yet thought about transition in a negative way and were not scared, or they were possibly unwilling to reveal this fear to a stranger in the interview situation. It is perhaps easier to talk about fear after you have overcome it. Hernandez-Martinez et al. (2011) found students told stories of overcoming problems at transition:

> When learners reflect upon themselves and their experiences, they therefore want to tell of their troubles as troubles overcome in their rite of passage, as an affirmation of who they are now ... i.e. the person I was and the person I have become. (Hernandez-Martinez et al., 2011, p. 128)

Part of this story of overcoming is performed through the laughter in the face of fear. Most of the students who admitted to being scared laughed when they told me about it. To be able to laugh about getting lost and being scared implies that these are long gone fears.

Overall the students performed ‘successful Year 9 student’ to me in this second interview. There was a lot of consistency between what the students anticipated in the first interview and what they reported in the second. It seemed they really wanted to portray to me that things were going well and that they had coped with the transition very successfully.

It is now time to turn to what the Year 9 teachers said about Year 9 students. How did they recognise a Year 9 identity performance?

Recognising Year 9 Students

So they come in and they’re still very much in the intermediate, primary school mode and, you know, they’re expecting a lot of structure, routine and that sort of thing. Overall of course they start off in *Year 9* as just little *kids* really. I think because they're new to the school - especially coming from intermediate where they've been top, they've kind of been like the bosses and then coming to high school where they're the babies again it kind of brings them down a level. *Yes, at first* they're still little kids. *Also* at the beginning of the year they're very ... not timid but they abide by the rules a lot more. Oh they're little angels! They are easier, they're slightly timid. They are my favourite, to be honest. Worst are Year 10s. I enjoy having juniors, because you can play with their mind sometimes – you’ve got a bit more lee-way with them. Year 9 kids are more receptive and more obedient.

I love the age group. *They are* really excited *and* a lot more motivated I s'pose. They haven't learnt, a lot of them haven't learnt the whole 'too cool to say anything.' They've still got that excitement of youth I suppose, at Year 9. But what I like most is they quickly adapt to the way I teach. Year 9s are my favourite classes in the sense that they are very responsive. They're very positive. They're very keen. Most of them are really excited to be here and to learn. They're a real pleasure actually, the Year 9 students at the beginning of the year. They're fresh to the school, they're more open I think. They're not cynical perhaps. I think they're a bit more keen. *Overall in* Year 9 they are very studious. They are ready to learn, they are so excited about everything. And some of them they keep that excitement and some of them, unfortunately, some of them, along the way they lose it. This is the sad part, I think this is what we have to pay more attention *to*.

They start to turn into Year 10s at the end of the year. I suppose it's all their development and stuff as well, probably, maybe, a time of their life when they have extra hormonal imbalance, maybe. There's a big change between year 9 students at the beginning of the year and Year 9 students at the end when they're getting ready to go into Year 10, there's a big change. I think that transition from Year 9 to 10 is a big one and that's where a lot of them really change. Yeah, you'll kind of see students who were top in Year 9, or having high potential, going off the rails a little bit in Year 10. Towards the end of the year they *think*, "yeah, we've made it through the year!" You know, "we're not the small fish in the sea," and they start to get a bit, you know, a bit more full of themselves as they move into Year 10. Because they're not, they're not going to be the little beginners and they become more confident with the way the system is, how it all works, how the school works and they feel like they belong a little bit more. *They are a* bit more at home with it. *I think this is partly because* Year 10 isn't so much of a step up work wise from Year 9. It's not really that new. And they're more used to school, they're sort of old hands at school.

In Year 9 they need to learn to become an active learner *and* develop, you know, good work habits in class and good – being able to review and question, you know, not just be a placid learner. You know they are not used to study. They think whatever they learn is in class. Which is correct, but also they know that when they start college they also must put effort into their own learning, like asking questions, like going home and revising, like doing homework and coming up with new questions, even not much from the homework sheet but also beyond that. *At Year 9* you're dealing with, hopefully, more in training them how to go about learning and developing a good work ethic.

Year 9 is a tricky year to manage well, as the students have come from a variety of schools and have been taught different skills to different levels. I don't assume much from them. I mean their prior knowledge - as far as their prior knowledge is concerned. So I try and, you know, start as if you're starting from scratch. So if I'm using a term I try and explain what that term means. Because it may mean something, you know, in English quite different from what it's meaning in maths. At year 9 we need to make sure we fill in all the gaps while still extending students who have been exposed to more advanced work. Some of them don't really know what we expect them to know. Yeah, they missed out ... because of them I should start from the very basics because they have not done the

basics that they were expected to do at that level.

I think students tend to be quite polarised, they either come in thinking that they're very good at maths, and quite often they're no better than the other students in the class, they've just got more confidence. *And others,* I mean at the beginning they have a lot of fear of maths, so at the beginning I ask them to, you know, say to their neighbours: "I like maths, I can do maths well/better," *and I get them to* speak louder to give them some confidence. So we've got to try and get over – get them over that hate of maths before we can get them starting enjoying it and learning from it, rather than having this block, you know, they don't like doing it. They seem to hate fractions and hate percentages and I know that they do that right from the junior level. I want them actually coming out of Year 9 not hating maths. I think for Year 9 it's not just teaching, we try to be more caring, because of their age, *and* more understanding. *We* try to put them at ease.

It is clear that these students were recognised in comparison to the other, older members of the student body at secondary school. This comparison made them seem very young: "little kids" or "babies" contrasts significantly with the students' attempts to perform 'grown up'. Ganeson and Ehrich (2009) discuss research which found students felt they were treated as babies and that this could be a negative experience, yet the students in their own research did not report this. The students in my study also did not talk of being babied, yet this was the way in which some of their teachers spoke of them to me. Of the 16 teachers, six referred to their maturity level. Closely paired with this discourse was the notion that Year 9 students were more compliant and well behaved, as discussed by four teachers, and also more motivated to learn and responsive to the teaching, as spoken about by six teachers.

Year 9 was considered a time of much change by four teachers and this change was associated with a decline in behaviour in a way that was seen as natural and related to puberty or "hormonal imbalance." The teachers asserted that Year 9 students needed: to be taught how to learn properly (as stated by four teachers), have the gaps in their knowledge filled (four), their negative attitudes about mathematics changed (three), and their confidence in their mathematics ability built up (five).

It was also apparent where these teachers positioned me (or perhaps responded to how I positioned myself) as a fellow teacher, with common sympathies, evident in many "you know" utterances throughout their interview. Furthermore, their knowledge that I came from a background of intermediate teaching would possibly have coloured or tempered some of what they said about these students' learning backgrounds. When they spoke to me about how the students needed to learn work habits, they were perhaps trying to draw me in to this argument and convince me of an opinion that I was unlikely to share, especially given my experience of teaching Year 8 students who I would argue *did* already know how to learn.

At this point I should acknowledge that the performances the students gave me in interview were of course different performances to the ones the teachers recognised – and they were performances on

very different stages. The interview room situation with a single audience member may be a space in which students can perform with bravado in comparison to the possibly more intimidating stage of the secondary school mathematics class. What I saw and heard in the interview may not reflect the performances teachers recognised in the first few weeks of secondary school. However, the contrast in the performances by these new Year 9 students with the general teacher recognition of a Year 9 student warrants further thought.

If students performed ‘grown up and ready for a challenge’ while their mathematics teachers saw them as ‘babies needing to be taught how to learn’, then what impact may this have had on the students’ learning experiences? How might the teachers’ reading of the students have affected their subsequent performances? Could they begin to see themselves as the teachers did and thus change their learner identity performances in the future? How might this constrain opportunities to learn or their taking up the script of an autonomous, enthusiastic learner of mathematics?

The following chapters in this act begin to answer such questions. I will look at students’ performances as they take up a position on the stage, respond to their teachers’ direction and begin to enact change in identity performances in response to changes in the figured world of mathematics learning.

Chapter Two: Taking Up a Position on the Stage

When students enter the secondary school mathematics classroom they must take up a position on this new stage. In this chapter I play with the word “position”. I use the word to refer to physical position, that is the seat the students chose or were placed in. I also use it in the sense of positioning theory (Harré & van Langenhove, 1999), that is, the way in which students are located within wider discourses through interactions with others. When teachers arrange the desks and seats in their classrooms they are both physically positioning students in ways that may affect their learning, but they are also positioning students in relation to figured worlds of mathematics learning (and of, for example, gender), and this impacts on their learner identities.

I begin by discussing the constraints of the stage, paying particular attention to the typical seating layout of rows found in most of the secondary mathematics classrooms. I follow with a discussion of the impact of seat choice, giving examples from student and teacher interviews and observational data. This is contrasted with the situation of no choice in seating and the recognition of identity performances in this circumstance. Finally I take a look at a class working in a non-traditional seating arrangement, presenting a short play of the interactions in one group. I utilise positioning theory to make sense of these interactional identity performances.

Constraining Performances

Seating arrangements represent one of the biggest initial changes faced by many students at the transition to secondary school. Of the 17 Year 9 classrooms I visited, 12 had students in rows, mostly in pairs. In two classrooms they were in groups during one of the observations and in rows during the other. Two classrooms had the students in a large U shape but one of these moved students into groups of six during the lesson I observed. The remaining classroom was arranged in desk groups of four. Most classrooms therefore, were strikingly different to the fluid group arrangements in both intermediate classrooms. The classroom layout gives a message to students about the way in which mathematics should be learned at secondary school. The seat students choose to sit in gives their teacher (and peers) a message about what kind of learner they are (Marshall & Losonczy-Marshall, 2010).

At intermediate school the students had almost unfettered access to their peers. When they talked about who in their class was good at mathematics several mentioned those students who could help them. Their classmates could approach these helpful students during mathematics lessons, particularly when the teacher was occupied teaching another mathematics group. Moreover, this also meant students could take up the position of ‘helper’ in mathematics; they could take on the role of ‘teacher’ when the teacher was unavailable.

> […] you can work together to solve the answer and if we both don’t understand it we’ll ask someone else in the other group who’s better than we are. (Ryder, Phase 1)

Overall a greater degree of moving around the classroom was possible at intermediate school, yet at secondary this behaviour was usually not permitted. At secondary access became restricted to those in the immediate vicinity.

> Well we're not really meant to talk to people in the class unless we're sitting next to them, so... […] You're not really meant to – you're meant to do it for yourself, you're not actually meant to do it with other people. Sometimes you can ask them for help if you don't understand but that's it. (Jonathan, Phase 2)

Very early in Jonathan's secondary school experience mathematics was constructed as an individual pursuit; performing 'mathematics learner' was primarily a *solo* performance. Students were allowed to request help from a neighbour, but they were really expected to do the mathematics themselves. In some observations I heard catchy phrases sung out by the teachers: "Remember, person next to you, not behind you thanks" and in another class at the same school, "Not across the room, next door" (Field notes, Messina, March 2012). It sounded to me that comments like these were often repeated at the start of the year.

Identity performance linked to seat choice

Consider the traditional secondary classroom layout in figure one below, the layout that was employed by 12 -14 of the 17 Year 9 secondary classrooms in my study:

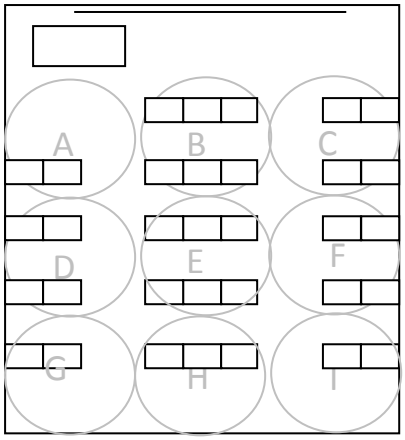


Figure 1: Classroom plan. Whiteboard at the front (top) and teacher's desk nearby. Students' desks in rows of 2 or 3. In grey are the 'areas' of a traditional classroom discussed below.

Areas ABC or BEH are the "action seats" in a traditional classroom (Parker, Hoopes, & Eggett, 2011; Totusek & Staton-Spicer, 1982). Students may choose such seats because they want to do well or because they want to be noticed. During observations I saw differences in the way students acted according to the seat they were in. Students in the areas ABC appeared to be 'hard workers' and were almost always on-task during my observations. The BEH students participated most in class and were on-task during class discussions. These latter seats I consider to be *centre stage*. The areas of

A and C (near the ‘wings’) were actually not very visible to the teacher and I suspect that classroom management techniques led teachers to sometimes *overlook* the students at the front as they focused on the students at the back, where they may have felt the need to manage poor behaviour. Students in the areas of G and I were the students who were more likely to sit alone and not participate in class. Any ‘disruptive’ student was also most likely to be in this classroom position. During observations I myself was most likely to be in this position also. Any student who chose this area deliberately to avoid being noticed would have been faced with the possibly uncomfortable situation of being very close to a (teacher-like) adult writing furiously in a little notebook.

My perceptions of the differing areas of the room being indicative of a certain type of learner is supported on the whole by research (Benedict & Hoag, 2010; Kaya, 2007; Losonczy-Marshall & Marshall, 2013; Marshall & Losonczy-Marshall, 2010). This perception is also likely to be in agreement with that of the classroom teacher and eventually also by the students themselves. For example, during one observation Hannah was late to class and sat in the centre. When asked afterward about students in the class who were noticeable she replied:

H: Oh, […] most of them just shout, that’s how you remember them, they’re really loud
I: Um, so are there one or two girls that usually shout or...?
H: Oh, like … the middle one’s usually quiet - but at the side.
I: Oh I see - the people who sit in the middle are usually quiet, but the ones at the edges sometimes yell out. […]
H: Oh, on the edges at the front they’re quiet.
I: Right, so the edges at the back are the noisy people? And where do you sit?
H: In the middle, at the back. (Hannah, Phase 3)

Hannah, like me and perhaps her teacher, recognised the type of performance given by students seated in particular seats.

Six months into secondary school almost all the students participating in this research project were seated in the positions that reflected their patterns of classroom participation. Brendon, Lauren, Jonathan, Brad, Blair, Peter, Abby, Ryder, Axel had chosen to sit in area ABC and all performed as quiet, hard workers who looked to be focused on their work. Interviews with their teachers supported my recognition of them as this type of student. Abby and Ryder sat at the front, but near the ‘wings’. They worked hard, but were not keen to participate in any classroom discussion, and again this was confirmed by their teachers. Anja, Robbie, Jacinta, Sarah and Hannah all sat in the GHI area, the back row. Robbie and Jacinta were the most disenchanted with secondary school of the entire group of participants and thus were perhaps typical ‘back row’ students and Hannah too was reluctant to participate. Sarah and Anja, in contrast, were not in seats that reflected my understanding of their relationship with mathematics learning. However, in both cases their classrooms were shallow and sitting at the back (and also on the same side as the teacher’s desk) meant they were actually still quite close to the teacher. Jacob and Belinda sat in the centre of the classroom, and both participated

in class discussion. Finally, Chad, Emily and Mia were in either a U shape or groups of four desks together. In their classes participation patterns were less obvious [13].

These seating choices were not completely static. Yet when students made a significant change in their seating position it tended to mirror a change in the way they performed their mathematics learner identity. Of particular note were Jacinta's move from area E to H and Blair's move from G to B between the first and second secondary school observations. I will examine these moves further in Chapter Four (page 89) when I discuss change in identity performances. Peter and Jonathan both moved from the C/A area to E (centre stage) between Year 9 and 10, reflecting an increase in their lesson participation and increasingly positive mathematics identity performances.

Finally, in two classrooms I noticed a gender split. In Anja and Jacob's class, both in Year 9 and 10, the girls and boys sat on opposite sides of the classroom. Yet neither student could explain why, saying it just happened that way. I noticed their teacher spoke about girls and boys in differentiated ways also:

> But because being a boy and a girl, that's a huge ... ah, difference. Um, ... in saying so, I mean, Jacob can rush to do the work, being a boy, to finish off, but Anja could be more conscientious. (Jacob and Anja's teacher interview)

In Emily's Year 10 class the split was even more dramatic. There were only 8 girls to 20 boys in the class. These girls sat at the desks at the very edge of the room, on the far side of the teacher's desk. There is much research about the marginalisation of girls in mathematics education (see for example: Mendick, 2005a; Solomon et al., 2011; Walkerdine, 1998), but here was a physical representation of this. However Emily was unable to give me any insight into this during the interview afterward. She explained that the form classes were re-streamed for mathematics and that the girls knew each other more than they knew the boys, indicating that this was why they chose to sit together. Why they sat far from the teacher's desk is unknown, but in my observation of this lesson I noted that no girl put up a hand to answer or ask a question at all, despite there being many opportunities for discussion, to which the boys contributed. The girls sat at the margins and they also performed marginalised mathematics identities.

In general I am unsure as to whether the seat position helped to create participation patterns or whether where students sat shaped to my own understanding of the type of mathematics learner they were. Furthermore, while I recognised 'girl' or 'hard worker' or 'disenchanted student' in these students' seating choices, it is possible that the students were simply performing 'friend' through their seat choice, and it is worthwhile to consider the ways in which performing friend and performing 'mathematics learner' work (or do not work) together.

[13] Note, the remaining three participants: Edward, Callum and Abid, were not able to choose their own seat.

Sitting with Friends

When given choice students tend to sit with their friends. The stage layout and static seating positions mean that *who* a student sits next to, or who their friend is, becomes influential on their mathematics learning experiences. Consider the following excerpts from interviews:

> I sit next to a girl who is - who gets tutored in maths. So she understands most things […] so I can ask her how she's done the questions, worked it out and she'll show me. (Anja, Phase 4)

> I: Is there anyone in your class who's really good to sit next to?
> R: Oh yeah.
> I: Yeah? Who is that?
> R: ... ... Oh I don't know, there's heaps of smart guys.
> I: There's lots of smart guys in your class? So do you like it when you are sitting next to one of the smart guys?
> R: I don't sit next to them. I sit next to my friends. (Robbie, Phase 3)

Those students who take up a position next to a 'smart guy' in their mathematics class reap the benefits of their help. Other New Zealand research has similarly found that who a student sat near reflected how they felt about mathematics learning and their participation in mathematical discussions (Ingram, 2008).

The teachers too recognised the positive or negative influence of seatmates and friends:

> Well, ah, Brendon have made a clever choice to sit with student who doesn't distract, who is helping. It was his choice to sit next to R---. […] And they work together, they discussing, helping each other. It's good if kids discussing, helping each other, explaining each other […] They [are] both successful students. (Brendon's teacher)

> Ok, ahhh, Peter's keen and he's sitting with two good friends of his and they work really well together. They talk about other stuff as well but they do get through all their work and they work together and they're quite competitive with the other kids as well. And um, I can only really say good things about him […] The girl that [Sarah] sits next to in class would be more borderline. So if she goes she might take Sarah with her - or Sarah could keep her up as well. So, who knows? (Sarah and Peter's teacher)

> Yeah, Jonathan, Jonathan – Jonathan will just work. You know, he's still like a normal kid he'll get off-task here and there. […] He works with J--- and they'll just work away. J--- is a very good, you know, he's a keen motivated sort of kid. (Jonathan's teacher)

These teachers also appeared to consider it normal to go off-task at times or talk off topic. The students enact friend as well as mathematics learner during class. This supports other research into the ways in which students may "seamlessly" switch between the figured worlds of mathematics learning and of friendship (Esmonde & Langer-Osuna, 2013, p. 303).

While Brendon made a “clever choice” of seat-mate in Year 9, when I observed him in Year 10 he appeared to be sitting with a girlfriend. She spent a large amount of the lesson with her arm around him and leaning over his work. He was no longer at the front of the room, having moved further back. He stayed on-task throughout the lesson, though he also managed to keep his feet on his skateboard the entire time, spinning it around and flipping it over. At the interview I asked him about his new seat-mate:

> She's more distractive I guess, but ... she likes to get her work done as well so when she wants to do her work she’s quiet and I'll do my work as well. (Brendon, Phase 4)

Brendon performed ‘boyfriend’ and ‘skater’ as well as ‘mathematics learner’ during this lesson. Perhaps the boyfriend performance was prioritised as he implied it was only when his girlfriend wanted to do her work that he was able to do his. This again resonates with Ingram’s (2008) findings that “students largely felt powerless to control others’ behaviour and could only work if a person’s behaviour *allowed* it” (p. 283, italics in original). I was left wondering just how much choice Brendon had in his seating position.

No Choice

Edward, Callum and Abid did not get to choose their seating position in their class. For Edward and Callum, however, the position they were in was still very significant. At Padua School the mathematics department employed a particular method for seating their students. Following each topic test the boys were re-seated in the order of their marks on that test. The highest result sat at the back and the lowest at the front. “… so there’s bragging rights in terms of who’s furtherest to the back of the class” (Edward’s teacher). This practice was followed in all of the three classrooms that I observed in this school. In just one of the Messina classrooms (Callum’s) the teacher similarly ranked his students. Although this teacher did not mention it, Callum did, describing the disadvantage he felt in his seating position “…‘cause it’s real distracting and people around you are like, hitting each other and singing, real badly and stuff like that” (Callum, Phase 3).

Abid was moved to area B so that his teacher could make sure he would not be distracted. This move demonstrated how Abid was recognised as a certain type of learner:

> [Abid] chooses to kind of - he takes a long time to get on task and any distraction he's off task and then he'll talk about how he's bad at maths. But really it's because he's not .. **doing** as much maths as he could. (Abid’s teacher)

Due to this recognition as distractible, Abid was not able to exercise choice over his position on the stage. In contrast, although one could not recognise Edward or Callum through a seat choice, by virtue of their place in the classroom they could be recognised by their peers (and themselves) as a good (or not so good) learner of mathematics.

Finally it is not only the students who may lack choice in their positioning on the stage of the classroom. Some of the Year 9 teachers in this study taught in different rooms all day. One wore running shoes and seemed to always be racing large distances between periods; his class had lessons alternating between two different rooms, due to timetabling issues. In the most extreme case one Year 9 mathematics class actually had nine different rooms for mathematics over the two-week, ten-day timetable. Decisions such as having desks in rows or groups were made by the teacher occupying the room immediately prior to the class. This teacher had little control over the seating arrangements in his rooms, contributing to a lack of power in general.

Sitting in Groups

Not all the classrooms were set up in the traditional manner of desk rows, and in a few classrooms teachers altered the seating arrangements from time to time and changed whether students could choose where to sit or not. The following play comes from Belinda, Abid and Brad's Year 10 class. The lesson actually began in a traditional row format and then the students moved their desks into groups in order to complete a problem-solving challenge. The students were randomly allocated into each group. The groups were to work together to complete four or five trigonometry problems faster than the others[14].

Performing Friend

SCENE: *A classroom filled with students of around 14 years of age. Students are seated at desks in groups of four. One group, containing BELINDA, two other girls and one boy, is at centre stage under the spotlight…*

TEACHER: Before we start, are you familiar with trig ratios? If not, you need to pay attention. (*She writes up a trigonometry question on the board.)*

BELINDA: (*Raises hand)* It's eight.

TEACHER: Very good. Do we need another example? Right, now make sure your desks are joined so you can discuss. The winning group will get the pizza next week. (*Teacher hands out a whiteboard marker, small whiteboard and question sheet to each group.)*

(BELINDA takes the marker and the board. BOY grabs the question sheet and starts to work it out on his own.

GIRL 1: *(Snatches the question sheet back and starts to read the question out to the others.)* A ladder is rested against a wall…

(*BELINDA draws a triangle on the whiteboard and labels the sides and angle with numbers. She takes the BOY's calculator. He takes it back. She writes in a four.)*

GIRL 2: Don't do the four like that, make sure it is all joined up.

GIRL 1: I do my fours like that.

[14] This excerpt is as accurate as my notes allow. The lesson lasted longer than the play would indicate but I have only included interactions that I recorded in field-notes. I re-create these notes in their entirety so that the reader may make their own interpretations of the events, yet I also acknowledge that in writing it up as a play I have generated a 'fiction' and that it has already been filtered by my own 'on the spot' interpretations.

(BELINDA hands the board to the teacher.)

TEACHER: Well done, here is the next question.

(BOY takes the question sheet and starts to write the question and answers on the board. He uses his calculator occasionally.)

GIRL 1: Read it out!

(BOY continues to work, ignoring GIRL 1.)

GIRL 2: So did you see that movie last night?

GIRL 1: Nah, I've seen it before.

GIRL 2: What about that thing they do with the knife?

BELINDA: I can do that too.

(BOY hands in the board to the teacher and gets the next question sheet.)

BELINDA: Read it out!

(BOY continues to work on his own. GIRL 1 grabs the question sheet. BOY grabs it back, writes an answer and takes it to the teacher.)

TEACHER: This group is doing really well. (*She gives the BOY the third question sheet).*

(BOY takes his calculator and starts inputting numbers.)

GIRL 2: Can you really do it?

BELINDA: Let me show you. (*She picks up a pen and spreads her fingers out on the desk. Slowly she stabs the spaces between each finger and gets faster and faster.)*

GIRL 1: Woah!

(BOY hands the third answer to the teacher. The teacher shakes her head.)

BELINDA: Let me see, you got it wrong. (*She takes the question sheet and starts to read it.)*

(The teacher comes over to the group and starts to explain the problem. *BOY takes the question sheet back from BELINDA.)*

GIRL 1: I hate my ears. I have to wear my hair like this 'cause my ears are so big.

BELINDA: I've got really small ears – they look stupid though, see!

GIRL 2: You have a small nose at least – look at mine.

GIRL 1: My tongue is really long – I can touch my nose*.*

(The three girls all stretch out their tongues and try to touch their noses. Meanwhile BOY writes down an answer and hands it to the teacher.)

TEACHER: Great, now the last question requires you to make a nice poster showing all your working and the answer.

BOY: My desk is too messy for this. (*Turns to BELINDA)* Can you move so I can do this on your desk?

(BELINDA *does not move. BOY tidies away his belongings into his bag. He starts to write on the poster.)*

TEACHER: The poster that is the nicest with good working will get extra points.

BOY: (*Hands the poster over.)* I've done the maths now you guys finish it.

BELINDA: Ok, we'll make it pretty.

BOY: Yes you three need to make it pretty. Here, use my felt pens. You have ten minutes.

(The three girls enthusiastically bend over the poster and start colouring. BOY stands over them, watching and micro-managing.)

TEACHER: Well done, this is the winning group!

Discussion of play

Before the group work began, Belinda positioned herself as an able mathematics student; she answered a number of questions, publicly demonstrating that she knew how to work out trigonometry problems. Once the group activity began it appeared that BOY was also positioning himself as the one who knew the answers. Belinda and BOY engaged in a power-play for control of the marker, question sheet and recording sheet. Controlling resources endows advantage in controlling the discourse for that student (Barnes, 1998). One difference in their actions was that while Belinda tried to include the others, BOY wanted to complete the task alone. Half way through the activity Belinda was drawn into a discussion with the other two students, GIRL 1 and 2 who appeared to be her friends. BOY continued the mathematics work, returning it to the others when it was time to present and make it “pretty”.

It is useful to use positioning theory here to understand this play. "Positioning is a discursive practice [...] within a conversation each of the participants always positions the other while simultaneously positioning him or herself” (van Langenhove & Harré, 1999, p. 22). For BOY and Belinda, positioning themselves as the mathematics expert required positioning the other as not. This positioning appeared not to impact on the other two girls. However they were actively positioning Belinda into the role of ‘friend’ and ‘girl’ by drawing her into a discussion about the problems with their facial features. In doing so they positioned Belinda within a figured world of friendship that was also gendered (see for comparison Esmonde & Langer-Osuna, 2013).

In my labelling of the other characters in the play (and in my field notes) as BOY and GIRL, I indicate my own interpretations of this as a gender issue. I saw Belinda and BOY as competing to be the mathematical authority, and the boy as ultimately winning in this. Had I labelled the other characters as STUDENT 1, 2 and 3 then I would be highlighting the co-performances of friend and student that Belinda was forced to try and merge together. Was I right to recognise gender here? Belinda did not engage in an explanation of gender during the follow-up interview. Furthermore the character of BOY was more than just a boy for Belinda. He held a historically constituted social position in the class and she would have been responding to him within a much more complex web of relationships than I observed.

There were certainly multiple performances required of Belinda. How easy was it for her to co-perform able mathematics learner, girl, and friend along with any other identities less visible to me? When I tried to engage Belinda in a discussion about this activity during the following interview, she revealed her perceptions of the influence of the others in the group.

I: I was quite interested when I was watching in your class the other day and you were doing group work. And what I thought I noticed is that you seemed to know all the answers and you seemed to know how to do it quite well.
B: Yeah, I guess/
I: And then you got into your group and you started doing it ... and then there was a boy in your group who sort of ... started doing it all himself.
B: Yeah (laughs).
I: While you chatted with your friends.
B: Yeah.
I: Tell me about that?
B: I guess its ... its who you're with in your group.
I: So it might have been different if you had different group members?
B: Yeah.
I: So what do you think would've changed? What can you imagine...?
B: Probably would have worked together ... or not done it at all (laughs). (Belinda, Phase 4)

I interpreted this as meaning that the presence of certain group members will require a particular performance to take precedence over another. Depending on who were the members of the group, Belinda may have worked with them on the mathematics, or rejected the task completely. Again this resonates with the notion that students are largely affected by their peers around them (Ingram, 2008) and raises the question of how much agency Belinda (and the others) had in this group learning situation.

This short play highlights the ways in which group learning, despite there not being a traditional classroom layout or pedagogy, also works to constrain students' identity performances. The group situation gave greater opportunity for students and their peers to position each other in particular ways through their interactions. By moving out of rows and into groups the teacher relinquished some mathematical authority and students were no longer constrained by an inflexible seatmate who may or may not have been able to provide them either with help or the opportunity to be the helper. Yet the students still had constraints on the type of mathematical identity performance they could enact.

Concluding Discussion

The layout of a classroom is neither innocent nor is it inconsequential. When the students arrived at their mathematics classroom on the first day they were confronted with a message about the nature of mathematics and about learning mathematics. As the researcher I was struck by how *old fashioned* these classrooms looked and particularly by the contrast with the intermediate classes the students came from. By the time I interviewed the students, a month or two into their secondary education, these rooms were considered normal and not commented upon. Even when I asked about the differences between intermediate and secondary school, the room and the layout was not seen as significant. Yet it is.

In the majority of classrooms mathematics was set up as an individual pursuit; collaboration appeared meant to be minimal. Students had much decreased access to their peers and help was limited to their seatmate or the teacher. Students could not easily take up a position of being the mathematics expert in the class through giving help to their classmates; they were only available to their neighbour. Some students were lucky enough to have a useful seatmate while others were not.

Yet Belinda's experiences highlight the fact that simply having students working together in groups does not alleviate the constraints of the classroom stage. It is easy to dichotomise classroom environments into 'good' and 'bad'. In the research literature 'traditional' and 'reform' mathematics classrooms are presented in a way that is reminiscent of this dichotomy of good or bad (see for example Boaler & Greeno, 2000; Cobb et al., 2009). Even in classrooms employing collaborative learning, a closer examination may reveal that some groups of students, such as girls, are still positioned as subordinate (Barnes, 2000).

Students were usually given choice of where to sit, but this choice is also not without implications. Choosing a seat is a mathematical identity performance. Even if it is not intended to be, it is *recognised* as such. Once the teacher (or classmate) recognises a student as a particular type of person, then they logically will treat them that way. Jonathan was seated in the front row and his teacher saw him as a "hard worker," and Brendon, also at the front, was a "successful student" with a good "attitude". Peter at the front was "keen" and Sarah at the back was "border-line". Whether these students chose the seats because they tended to perform that way or they performed that way due to their seat position is unknowable, but they were *recognised* in these performances. Generally the students chose to sit with their friends. If their friend chose to sit in a seat at the margins then how real was their choice not to sit there also?

Given that there seems to be an area in the classroom that is more ideal in terms of learning, (Benedict & Hoag, 2010; Marshall & Losonczy-Marshall, 2010), participation and positive recognition by the teacher (that is, area BE), then the important question is: Which students have access to this area? Students whose friends chose seats at the periphery may have felt bound to sit with them, performing 'good friend' before they performed 'good mathematics learner'. Students who do not wish to be noticed by the teacher or peers will not choose one of the action seats at centre stage either. Differentiated access means differentiated opportunities for learning and this makes seating positions an equity issue.

Finally, for Edward and Callum, their seat placement actually positioned them into an identity *category*. By being placed in a particular spot in the classroom they were forced to perform 'good at mathematics' or 'bad at mathematics' and for both these boys it was a bad at mathematics role that they increasingly performed on the stage of the interview room to me.

Exit Stage Left

Students take up a position on the stage of the mathematics classroom and they also must take up other positions on other stages as they go through the school day. The following excerpt captures this:

> Meanwhile one boy is putting ‘product’ in his hair... the bell rings. (Field notes, Messina, March 2012)

As the performance of ‘mathematics learner’ came to a close this boy was getting ready for the next act, a scene change. He stepped off the stage of the mathematics classroom on to the new stage outside. His next identity performances to his peers outside of the classroom clearly required a costume adjustment.

Chapter Three: The Teacher: Directing Performances

In this chapter I will discuss the teacher as director of performances in the secondary classroom. To begin the chapter I use plays to represent the extremes of direction within the 17 Year 9 classrooms I saw. Despite differences in tone and organisation they also highlight the similarities in the ways in which the figured world of mathematics learning is constructed at secondary school. Following this I discuss the teacher as the mathematical and social authority (Cobb et al., 2009) and the impact of explanation-style pedagogy. I finish with the ways in which students understood themselves differently when in their mathematics classes.

Play # 1: I wouldn't send my son here![15]

SCENE: *33 large boys aged 13 are lined up outside the classroom. The teacher looks up and down the line and motions to one or two to pull up their socks or tuck in their shirt. They do so with some reluctance. Inside the classroom the desks are in long lines, clustered in twos or threes. The room is old and the walls are bare. The class file in.*

TEACHER: (*Aside to audience*) I wouldn't send my son here[16]. (*To the class*) Right, stop, look and listen. Today's task is continuing on from last week's algebra. Like and unlike terms. Continue with the textbook exercises from where you left off.

(*Slowly the boys take out textbooks and open them. The teacher constantly moves from desk to desk, looking at the boys' work and commenting quietly.*)

TEACHER: Robbie, you don't look like you've started. Come on.

(*Students put their hands up at times and the teacher walks over to them, murmurs some help and moves on to the next student*)

TEACHER: Remember, person next to you, not behind you thanks!

(*One student is sitting alone. At this he glances at the empty seat next to him*)

TEACHER: Robbie! (*He circles his hands to suggest 'get on with it' and glares at the student.)*

TEACHER: Don't just write all the questions down – write one then do it.

(*Teacher goes over to Robbie's desk and gives some help. Robbie appears to work for a minute or two*.)

TEACHER: Do five, then mark them to check if you're on the right track.

STUDENT: What is 6x – x?

TEACHER: Six x minus one x

STUDENT: Zero x?

TEACHER: Six lots of x minus one lot of x

STUDENT: Six?

TEACHER: Six bananas minus one banana. (*Teacher steps forward and speaks to audience)* This *class* is stream 6 or 7 but there's still a big range of ability.

[15] These plays are constructed from field notes of observations at Messina and Sardis. I have attempted to recreate the events verbatim but they will have been already filtered by my observational biases.

[16] In fact, this teacher's son attends the school depicted in play #2

(*While the teacher is addressing the audience, one student leaps out of his chair and runs out of the room. The teacher looks over and chases after him. They return a moment later.*)

TEACHER: You are already on report.

(*The class continues as before. Students put up their hands and the teacher goes to them to give assistance. Some students appear to be counting using their fingers. The noise level gradually increases*.)

TEACHER: (*Shouts in a loud voice*) QUIET!

(*The class go silent and all bend over their books to work. The teacher sits at his desk and calls out the attendance. The bell rings and the students pack their bags and file out*.)

END SCENE

Play # 2: The Professors

SCENE: A modern classroom with seats set up in a U shape, and a whiteboard and data projector at the front by the teacher's desk. The walls are full of pictures, students' work and posters (including one of the Dalai Lama and another of Einstein).

The teacher sits outside the class greeting students as they enter and giving them some marked work from the previous lesson. The students sit at a desk as the teacher hands out today's activity. They do it quietly and quickly hand it in to the teacher one by one.

TEACHER: Let me get the *kete*[17] for my favourite class. (*The teacher takes a* kete *filled with iceblock sticks of the students' names. He pulls out sticks one by one.)* James… Sally … Janet

(James, Sally and Janet go to the whiteboard and write their answers to the questions. Sally's answer is incorrect. The teacher approaches her and draws up a number-line on the board to give her a hint. Sally corrects her answer.)

TEACHER: Excellent work Professor James, Well done Professor Sally. Good thinking Professor Janet. (*Teacher applauds the students and they sit down.)* Here is today's work. (*The teacher hands out worksheets.*) You can rearrange the desks into groups of four and work together.

(The class pick up their desks and move them into groups.)

TEACHER: (*Sounds a small gong and the class are silent.)* Remember, ask three before me. On your marks, get set, go.

(Classical music plays in the background. Students work, discussing quietly with each other. 5 or 10 minutes later, the teacher takes out the kete and pulls out more ice-block stick names. One by one every student in the class comes to the board to write up their answer to a question. The teacher clarifies some answers.)

TEACHER: Excellent work today class. Please return your desks to their original place. Thanks.

END SCENE

[17] Basket

Social and Mathematical Authority

The plays are both taken from observations early in Year 9 at Messina and Sardis. In Chapter Two I mentioned the research literature on classroom contexts that dichotomise classrooms into the categories of traditional or reform. Traditional classes are those where the teacher has all the *mathematical authority* (Cobb et al., 2009), while in reform classes the students have much more agency regarding their mathematics learning. Much of this literature discusses the impact of these differences on students' mathematical identity constructions (see for example Boaler & Greeno, 2000; Cobb et al., 2009; Lim, 2008).

These plays demonstrate that contexts come in many shades of grey between the black and white of traditional and reform. In both these classes the teacher is the director of performances, controlling the roles students may take and initiating action; they have *social authority* (Cobb et al., 2009). The first classroom is more old-fashioned, yet there is still space for agency. Robbie resisted the activity directed by the teacher and the teacher had to work hard to get him to comply. Another student demonstrated agency by running from the classroom, off the stage, and again the teacher was forced to act in order to keep the play running to script. The second classroom appeared more 'new age'. The students were labelled "professors" and they were all given at least one opportunity to take on a teacher role by writing their answer on the board. Yet the teacher retained the position of mathematical authority. He checked the work and corrected it if wrong. The students were publicly silent in this class as the teacher had the main speaking role; the teacher directed the mathematics learning.

Secondary school teachers occupy the position of mathematical authority by virtue of being a specialist teacher. The students recognised this greater level of mathematics knowledge in their secondary school teachers:

> I think all the classes, a lot of them are so much better than in intermediate because each teacher specialises in what they're doing. (Lauren, Phase 2)

> Um, high school's going well for me […] the teachers here are a lot better and probably a bit better trained than the other teachers that I've had in - well that I've had, yeah. (Axel, Phase 3)

As seen in Chapter One, the students expected their teachers to be better because of this specialisation. Regardless of whether these teachers were "better," they were afforded the role of mathematical authority, whereas at intermediate the students may have positioned themselves or their classmates in this role:

> Because, well, not saying anything bad about [my intermediate teacher] ... but um, ... she didn't really teach us. (Ryder, Phase 2)

> Well [my intermediate teacher] wasn't the best maths teacher, I think what really prepared me [for secondary] was um, the other, like the other pupils in my group. [My teacher] didn't really teach, she kind of left it to the - (whispers) she wasn't that good at maths. (Chad, Phase 3)

The opportunity for students to be the mathematical authority at intermediate school was also evident in the way they were able to position themselves in the role of helper.

> I'm in group one. […] It's good because like when you know the stuff […] people can come to you and ask you and it's good to like, know things, it's like, yeah. […] showing that you can do it and they can too. (Belinda, Phase 1)

> [In my group] We all work together so we can help each other if one of us is stuck, it's good that way, it's good. (Chad, Phase 1)

> And [Emily] always helps me, if I go like, "Ems, help," she'll explain it, like straight away. (Jacinta, Phase 1)

At secondary school students were able to give help to their neighbour, but could not usually take on the helper role more generally in class. Some teachers applied the "ask three before me" rule, meaning students had to approach three classmates for help before asking the teacher. However, implicit in this rule was the notion that the teacher had the final word and as such the ultimate authority.

Yet some students in some classes attempted to emulate this authority of the teacher. I noticed on at least four occasions, in different classes and schools, a student come to the front of the room while the class were doing independent exercises, take up the whiteboard marker and use the whiteboard to demonstrate and explain a mathematics procedure[18]. They were often addressing their seat-mate and could easily have done the same thing more privately and with pen and paper. It appeared as if they were trying to establish greater authority for themselves and their explanation through taking up a teacher position – at the front of the room and using the teacher's props.

Another difference occurring in various classrooms could be seen in the pronoun usage by teachers. When discussing mathematical procedures some teachers used the term 'we' and positioned the students with themselves, the teacher, and with an abstract group of mathematicians. I was struck by this different usage during observations:

> Note: Teacher uses 'we' e.g. "**we** use bearings to give more exact directions." […] "**we** need a map and a protractor." (Field notes, Philippi, August 2012)

> Student asks why write "<s" instead of "angles"? Teacher explains "**we** like short cuts, **we** don't like writing." Note use of '**we**'. (Field notes, Messina, August 2012)

[18] In every case it was a girl who did this and in classrooms with a female teacher.

However it was not always obvious whether the “we” used was inclusive of the students or exclusive. That is, did it mean, ‘you, me and all mathematicians,’ or did it mean ‘us mathematicians, but not you students’? I felt it to be the former in the first case and the latter in the second - but I am not sure exactly what gave me this impression.

In other classrooms the teacher used ‘they’ as the pronoun in such situations. For example:

> “If **they** ask you to prove y = 1, how will you prove it?” (Field notes, Messina, April 2013)

> T: “**They** can do it different ways, eg. slanty”. Interesting use of “**they**” – it puts the mathematician outside the group, but includes the teacher with the rest of the class… (Field notes, Messina, August 2012)

As I noted at the time, with the use of the omnipresent ‘they’ the teacher positioned themselves and the students outside of the community of mathematicians. The ways in which students were positioned, and also the way teachers positioned themselves with reference to mathematicians’ practice, was illuminating. The use of these pronouns may have affected students’ sense of ownership of their mathematics learning and the sense they gained of the availability to them of the role of ‘mathematician’.

There was some variety in the level of social authority held by the mathematics teacher in each classroom and this often depended on their depth of experience. However I got the sense that in all classrooms the teacher expected to be the social authority by virtue of their role as teacher. In some classrooms the teacher’s social authority was considered so absolute they even appeared to own the *time* during mathematics lessons.

> T: “You owe me 5 minutes after the bell.” (Field notes, Messina, April 2013)

Such a comment is likely to be familiar to any current or past school student. The implied interpretation is that time has been ‘stolen’ from the teacher and the students must pay it back from their *own* time – which is after school hours.

This sort of message contrasts deeply with that of Axel’s teacher; she instead apologised for having to stop the students when the bell rang.

> T: “Sorry to stop you but the bell’s going to ring…” Note: the apology positions students as wanting to learn. (Field notes, Philippi, August 2013)

This comment also positions the students in the class as having joint ownership in the mathematics learning endeavour.

I have intimated above that the teacher may not hold all the social authority in the classroom. Consider the following notes from an observation from Year 10[19]:

> T has yet to address the class. She has interacted with a number of students while marking homework. However, she does not appear to be the director of the performances in this room. […] Half the class is listening – but they are not compelled to listen. […] Some students appear frustrated with the simplicity of the video clip. Lots of grumbling. T abandons a little early (I think) and assigns text book exercises. […] Interesting to think about how the T's performance is constrained. T gets rewarded for practices such as clear, step by step explanations, no contextual questions, textbook work – with good behaviour! (Field notes, Phillipi, March 2013)

In this classroom the teacher had more limited social authority. She did not initially position herself at the front of the classroom and the students exercised a great deal of agency in resisting her attempts to show a mathematics video-clip. When she changed tack and assigned the text-book exercises she was rewarded with a well behaved class of students. They managed to convey and achieve their expectations of the way in which mathematics lessons should be.

In the figured world of mathematics learning the teacher is the one who is supposed to be the mathematical and the social authority, as constructed by both the teacher and the students. However this authority is not absolute in every class. Some teacher's practice is more marginalised than others. Significantly, when the teacher holds the role of mathematical authority then this role is not available to the students. In this typical case the students must take on the more passive role of mathematics learner. In order to understand what this role entails it is useful to know how the students described their mathematics lessons at secondary.

Directing and Explaining

At Phase Two I asked students about how their teacher taught them mathematics. Of the 21 students interviewed at the second phase, 14 of them replied to this question with a response that included *explaining* and making the mathematics *easier*. A further two mentioned being given notes to copy, which had a similar effect. Here is a monologue of their replies:

Can you tell me about how your teacher teaches maths?[20]

She writes what we have to do and then she gives us an example and then she gives us some questions. And if we don't understand she writes it – one of them on the board so we can see how to do it. She like, teaches it to you, like, easy so you, you get to understand it. After she's explained something she'll say, 'does everyone get it?' and if someone hasn't she'll go through a few examples with us to make sure we all understand. And anybody who thinks they know how to do it, she usually lets them try to explain it too. Yeah, like she'll explain it like over and over and over again so we get it.

[19] Note the theatre language in the field notes, demonstrating the way in which the metaphor I used for analysis later will have also filtered my observations.
[20] There was a mix of male and female teachers. To keep the flow I have made all female here.

If we're confused she'll explain it in a different way. The teachers here explain it a lot ... in quite a different way so it's easier to understand. And she, well she makes things seem more simple, like all those angle rules and stuff. She does it really well but it's your job to listen and if you don't then, you know. She does it and you have to sort of pay attention. If you don't then you're lost, sort of. *But*, well, if you don't understand anything you can go to her, like anytime of the day and she'll help you… So it's a lot easier.

The students were very appreciative of explanations and the way in which their teachers made mathematics easier. This is similar to the findings of Anthony (2013). She reported that students in each of three different classes described their teachers positively, despite the great variety in pedagogy. The students described their teachers as being good "because they were caring and they explained things well" (p. 223).

Explaining, demonstrating procedures, otherwise known as "chalk and talk" (Solomon & Black, 2008), and making the mathematics easy to do, all have major implications for students' learning experiences. Firstly this pedagogy serves to over-simplify the mathematics to the extent that arguably it is the teacher who is doing the mathematics while the students are mindlessly following procedures. Consider the dialogue from Play #1 above where the student asked: "What is 6x – x?" The teacher's response exemplifies how an explanation can make the problem easier, but arguably the essence of the algebra is removed (it becomes *bananas*) and the very purpose of the problem is questionable. This is a classic example of the Topaze effect (Brousseau, 2002), where the target knowledge disappears completely. Further, this "spoon feeding" of students at secondary school is complained about by research mathematicians who claim it works against the development of intuition in solving mathematics problems (Burton, 2010).

Secondly, well explained procedures can serve to reduce understanding. For example I observed the following in an algebra revision lesson during Year 10. The teacher demonstrated a procedure for solving equations using what she called the flow method.

> The teacher puts up 5 questions on the board saying "Question 5 is a bit challenging." Question five reads: Q5) $6 – x = 2$
>
> [I watched Abby write the following in her book, correctly following the flow method]
>
> $6 – x = 2$
> $-x = 2 – 6$
> $-x = -4$
> $x = -4 \div -1$
> $x = 4$ *(Field notes, Messina, April 2013).*

Under the teacher's procedural method question five was challenging because the students had to recognise that the negative x required dividing by -1. What I found significant was that not a single

student made the comment that you could tell the answer simply by looking at the question. Often during observations I noticed the procedures promoted by teachers appeared to undermine any past learning or understanding.

The examples given here are representative of much of what I saw during my observations. The students in general liked being given detailed explanations and demonstrations of procedure; they were on the whole very complimentary of their teacher's pedagogy. They liked things made simple and appeared happy to complete a huge number of short answer questions as they chatted quietly with their friends.

Yet while appreciative of the teacher, this pedagogy led the students to construct mathematics itself or mathematics learning in a particular way:

> Maths is hard. Well I find maths hard and then, but when it gets explained, it gets easy. (Mia, Phase 3)

> Um, say like, in maths we like, we just learn rules. We don't really learn what it's really about. We just have to memorise rules and then write about it. (Emily, Phase 2)

Mathematics is hard or it is easy, as opposed to something that is challenging and doable. Mathematics learning is about memorising rules and doing procedures rather than understanding. And mathematics problems are all too often of the short answer type as evident by Sarah's surprise when given something contrasting this:

> And there was just one big [question], [which was] surprising – I didn't really think that we'd do one problem for the whole session but we did and it was really weird. And so we just did a whole problem and we just worked it out, broke it down and stuff. Yeah. And it took up a whole session. (Sarah, Phase 2)

I too found the lessons I observed in this class surprising, due to the dissimilarity to other classrooms. I observed 33 Year 9 mathematics lessons and in only four of these was the class given a problem to solve that took up the entire lesson. All the other lessons required students to complete numerous short answer problems, as demonstrated in the classrooms depicted in the plays above.

This suggests a mathematics learner performance of speed. Similarly Schoenfeld (2010), in a survey of 12 high school mathematics classes, found students considered an average of 2.2 minutes to be a reasonable amount of time to work on a mathematics problem. The message given by their mathematics learning experiences was that if a problem cannot be solved in a few minutes, they should give up. It contrasts deeply with the experiences of research mathematicians who find doing mathematics to be a process of "struggle and pleasure" (Burton, 1999, p. 140).

Finally another impact of this style of pedagogy is in the promotion of passive learner performances. When I asked what they need to do to be successful in mathematics [at secondary school], 14 of the students said listen or pay attention:

> I think it's just all about paying attention and working hard. (Abid, Phase 4)
>
> Um, concentrate on what the teacher is explaining, like, even if I know it - I might be thinking that it's - I might think it's right but it's just a bit wrong in some way. (Ryder, Phase 4)
>
> Study. Listen. Keep quiet. (Mia, Phase 3)
>
> Ah, pay attention in class. (Chad, Phase 2)
>
> I will probably need to listen really well and probably be able to write down all the notes that I need. (Jacob, Phase 2)
>
> Mainly just listen to what the teacher is saying, do the work and if you don't understand ask a teacher or a friend who knows how to do it. (Brad, Phase 2)

Answers to this open ended question had remarkable consistency. The large number of responses of "listen" or "pay attention" pays tribute to the teacher-directed, explanation-based pedagogy. It is also highly suggestive of the view that the teacher is the main source of mathematics learning and certainly the mathematical authority.

To summarise this section, explanation-based pedagogy has an impact on learner identity performances and on how students construct their understandings of mathematics learning. Mathematics is hard, but it is easy when someone explains what to do. Mathematics is all about learning rules, and mathematics problems can be done quickly. When learning mathematics you need to pay attention and listen and do the mathematics in the way the teacher has demonstrated. In this construction the students are positioned and position themselves as 'student' rather than as 'mathematician' (Pratt & Back, 2009). Furthermore many of these students liked to perform student, being told how to execute skills, and leaving the teacher to perform mathematician.

Mathematics Learner Identities

At secondary school mathematics is taught to the whole class together, and it is taught by a specialist. At intermediate mathematics was embedded in the same classroom with the same teacher as for all other curriculum areas. Therefore at secondary school students are more likely to develop subject specific learner identities. This raises the question of whether students felt they enacted identity performances for mathematics that were different from other subject areas. In order to address this question, at the final interview I asked the students: "Are you the same kind of person in maths class as you are in the rest of your life?" I followed this by asking for a comparison of mathematics with other subject areas.

Consider the following monologue of responses. It represents the ten students who said "no", they were not the same kind of person in mathematics classes. Only two students said "yes" and the others qualified their answer in some way, for example saying other subjects were more creative, mathematics is more important, or that it depended on the particular teacher.

Are you the same kind of person in maths class?

No! I have to be a lot more serious in math class. Like, I can't laugh as much… In the other classes I usually know what I'm doing a lot better. I think I - I struggle more in maths, just because I'm not confident at it, I'm not sure what to do. I'm kinda more relaxed in English, and social studies and stuff. I probably don't joke around as much because you have - maths is far more serious. It's a far more formal environment. Concentration. 'Cause you're like sitting down, you can't move or anything. It's different. I like, switch off, not switch off, but like ... I'm shy. I'm different in my maths class 'cause I'm more quiet. Yeah, I'm more quiet in maths classes. I'm usually loud in other classes. Maths is one of the classes that I struggle in. I was going to say less silly but I don't think I am really. I'm more focused, sort of in maths. I try and concentrate harder in maths 'cause I know it's one of my weaker subjects.

These students appear to have constructed mathematics as "serious". It is a formal environment that requires concentration and no joking or silliness. The implication of a serious performance is that it mutually excludes a performance of "playful" (Lewis, 2013). At no point in secondary school interviews did the students talk about play in mathematics.

As well as performing 'serious', these students also appeared to perform 'shy or quiet' during mathematics. This suggests that there are perhaps many more students demonstrating "quiet disaffection" (Nardi & Steward, 2003, p. 346) than we realise within our mathematics classrooms.

At this point I should say that the data I have presented at times misrepresents the students' identity performances overall. I have chosen to present, in this chapter and in others, interesting vignettes and plays of eventful happenings in order to illustrate significant identity performances. However I have not presented a play of the most typical mathematics identity performance seen in the student participants. The most typical performance was that of silence. The majority of the students were extremely quiet in the mathematics classroom. One might suspect this was a consequence of knowing a researcher was in the room and focused on them, yet the students' teachers all confirmed that the behaviour I observed was typical. At the teacher interview I firstly asked the teacher, "What type of person is – ?" of their students. Consider these replies:

> Callum's a quiet reserved type. (Callum's teacher)
>
> Well he's quiet. (Brendon's teacher)
>
> She's very quiet, shy. (Hannah's teacher)
>
> Um, she's very quiet. (Abby's teacher)
>
> Um she's ... quite bright but ... very quiet. (Lauren's teacher)
>
> Ah, I would say he's a bit withdrawn. (Ryder's teacher)

A further six students were described as quiet at another point in the interview, for example:

> As I said before one of the things letting her down is being so quiet and not sharing her understanding with me. (Mia's teacher)

Of the remaining ten, some told me themselves they were always quiet in class, while the other, louder students have been featured in the plays throughout this act. It is unlikely that in asking for volunteers for this research project I obtained a more quiet or introverted group than usual (logic would presume the opposite). Rather I suggest that students in general are more silent during mathematics lessons than teachers (and researchers) might realise. It may only take the contribution of a few students to generate the appearance of a multi-voiced class discussion.

Finally the question of identity performances in mathematics can evoke an emotional response. Abby was one of those who said she was not the same sort of person in mathematics:

> Because I'm not as in control of the – because it's more in control of me than I'm in control of it. So I'm always trying to stay above it instead of like, slipping behind the rest of the class. (Abby, Phase 4)

Abby felt mathematics was in control of her and her efforts to "stay above it" are evocative of a fear of drowning. Later in the interview she repeated this imagery, telling me how things had improved over the last 18 months and I took up her metaphor in my reply.

> A: Um, ... I still don't ... enjoy maths but I feel like, you know ... I'm not always trying to like ... ... to doggy paddle over it. Like I can sort of like, - I can more/
> I: You can float?
> A: Yeah, I can float more.
> I: Ok. Alright, so you're not swimming/
> A: Yeah, but I'm not drowning. (Abby, Phase 4)

Abby felt she lacked control over mathematics and this statement perhaps reflects the fact that control was held by the teacher as the social and the mathematical authority.

To summarise, it appears that for some students the context of learning mathematics, including how they viewed both the nature of mathematics and the teacher's direction, generated identity performances that were qualitatively different to other performances in their repertoire.

Summary

In this chapter we have seen that there are a variety of ways to direct the mathematics classroom. Yet despite these differences we can see some consistency in the way that the figured world of mathematics learning at secondary school has been (and is being) constructed.

The practice of specialised teaching roles affords the teacher a position of mathematical authority. This is a role that can be passed on to the students, as we saw in Play #2. The students in that class

were briefly allowed to be the mathematical authority as they wrote their answers on the board and assumed the title of professor. Yet this role was tightly directed by the teacher and only a ‘bit part’.

The teacher performance, in enacting mathematical authority, entails the giving of explanations in order to make the mathematics easy to understand. The student performance paired with this is passive listening and following given procedures. Such pedagogy works against students developing an identity of engagement (Solomon & Black, 2008). The teacher plays the role of the mathematician while the student must play that of someone learning skills, perhaps in the hope that they will one day play the mathematician role.

In directing performances on the stage of the mathematics classroom, the teacher constructs the figured world of secondary mathematics learning. However the students also contribute to the way in which this world is constructed; they are active participants in this, even if the world they construct requires them to be passive learners.

Finally, the dominant performance that I observed was that of the quiet learner (despite the vignettes to be presented in the following chapter). In mathematics classrooms the teacher has the speaking role, and students are positioned as the background cast, the extras.

Chapter Four: The Performances

In this chapter I will present vignettes of the identity performances of four different students. I draw on observations and interviews with these students and also interviews with parents and teachers. I borrow from the literature on narrative analysis first to understand the stories the students told during interviews. Then I use these stories to critique the sole use of narrative in analysis. These vignettes together illustrate the use of the metaphor of performance to understand identity. Although a performance is context and time specific, there is remarkable consistency in these students' performances. This suggests that performances are situated historically as well as contextually; past performances have bearing on current performances. However, change in identity performance is also possible. Sometimes the experiences of transition, the stage for performance, the audience and the teacher's direction all work to effect significant change in someone's identity performances.

Jacinta

Jacinta was a talkative and thoughtful Māori girl. She performed a positive maths identity to me during our first interview.

> I like maths, it's one of my favourite subjects […] I like trying new stuff in maths […] like if I first do something, it's kinda hard, but if I understand it, it's really easy, like it becomes really easy and I'll be able to do it just like that. (Jacinta, Phase 1)

Act 1: Girl who likes maths

SCENE ONE: *A secondary school classroom. Students are seated in groups of two, four or six. Orientation is towards front of the room where a teacher stands near a whiteboard. Students have bags, books and I-pads on and beside their desks. Jacinta is seated at a desk group of six in the centre of the room.*

(The bell rings)

BOY: Hey, hey, girl who likes maths, I've forgotten your name, … , oh Jacinta, hey…

JACINTA: *(Turns around)*

BOY: Hey … *(He is interrupted by the teacher).*

TEACHER: Right, we are going to do a lesson I saw in another class. Take out your I-pads

JACINTA: (*Calling out*) There's no internet!

[…]

TEACHER: Okay everyone stop. It's not working. *(She hands out some textbooks to the class.)* We were going to have games all period but the intranet is not working. You all need to de-screen. *(She reads out a word problem and writes it on the board.)* What do I do first?

JACINTA: (*Calling out*) It's two thirds!

[…]

JACINTA: (*Calling out*) I've done these!

TEACHER: *(To Jacinta)* and you said you didn't like fractions! Now look at question four.

JACINTA: *(Waving her hand in the air)* It's six and three quarters!

TEACHER: Hang on, what is the next step?

JACINTA: You were about to divide by two…

STUDENT: (*To Jacinta*) You're a nerd!

TEACHER: That's not nice-

STUDENT: It's true.

TEACHER: But remember Jacinta didn't like fractions at the beginning and now she's turning into a maths geek like me - and she even does maths at home.

[…]

JACINTA: It's only because I was taken off the internet at home.

SCENE TWO: *The same classroom yet now empty of all but one student, Jacinta and the interviewer. Two desks are pulled to the forefront of the stage.*

INTERVIEWER: […] What would you say is your best subject?

JACINTA: Maths. 'Cause I'm good at it. And everyone says I'm good at it. Like everyone calls me a nerd. 'Cause I've done lots of it. Because I understand it a lot better than most people. 'Cause I've always been good at maths – well to me I have and to my parents, 'cause my whole life I've done it and I've always been head of the class in it.

Jacinta's performance at the Phase two observation (scene one in the play above) was striking firstly because of the contrast with most of the other participants in this study. She took on a centre stage position and the leading role after the teacher. It seemed she was positioning herself as either 'maths expert' or 'teachers' assistant'; there were a number of times when she either corrected her teacher or reminded her of the next step to be taken in the procedure.

There are a number of possible reasons for Jacinta to take up such a position. At intermediate school there were many high achievers in her class, but this class was a middle stream and Jacinta may have felt more expert in comparison. Also at the start of the year she was able to use her familiarity with the technology to help her teacher with issues relating to the use of the I-pads. It allowed her to continue this IT assistant role with mathematics also.

We can see, however, that the audience for Jacinta's performances may have recognised her differently. She was called variously "girl who likes maths", a "nerd" and a "maths geek". The label of 'girl who likes maths' suggests this is unusual and it appeared to be more memorable than her name. 'Nerd' is a label commonly affixed to someone who displays a talent for mathematics (Damarin, 2000) and can be considered part of a typical script in the figured world of mathematics learning. But

perhaps more surprising is the teacher's contribution of "maths geek, like me". This may have been an attempt to make the label more acceptable; but the comment, "she even does maths at home," appears to position Jacinta in a way that she chooses to resist. Her resistance comes in the form of the comment, "only because I was taken off the internet at home."

However, in the following interview (scene two), Jacinta appeared to take this label on board. "Everyone calls me a nerd" is paired with "everyone says I'm good at it [mathematics]" – implying the two are the same thing. I wondered how invested she was in this label and whether it was perhaps a case of making a virtue out of necessity – embracing the label she was forced to wear, even though it may have marked her as "deviant" (Damarin, 2000).

Six months later I revisited Jacinta to observe and interview her again and this time to interview her teacher also. Her performance was again striking, now for the contrast with her last one.

Act 2: I don't get it!

SCENE ONE: *A secondary school classroom. Desks are arranged in groups of one, two and three, in rows facing the whiteboard. Jacinta is seated at the back of the room. The class is in the middle of a probability lesson.*

[…]

JACINTA: Come and sit over here Melissa

TEACHER: Now draw up a table of all the outcomes from two dice rolls.

STUDENT: I don't get it.

TEACHER: I'll do the first few *(She explains how to find P(2) and P(3).)*

JACINTA: *(Puts up her hand but is not noticed/ignored by the teacher).*

TEACHER: Now complete the rest. If you're Craig you've already done it!

JACINTA: (*Whispers to her neighbour)* Yeah, I re-dyed my hair yesterday.

TEACHER: Now copy down this chart *(She explains how to play a probability game.)*

STUDENT2: Slow down, slow down!

JACINTA: *(Calling out)* I don't get it!

TEACHER: You need to choose when to stop.

JACINTA: What?

TEACHER: Listen!

JACINTA: Do we write 30 or 130 dollars?

TEACHER: *(Ignores Jacinta and calls on another student to answer her question.)*

JACINTA: *(Puts her hand up).*

TEACHER: Yes Jacinta?

JACINTA: Do we write 30 or 130 dollars?

TEACHER: You can do it either way.

SCENE TWO: *The same classroom yet now empty of all but one student, Jacinta, and the interviewer. Two desks are pulled to the forefront of the stage.*

INTERVIEWER:	Ok, so what I'm trying to get an idea of is whether you've changed your mind about maths at all this year.
JACINTA:	I'm pretty sure I have. Like at the beginning of the year I was all excited 'cause I liked it all through intermediate and primary but now it's kind of just boring and I don't like it.

Jacinta's classroom performance during my second observation was markedly different. She positioned herself very differently in the room and performed a very different role. She was seated at the back of the class and no longer played teacher assistant, nor expert. She still had a speaking role; she called out and at times put her hand up, but not to give an answer, rather to say she didn't get it. The teacher appeared to position her differently also. In the first observation the teacher responded to her on both the occasions she called out and put up her hand. In the second, the teacher sometimes ignored her calling out and ignored her also when she put up her hand. Someone else, Craig, had the role of 'top of the class' and was positioned as such by the teacher with her insinuation that he had completed the task already.

Jacinta's interview comments were reflective of her classroom performance. She described mathematics as boring and stupid. Her demeanour in the second interview was also different; I recognised this performance as that of a reluctant teenager. Her responses to most questions were short and unforthcoming in comparison to the two previous interviews.

In an attempt to gauge whether this second observation reflected a 'real' change in identity performance or was simply a bad day, I asked Jacinta's teacher this during interview:

> Um, she started off as a very diligent student, um, and now she's gotten to be one of the cool kids, and ... does what she has to but probably no more. Um, sits at the back, very social with her little friends. Ah, happy to say, "I can't do it," rather than focus on what she is doing. She gives up very quickly, whereas she didn't at the start, I don't think she did. At the start of the year she was a lot better. (Jacinta's teacher)

The performance of cool kid had taken precedence over that of good at maths. This case study tells a sad story for mathematics education and as the reader you may wish to know what happened next. Jacinta left the school at the end of Year 9. Unfortunately I was unable to gain consent from her new teacher to continue the research into the final phase.

Blair

Blair is a sporty, NZ European/ Pākehā student. He had mixed feelings about mathematics:

> Um. I like [mathematics], but it does get pretty boring. (Blair, Phase 1)

Blair's initial identity performances at the start of secondary school are similar to those we've just seen from Jacinta. He positioned himself on the stage of his secondary classroom in the back row, seemingly determined to play the 'cool kid' at his new school.

Act 1: Shut up Blair!

SCENE ONE: *The desks are not set out at the start of lesson when students arrive. As students enter the room they move desks haphazardly and sit down. Blair seats himself right at the back in the centre of the room in a line of four.*

TEACHER: It's not a test it's just an assessment. It's not going to go on your record *(He hands out papers to each student).*

(The class are silent with the exception of the row of four boys at the back. One of these boys in particular talks a lot, and speaks his thoughts aloud).

TOM: What's a factor? *(No-one replies)* Shut up Blair! …. (*no reply*) What's a factor?

HARRY: Blair doesn't know

TOM: He does, he's up to 20 already!

BLAIR: *(Pulls his phone out of his pocket and uses the calculator function to help answer a question.)*

OTHER STUDENT: *(Puts up hand. Teacher calls on him.)* How do you do question 17?

TOM: How do you do question two?

BLAIR: *(Giggles.)*

[…]

TOM: Shut up Blair! Shut up Harry

TEACHER: *(Approaches the four boys, looks at their work and then walks away)*

BLAIR: *(Shows his neighbour his book. Question five reads: abc, Blair has written "easy as 123" His neighbour laughs).* What job can you get doing abc?

TOM: I don't know … maths teacher?

TEACHER: *(Sends Tom outside. The other three quieten down.)*

TOM: Can I come back in? *(Teacher lets him in).*

BLAIR: *(Raises his hand and the Teacher approaches.)* How do you do this?

TEACHER: That doesn't look too bad. *(Leaves to roam the room.)*

BLAIR: *(Drinks some powerade from a bottle.)*

TEACHER: *(Returning to Blair.)* Remember the distributive property on Tuesday? … Think about it, were you listening?

BLAIR: Probably not.

SCENE TWO: *Blair and the interviewer are seated near a computer in a mathematics resource room. Papers are piled all around.*

INTERVIEWER: Can you tell me a bit about what maths lessons are usually like?

BLAIR: Um, we're allowed, we're allowed to talk and things like that, just sensibly, not going

overboard, you're allowed to talk about really anything, but if you start getting way too loud then we start getting told off and split up, things like that.

SCENE THREE: *A café. At the front of the stage sits Blair's mother and the interviewer. They are drinking coffee and talking. A digital voice recorder sits on the table in front of them.*

INTERVIEWER: So how do you know [he and his teacher] had a clash? ... Is that what Blair said to you?

BLAIR'S MUM: What actually happened was – two of them were talking in maths. And they were trying to – one of his friends isn't doing particularly well either, and they were trying to work out the problem, according to my son, which he probably was but he also talks a lot. He has verbal diarrhoea. […]

So the maths teacher, my guess is, probably had his back to the kids, all he heard was this talking, because Blair talks a lot I would imagine that he would have immediately turned around and immediately known who it was. So Blair got sent out of the class. Well to me that's really destructive. 'Cause he gets sent out of the class, so he's missing out on his maths lesson, he's already behind. But what Blair's upset about, was that they were both talking, so why's he the only one sent out of the room? So he challenged the teacher on that basis. It wasn't the fact that he was talking; it was the fact that he was the only one being punished.

Blair positioned himself, and was positioned by his classmates, in a way that I recognised as one of the cool kids, a position shared by the four boys seated at the back of the room in a row of four. Being one of the cool kids appeared to require performances of being disruptive and off-task. One of these boys, Tom, also took an active role in positioning Blair in this way. Twice during the lesson he yelled out "Shut up Blair!" so that the whole class and teacher could hear. Blair was not talking at either of these times, but the comment was effective in making it seem like he was. On a number of occasions Tom tried to draw him into off-task conversation but Blair resisted him successfully for the first part of the lesson. However, later in the lesson he was drawn in and began to engage with his neighbour in the off-task talk.

Blair differs from Jacinta's case in that his performances were not consistent across the different stages. He performed a role of 'naughty kid' in class, but not to me during interview. Despite his awareness that I witnessed him in this role, during the interview he performed as someone who talked sensibly, assuring me that he was allowed to talk if he wasn't too loud. He had clearly presented himself differently to his mother also. She was incensed that her son "had a clash" with the teacher when it was really the fault of a classmate. She recognised her son as talkative, yet keen to learn and do the work. These different ways that Blair's identity was recognised perhaps highlight the influence of the audience on any performance.

As with Jacinta, when I revisited Blair six months later, his classroom identity performance was significantly different.

Act 2: You need to actually work

SCENE ONE: *Desks arranged in groups. Students wander into the class in small groups, some time after the bell has gone. Blair is late, arriving with two others, a boy and girl. They sit in a group at the front of the room, near the teacher's desk.*

TEACHER: (*Assigns a textbook page to the class. Some students take out books*).

STUDENT: When's the test for this?

TEACHER: In three weeks' time.

(Blair's group all appear to be working – but the majority of the rest of the class wander around the room, chat off task and some leave the room. The teacher writes up examples and working on the board. Two girls work on a social studies project. A group of students are preoccupied with trying to fix a broken phone. Another group of four boys are bent over an English project, working quietly together).

TEACHER: *(Approaches Blair's group to look at their work. Turns to address the class*) Any questions on timetables or temperature? *(He is ignored.)* You should be able to work your way quickly through these … It's all fairly simple, fairly easy.

(Some students pack up and stand up, the remainder do so also. The whole class have been ready to leave for five minutes when the bell goes.)

SCENE TWO: *In a quiet corner of the school library, Blair sits with an interviewer.*

INTERVIEWER: So, what are maths lessons generally like now?

BLAIR: Better than they were. […]He's learnt to control us a lot more. So it's easier to do things now. And I think my, my um, ... test results have gone up quite a bit […] Between merit and excellence for my tests at the moment.

INTERVIEWER: […] So, do you think that your feelings about maths have changed this year at all?

BLAIR: Yeah. I've been finding it a lot more important to do. […] So, ... I've kinda seen how much harder you need to actually work on it to get good marks and things.

It was difficult for me to reconcile the two observations depicted in act one and act two; the general behaviour of all the students was so different I could have been viewing two different classes. At the first observation Blair and his friends had the main roles; at the second there was so much going on, so many students had active (non-mathematical) parts that I struggled to record what was happening in my field notes. The students who had previously performed 'good' were now performing 'naughty'. The teacher provided the only consistencies; he seemed to have a minor role on both occasions.

Blair's performance on this stage was also quite different from previous performances. He positioned himself near the teacher's desk and near the whiteboard. He appeared to be working hard on the

mathematics task and he (and his friends) no longer drew attention to themselves. They did not perform naughty or disruptive. Indeed, it would have been a challenge to be seen as more disruptive than some of the other students. In contrast to the first observation, it was no longer cool to be naughty; it was now cool to be working instead.

Unlike Jacinta, in the second observation it seemed as though Blair managed to perform 'cool' and 'dedicated mathematics learner' dually. The stage of his mathematics classroom and the role of the teacher allowed for the dual performance in this extreme case. However I did wonder about his classmates, students who never usually tried to perform naughty and who were usually willing and able to perform the good student and would always listen to the teacher. Did the constraints of this stage work on them differently to produce different results?

Blair's interview responses again did not closely match my observations, as per the first occasion. His initial comment that lessons were better now because the teacher had more control did not fit with what I had seen. Yet later in the interview he conceded that the teacher "doesn't really control the class" and that he was able to do a lot more work in other subjects.

Yet Blair's mathematics marks improved over this time. He began the year getting achieved and merit results and subsequently gained merits and excellences. His teacher confirmed for me this improvement. Something about this situation worked for him. I certainly saw evidence of Blair and his friends taking the work more seriously. His interview comments: "I've been finding it a lot more important to do" and "I've kinda seen how much harder you need to actually work on it to get good marks" indicate that Blair began to take responsibility for his own mathematics learning. And it was perhaps due to the lack of faith he had in his mathematics teacher that Blair made this decision. He spoke about his Year 9 experience more eloquently in his final interview:

> Our teacher wasn't that good. Like he doesn't work here anymore but he couldn't control the class or anything and it was just ... it's hard to really say but, like, he wasn't really a good teacher in general. […] Well I did a lot more work at home and things because like the tests and stuff - the whole class was falling behind I think. So we all did a lot more work at home and things like that. Because we had to. (Blair, Phase 4)

To conclude, we can see strong evidence for identity change in both Jacinta and Blair's performances. However, such change was not typical of the cohort of participants; in the others any changes were much more subtle. The following vignettes demonstrate this consistency of identity performances.

Emily

Emily was a high achieving Samoan girl who received the Dux award in Year 8 at her intermediate school. In contrast with Jacinta and Blair, Emily's interviews were characterised by consistent performances. Four main themes emerged in her mathematical identity performances. These were: a desire to be learning new content, a desire for understanding over rules-based learning, a sense of

possibility in her future career opportunities and a narrative of personal growth and improvement in mathematics.

In this section I wish to present three narratives from Emily's interviews. Each tells a story, each taken approximately nine months from the last:

> *End Year 8*
> I found maths at primary quite […] boring 'cause I never really learnt new stuff during class. [..] By the time I got to intermediate in Year 7 I ... didn't really like math anymore and I felt stronger in reading. But then after a while at intermediate then I learnt new stuff and had enjoyable sessions and I just really started to enjoy maths and that really showed because my grades started getting higher. (Emily, Phase 1)

> *Middle Year 9*
> Last year maths was .. um, alright and when I came to college I really didn't like maths. But now as the year goes on I'm finding that maths is more enjoyable. And - it's probably 'cause I'm getting better at it. And getting the hang of the stuff that we're doing. And a lot of the stuff that we're learning now is quite new to me. And I like, as I said, I like doing new stuff and so I find it more enjoyable. (Emily, Phase 3)

> *Early Year 10*
> I think now I feel a lot better about maths ... towards the year – end of Year 8 and a bit of Year 9 I was really starting to not like maths, I was really starting to think oh, I hate maths it's really confusing (laugh). It's just like, it takes so much effort. But now I see that it's really worth the effort and when you finally get it and come out the end it just makes you feel so much better about yourself, like you've accomplished something real good. (Emily, Phase 4)

These three narratives are interesting because the main plot development is the same. They tell a story of being negative about mathematics, due to boredom or confusion, then learning new stuff and getting the hang of it and finally enjoying the subject. The story is of a conquering hero or of a personal journey of growth. It has a happy ending for the hero. Through this story Emily positions herself in relation to mathematics, and the position is a dominant one.

However, although these stories are consistent in that they are the same story, when fit together in the context of time they are inconsistent. Consider the story told in Phase One (at the end of Year 8); Emily is at this point very positive about mathematics. Yet her narrative at Phase Four relies on a telling of how she was starting to "hate maths" at the end of Year 8. While the stories are inconsistent with each other, the performances are very consistent.

My observations of Emily in the classroom do not support her suggestion that she was starting to hate mathematics. In every observation I noted her to be working enthusiastically, focused and engaged. Her teachers commented similarly:

> Emily, like she's our dux this year, she's good at everything, she's just a massive all-rounder. She just loves maths, loves learning, loves asking questions, loves critical thinking, getting into anything and everything. (Emily's Teacher, Year 8)

> Very capable, focused, determined and organized. She has a very positive attitude. Extremely well-mannered and hard-working. Always on task. Listens well, contributes well, completes all her homework to a high standard. (Emily's teacher, Year 9)

However, although Emily's identity performances are consistent, there is evidence of change in the way in which Emily understands what it means to be a learner of mathematics, and the way in which she constructs mathematics as a subject. Initially mathematics is portrayed as boring and Emily wants to learn new things. By the last interview mathematics is portrayed as confusing and requiring of effort, which Emily is able to manage. The identity performances are the same, but mathematics learning is constructed slightly differently.

Abid

Abid was an articulate, part Māori, part Pākehā boy with a quirky sense of humour who played in a rock band. Like Emily, Abid presented consistent performances throughout the eighteen months of this study. The themes emerging from his interviews were of struggling and slow learning in mathematics; that understanding is key, and rewarding when it happens; of future plans to be a professional musician; and a narrative of a recent change in attitude.

This narrative of a recent change in attitude was told at each interview. Each story belied the previous one as it gave the impression that the last time I spoke to him he had a negative attitude but this had changed recently for the positive. As with Emily's story, the performances are consistent, but the stories are inconsistent with each other.

> *End Year 8*
> Ok, um, I'm not very good at maths, but um, being in this classroom, the way that it's taught has helped me be better […] Well, I moan and groan about maths a lot but I think it is important and I think it is taught really well at this school and I'm looking forward to what it's like at um, college next year. (Abid, Phase 1)

> *Middle Year 9*
> I used to be really negative about math because I'm not very good at it, but I've come to realise it's all about effort, [...] I'm just not very good at it and that's why I've had a negative attitude towards it. And so I've decided maybe going at it with a more positive approach would have better results. (Abid, Phase 3)

> *Early Year 10*
> My attitude at the start of the year was avoid **math** to be honest. Yeah.[…] That did change - I've started becoming more, like, well I need to do this, I need to sort my stuff out. And I think

> that's kind of the attitude I retain now. ... Is it's hard but I can do it, I have to do it, […] Well I'm pretty sure - last year I said I hated it didn't I? I would have said that at some point (laughs). But um, ... I don't hate maths, to be honest, truly, 'cause there's not many things I do hate. But I think my attitude towards it is definitely changed and I'm being more like - I can do this, I can go and, you know, work hard and get people to help me out and .. it will all pay off. (Abid, Phase 4)

The theme of Abid's stories is of a recent change in attitude to mathematics. The stories suggest he used to hate mathematics but now feels differently. The inconsistencies lie in the fact that he continually talks about this being a recent change – throughout the 18 months of interviews. At his final interview the comment: "Well I'm pretty sure – last year I said I hated it didn't I?" may be a more accurate depiction of his feeling about mathematics, but does not reflect what he actually said in any interview.

Yet while Abid tells a story of a recent change in attitude, other data suggests that this change has yet to affect his performances in the classroom. His teacher's comments mirror my observations:

> And Abid, lacks confidence, which I think really prevents him from doing as well as he could. So he chooses to kind of - he takes a long time to get on task and any distraction he's off task and then he'll talk about how he's bad at maths but really it's because he's not .. **doing** as much maths as he could (laugh). (Abid's teacher, Year 9)

Abid's task avoidance and easily distracted demeanour in the classroom suggest that rather than having *had* a change of attitude, he is saying that he *needs to* change his attitude. His interview stories intimate that he would get good results if he worked hard, but the fact he has not done so suggests he may not have actually believed this will happen.

Abid faced the difficult situation of having to reconcile his mathematics performances with those in other subjects. His 'not good at mathematics' performance is one that may not merge well with the intelligent performance he is able to enact in other subject areas. Because mathematics enjoys high status at secondary school, it is not so easy to dismiss the subject with a negative attitude. It is possible that Abid's performance of a recently changed attitude toward mathematics is an attempt to reconcile these conflicting aspects of his identity performances.

Concluding Discussion

Although it is possible for people to perform their identities completely differently in every situation and to every different audience, I would argue that this is not the norm. Only four of the 22 student participants demonstrated a substantial change in their identity performances at the transition to secondary school. Emily and Abid, and 16 others, performed relatively consistent identities throughout the eighteen months of the study. Their performances were even consistent when they relied on narratives that implied a change over time. Abid's claimed recent change in attitude required an earlier performance of a negative attitude to ring true, but instead it is the performance that is consistent – not the story. Similarly Emily's personal growth and improvement in mathematics

required a lack of success and also negativity in earlier performances to corroborate the story. Instead the performances remain consistent – there is only a little change.

But dramatic change is also possible and both Jacinta and Blair demonstrated this. Jacinta's mathematical identity performance changed for the worse, in terms of her engagement with mathematics. In the classroom she chose to perform cool and this mitigated against her original performance of mathematics expert and teacher assistant. Her classroom performances were reflected in her interview performances, which were correspondingly positive and negative. Blair gave different performances depending on the audience, that is, his classmates, his mother or me. The audience of peers in particular is likely to constrain an identity performance in a number of ways. Despite the differing performances to different audiences, it is still possible to recognise in Blair a change in his overall mathematics identity performance. At some point in Year 9 he started to take the subject seriously and assume responsibility for his own learning.

It is useful to utilise narrative analysis to understand the stories told in interview. It is through stories that people "attempt to order, organize, and express meaning" (Mishler, 1986, p. 106), particularly rehearsed (Coffey & Atkinson, 1996) stories such as Emily's and Abid's. In interview the students were performing for me; they were telling me what they thought I wanted to hear, and stories of recently changed attitude, or of conquering a dislike of mathematics were both stories I liked. However it is important to remember that "although people have agency, they are not free to thwart or fabricate narratives at will" (Sparkes & Smith, 2008, p. 301). These students' stories must still fit with their experiences and will be bounded and constrained. Despite being stories I wanted to hear, these stories are still identity performances that told me something about the students who told them (Mishler, 1999; Ochs & Capps, 1996).

Through their telling, these stories work to construct reality (Bruner, 1991). We can see how the stories were used to construct the figured world of mathematics learning and to understand what it means to be a learner of mathematics at secondary school. In these vignettes mathematics was being constructed differentially by the students. Blair came to see mathematics as more important than he originally did. Emily constructed mathematics as simultaneously new and enjoyable but also confusing.

However the students' identity performances are better understood when we look at their performances in other contexts and to other audiences. Abid's performance of a recent change in attitude is more nuanced when compared with his performance of 'disengaged learner' in the classroom. He claims he saw mathematics as an important subject and therefore wished to convey, to the audience of me, a more positive attitude; but there were other influences on his performances in the classroom. Although Jacinta's interview performances match consistently with her classroom performances, on their own they do not capture fully the ways in which her performances were recognised by the audience.

Taken together we can see the limitations of using narrative identity as the only way of understanding students' experiences of mathematics learning. These vignettes also highlight the limitations of using retrospective accounts of experience; for both Emily and Abid the stories cannot be accurate historically. They do not tell us anything about the student's past identity, even though each is a compelling current identity performance.

Chapter Five: Discussion

In this final chapter of Act Two I aim to draw together some of the themes that are evident throughout the four preceding chapters. In particular I will look at: the main identity performances evident in the data, the figured world of mathematics learning at secondary school, recognising identity performances, and change. In this chapter I also provide answers to my first research questions: *What types of identities do students enact as they transition to secondary school?* And: *How does transition to secondary school impact on students' mathematics identities?*

Identity Performances

I designed this study in order to gain an understanding of mathematics identity. However there were many other identity performances evident in the data. The literature on identity suggests that identities are multiple (see for example: Aydeniz & Hodge, 2011; Esmonde, 2009; Sfard & Prusak, 2005; Stentoft & Valero, 2009), but what this literature does not always explore are the ways in which mathematics identity may be subsumed to other identities (Stentoft & Valero, 2009). Despite a research agenda which intends to look at mathematics identity, the students' priority performance may be given to another identity, such as friend. Even though I intended to collect data of mathematics identity performances, the students gave other co-performances that were significant for this study. In this section I will focus on: being a helper, quiet performances, performing friend, cool, and finally the performance of mathematics learner.

Helper

The performance of 'helper' was one that was talked about frequently during interviews. To be positioned as or to position oneself as a helper was a common occurrence at intermediate school, but it was more difficult to take up this position at secondary school. Some students reflected that because their intermediate teachers were not so good at mathematics it meant they were required to learn from their peers instead, and this positioned classmates in the role of helper. At secondary school the teachers had mathematical authority by nature of their specialisation and students could only take on some of this authority if it were allowed to them. The seating arrangement of most classes also limited students' ability to perform the role of helper and students got the impression that they were not really supposed to talk to the other students.

Closely aligned to the performance of helper is that of occupying a 'teacher' role. We saw in one classroom the students were positioned as professors when they were asked to show their working on the whiteboard. Yet this was a bit part; the teacher maintained the starring role. In this classroom the catch-phrase "ask three before me" was employed, implying that other students could help but that the ultimate resource person for help was still the teacher. In some classes students took up a teacher position by coming up to the whiteboard to explain something to a classmate. This demonstrated that students in these classes were able to position themselves in this role. At the start of secondary school, Jacinta positioned herself as the helper, for both IT support and as a

mathematics assistant to her teacher. But she was recognised as a nerd in this role and by the second observation she had relinquished this identity performance.

The position of helper affords students mathematical authority and performing helper is a strongly positive mathematics identity performance. In the next act we will see further examples of the helper role and the way it may be recognised as a performance of 'good at mathematics'.

Quiet

The vast majority of the performances I observed in secondary school classrooms were those of 'silence' or 'quiet' performances. It is difficult to provide evidence for this, beyond the comments of the teachers as described in Chapter Three; my field notes concentrated on the moments of action and of noise. However in the majority of cases the participant I observed did not make a single audible utterance during the lesson. I do not believe this was purely a condition of the research. In each case there were a number of students similarly silent. Even the classes in which the teachers drew students into discussion, it was usually a minority number of the class who participated. A student wishing to be invisible in the mathematics classroom may position themselves in a seat near the wings and to the front of the classroom and be overlooked by the teacher during lessons. Other mathematics education research has similarly found students willing to occupy this position of quiet worker (Askew, 2008). In general performing quiet will lead the student to be recognised by the teacher as a certain type of mathematics learner.

Thompson and Bell (2011) researched quiet students in Australian secondary schools. They utilised Deleuzean conceptions of subjectivity which bear some similarities to performative identity. These authors suggest that contemporary research depicts four models of the quiet student. These include the quiet student as deficit or lacking in some way (such as confidence or positive peer relationships). The second is a model of the disaffected quiet student who is disengaged from school. The third model sees quietness as being an innate characteristic of the student, such as shyness. Finally there is the model of the quiet student as constituted through institutional practices, such as assessment. In their own study Thompson and Bell found there to be three discourses informing the identity performances (in my terminology) of quiet students. These were centred around "regimes of fear, reward and the desire to escape the disciplining gaze" (Thompson & Bell, 2011, p. 405). The quiet performance was not static. These students were "fearful and strategic, compliant and active, rewarded and marginalised in multiple ways at various times as they negotiated and performed their [identities]" (Thompson & Bell, 2011, p. 405). However these students "struggled to move beyond passive choices" (ibid., p. 411) and their future identity performances were constrained.

The four models of the quiet student described by Thompson and Bell help make sense of the ways in which a quiet identity performance may be recognised. These students may be seen by their teachers as lacking, such as lacking in confidence, and this will be explored further in the next chapter. They may be considered as disengaged from mathematics learning, and this would surely impact on future interactions with their teacher. They may be considered shy and therefore they may not be given as

many opportunities to participate. Finally, quiet may be a performance that is particularly prevalent in the mathematics classroom. As described in Chapter Three, a number of students described themselves as more quiet during mathematics. This lends support to the notion of the quiet student as constituted through institutional practices.

Yet Thompson and Bell's depiction of the quiet students as being fearful and strategic leads to a different recognition of this identity performance. Their actions may be purposeful to avoid negative consequences of attention, or they may be intended to perform 'good student'. Although during interviews the students performed to me as if they were overcoming the fear of transition, perhaps there was some validity to the Year 9 teachers' recognition of the students as fearful.

However the quiet students in Thompson and Bell's research were nominated by the school as being quiet in general, rather than quiet in one particular subject. The fact so many students in this study said they were only quiet in mathematics suggest students' experiences of mathematics learning *positions* them as quiet. And yet they may be recognised as lacking, disengaged, shy or fearful in this performance. All these recognitions would have consequences for their interactions with the teacher and their future mathematics learning experiences.

Friend

We saw in Chapter One that friendship was an important factor in a successful transition to secondary school. As such it is likely that students perform 'friend' as a priority over their mathematics learner identity. Robbie explained that he didn't sit next to the smart guys when I asked who would be good to sit next to – he sat with his friends. When students entered the stage of the secondary school classroom they chose to sit with their friends. Yet in this choice their teachers may have recognised them in a way that implicated their *learner* identity.

Furthermore the performance of friend can work against a co-performance of mathematics learner. Brendon's comments regarding sitting with his girlfriend demonstrated how his learner performance was dependent on whether she wanted to do her work or not. Belinda was drawn into an off-task performance by her two friends as they discussed movies and their appearance instead of working on the mathematics task. Similarly Blair was positioned as off-task by his friend when he loudly called out "shut up Blair," doing so to draw him into a naughty role.

Reflecting on 45 years of research on teaching and learning in school classrooms, and in particular on intensive studies of individual students, Nuthall (2005) found that "students live in a personal and social world of their own in the classroom" (p. 903). This "pervasive (but hidden) peer culture" (ibid.) is what others have called the figured world of friendship (Esmonde, Brodie, Dookie, & Takeuchi, 2009). This world is, in Esmonde et al.'s (2009) terms, "racialised, gendered and classed" (p. 39). Even when the teacher promoted inclusive learning activities, "sexism and racism were alive and flourishing" in this peer culture (Nuthall, 2005, p. 903). This was perhaps evident in the play depicting Belinda working in a group with two friends and BOY.

For some students the performance of friend can be merged easily with other identities they wish to perform; for them the figured worlds of mathematics learning and friendship overlap. For others they must choose one or the other. The figured world of friendship is one they are likely to engage with for a greater proportion of time during the school day (Nuthall, 2005).

Cool

The performance of 'cool' is one I saw from many students during observations, a performance given with varying degrees of success. However this is a performance that was never given to me during interviews. The audience of one adult researcher did not require it; this is a performance usually only given to peers.

Jacinta and Blair are the two participants who gave a cool performance during observations but they were differentially able to co-perform this alongside a positive mathematics learner identity. For Blair a cool performance initially involved a co-performance of being off-task. After six months at secondary school everyone in his class was off-task and therefore performing as such was no longer cool. Blair was subsequently able to perform as 'conscientious mathematics learner' and maintain being cool simultaneously. For Jacinta her initially positive mathematics learner performance was recognised as that of 'nerd' (the opposite of cool) and it appeared she dropped this performance in favour of becoming one of the cool kids.

Being a nerd or geek is never far from the discourses surrounding mathematics learning and the portrayals of mathematicians in the popular media (Damarin, 2000; Moreau, Mendick, & Epstein, 2010). These images "have an impact and those who continue with mathematics often have to work hard to be able to position themselves as mathematicians or even 'good at mathematics'" (Epstein, Mendick, & Moreau, 2010, p. 58). Doing so always runs the risk of becoming a "marked category" (Damarin, 2000), labelled as geek or nerd, as Jacinta was, and excluding the possibility of cool.

Mathematics learner

A performance of 'mathematics learner at secondary school' is a performance that must be reconciled with other identity performances students are compelled to give. It is sometimes difficult to co-perform mathematics learner with the performance of friend or with other identity performances that may be important to a student. The reason a co-performance may be difficult is because there are finite ways of performing mathematics learner. Students must make a choice from a limited variety of scripts.

What then does it mean to be a learner of mathematics at secondary school? This is primarily a solo performance. The stages of most classrooms were set up to encourage solo performances and even when given group tasks the students worked on these in primarily individual ways. Teachers may have set classrooms up in this way for management reasons or they may have been constrained by the choices of another teacher; but the stage nevertheless constrained the learner performances of students.

Chapter Three demonstrated how performing mathematics learner required listening to explanations, completing exercises quickly, learning rules and being serious and quiet. It was a passive performance. Furthermore this type of performance describes a learner of skills rather than the identity of a mathematician.

Performing mathematics student at secondary school is a vastly different performance from that of a mathematician. Despite the label of professor endowed in one classroom, students were directed to perform in ways that bear little similarity to that of research mathematicians. Mathematicians rarely work individually, and they experience the pleasure and struggle of making connections in their learning that is very different to the transmission pedagogy of school (Burton, 1999). Burton (2010) urges mathematics learning at school to reflect more how mathematicians learn rather than the teaching of basic skills. Yet skills-learner is the identity promoted by secondary school. The performances encouraged in secondary mathematics classrooms suggest that students are not being prepared to be future mathematicians. This raises the question of what exactly will be the future identity performances of these students. One possible answer is the performance required by assessment regimes and this will be explored further in the next act.

The stage of the classroom, the directions given by teachers and the constraints offered by the theatre of school all work to generate a certain type of mathematics learner performance. This performance is delimited by the figured world of mathematics learning at secondary school.

The Figured World of Mathematics Learning at Secondary School

"By 'figured world,' then, we mean a socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (Holland et al., 1998, p. 52). In a number of ways the figured world of mathematics learning at secondary school is different to that world at primary school. This is evident in the literature on transition, as described in Act One, and further evidenced in the performances given by students before and after making the transition to secondary school. Some performances were promoted less, for example that of helper. Some were promoted more, such as that of listener.

The performances given by students as they performed mathematics learner tell us something about the figured world of mathematics learning. Performance scripts are drawn from this world but also the performances that are enacted work to further constitute this world, or to perform it into being. The students' experiences of mathematics learning throughout their schooling have contributed to their understandings of this world. In other research within New Zealand, children as early as Year 3 talked about mathematics as an individual pursuit defined by authoritative teacher directives. By the time they were in upper secondary school this view of the world further produced "profound feelings of alienation and inadequacy" (Walls, 2007, p. 764). Figured worlds are constructed over time – not just within one year. It would be more accurate to say the figured worlds are continuously being renovated.

Further, this figured world is larger than just one stage (classroom) or just one theatre (school). As well as past experiences of learning mathematics, understandings about mathematics learning drawn from peers in other schools and other classes contribute to this figured world. Depictions of mathematics learning in popular media contribute to this figured world also. Thus every student experiences the world in a unique way, and yet there are consistencies across the experiences of all the students in this study that tell us something about this world.

What is the figured world of mathematics learning at secondary school as presented in this data? Firstly mathematics learning at secondary school is old-fashioned. The stage layouts of most secondary school classrooms in this study do not diverge greatly from that which can be seen at a museum, that is, with rows of desks facing a blackboard. I recognised my own experiences of mathematics lessons during observations and I believe my parents would have also. This indicates that it is a figured world resistant to change. McCloskey (2014) uses the concept of ritual to understand those practices within mathematics classrooms that are persistent despite reform initiatives or research suggesting the benefits of change. Nuthall (2005) also draws on the notion of ritual to understand this stability of culture more generally, while Gill and Boote (2012) suggest that procedural mathematics is resistant to reform because it serves to perpetuate the traditional goals of schooling, that is, "ensuring that children learn the skills that society values and learn their place in society" (p.8).

Traditionally teachers are supposed to be the mathematical and social authorities in their classes. They arrange the stage and they direct the student performances. There are constraints upon the teachers as imposed by the theatre of each school and wider dictates from government (and these constraints I will discuss in the next act). However it is the teacher who mediates the figured world of mathematics learning for the students in this study. Yet the students as a group may at times take on the social authority in the classroom. In doing so they can actively construct this figured world in ways they believe appropriate as they demonstrate their expectations for mathematics learning. This was illustrated in Chapter Four, with the class that resisted the teachers' attempts to show an explanatory video and rewarded her with good behaviour when she set them textbook work instead.

The teacher as specialist is also expected to be the mathematical authority and this role lends itself to giving explanations. Such pedagogy positions students passively, promoting the mathematics learner performances of listener and rule-follower. Indeed we can recognise the characters of the figured world of mathematics teaching and learning in these very acts of explaining and listening. As discussed with the performance of helper, when a student enacts this identity they are temporarily assuming the role of teacher, yet this is a borrowed role and not the normal one for a student. The teacher's role is active while the student's is receptive.

The figured world of mathematics learning also determines the nature of the mathematics to be learned. The students expected the mathematics at secondary school to be challenging and they appeared to be ready for this challenge, as described in Chapter One. In particular the higher achieving students were especially looking forward to learning new content in mathematics. Upon

transition the students said that the mathematics was hard and also that it was easy (an alternative view could be challenging and yet achievable). These responses may reflect their expectations or (and) the pedagogy. Difficult mathematics is made easy to do when explained in a procedural manner.

To summarise, identity performances enact scripts from a figured world, in this case the world of mathematics learning. And these performances also work to constitute this world. But there are other worlds at play, such as the figured worlds of friendship and of gender relations. Students may be drawing from any figured world when they perform on the stage of the mathematics classroom and as such there is the potential for the audience to misrecognise the performance.

Recognising Performances

The framing of this study required students to perform Year 9 student to me, particularly during interviews. The students obliged and their performances tell us what they believed it meant to be a secondary school student. They performed grown-up and ready, overcoming fear, and successful at transition. But they were recognised differently by their Year 9 teachers who saw them as little kids who were keen and motivated but needed to learn how to learn and were often fearful of mathematics.

This demonstrates the fact that the teacher, or indeed other audience members, may not recognise the identity performance as intended. This theme of recognition is woven throughout the chapters of this act. Firstly, as described above, and in Chapter One, we saw the teachers recognised students differently to the performances given at interview. In Chapter Two I described how teachers recognised students as certain types of learners through their seat choice upon the stage of the secondary school classroom. Students were recognised as hard-workers, successful students, having a good attitude or being borderline, in part based on the person (their friend) they chose to sit next to. Students were recognised as learners of skills rather than as mathematicians, and also as quiet, as we saw in Chapter Three. In Chapter Four we saw how Jacinta was recognised as nerd and subsequently changed her performance. Students may be recognised as a maths geek or as a disruptive student and these recognitions affect future performances.

Despite the ways in which these performances are constrained, by the stage, direction, and positioning acts of peers, the students' performances are nevertheless recognised, and this recognition may not take into account these constraints. The teacher enacts power on the person as they recognise their identity performance in particular ways. In the next act I will explore further this notion of audience recognition of identity.

Recognising gender

As the researcher I too recognised performances in particular ways. I recognised gender in many performances given by the students. My recognition derived in part from the research literature on girls as marginalised in mathematics education (Burton, 2003; Mendick, 2006; Solomon, 2007a;

Walkerdine, 1990, 1998) and from my own experiences of being a girl in mathematics classes. When I saw all the girls having positioned themselves literally on the margins of the classroom, as described in Chapter Two, I saw this as a gender performance.

When I heard girls talking about their appearance, worrying about their ears being too big or too small I recognised this too as a gender performance, a performance drawn from the figured world of gender relations or perhaps of beauty and sexual stereotypes. When BOY passed the mathematics work to his three female group-mates and told them to make it "pretty" I recognised this as positioning them within gender scripts where the males do the thinking and the females do the superficial work.

As described in Chapter Three, when I noticed it was only girls who took up the position at the whiteboard to explain work to their classmates, and that they did so only in classes with a female teacher, I again recognised gender in this performance. I imagined these girls felt able to take on the teacher role because they viewed it as feminine and this performance may have been preferable to the masculinity of being mathematics student (Llewellyn, 2008; Mendick, 2005a, 2006).

Yet I must ask myself: how much of these performances can be considered gender performance? We are all co-performing a number of identities at any particular time and we are always recognised in these performances. There is huge potential for misrecognition here. None of my research participants reflected on their mathematics learning in such a way as to suggest being girl meant being marginalised – not once in any interview. At what point is it useful and at what point is it further discriminatory to recognise a performance as being part of one's gender identity?

I have used gender to illustrate a point that may equally be applied to other categorical identities such as ethnicity/race, class, sexuality, or any other identity that may be part of the life of a thirteen-year-old student. We may recognise a student's mathematics learner performance when they are enacting a different type of identity and the reverse may of course be the case also. This means we must question the implications of recognising students as a certain type of person, particularly when that recognition impacts on access to powerful learning opportunities or issues of equity.

Change

With this study I sought to explore the changes that occurred for students as they made the transition to secondary school and in particular how these changes may have impacted on their mathematics learner identity performances.

Yet even in the face of considerable change that occurred at transition, change discussed in the literature, change observed by me, and change somewhat glossed over by the students as they performed successful at secondary school, the students' mathematics identities demonstrated remarkable consistency. Different audiences, different contexts, separate moments in time appeared to generate identity performances that bore many similarities. Every performance impacts on every subsequent performance and this promotes consistency, leading to an enduring, stable sense of self that belies a postmodern interpretation of identity.

Yet within education, identity would not be a useful construct to consider if change was not possible – and it is possible. Change can occur, as we saw dramatically for Blair and Jacinta.

What changed more significantly at transition to secondary school was the figured world of mathematics learning. Changes to this figured world meant different scripts were available to perform. The same identity required calling upon slightly different scripts when at secondary school and this led to nuanced differences in the way in which the identity was performed. For example, a good mathematics student at primary school was likely to be positioned as a helper, whereas listening and learning rules were required of a similarly good student at secondary school. Emily, for example, demonstrated these changes in her positive mathematics identity performances of good student.

Identity is not just a performance; identity is performatively constructed (Butler, 1988). This means the performances *constitute* as they simultaneously *reflect* identity. The changes at transition meant students were doing different things as they enacted mathematics learner and these different actions generated new performances that became part of the students' repertoire. This means that gradually and eventually, over time, more changes will occur for students as they perform their mathematics learner identities. This suggests that by creating different learner experiences we can generate different learner identities in students. But this is not something that can always be done in a single year with one superb teacher. All past performances impact on a current performance and therefore change will need to be more far-reaching than an individual classroom.

In the next act I will explore other changes to the figured world of mathematics learning. These changes demonstrate further implications for identity performances, albeit in ways that can lead to differential experiences for students.

ACT THREE

The Scripts and the Audience: Recognising Performances

Chapter One: The Director's Script

In this chapter I consider the notion of a mathematics learner performance *script*. If identity is thought of as a performance then that performance is drawn from available scripts. Scripts suggest the way a performance *should be* enacted and they are derived from figured worlds. In this case it is within the figured world of mathematics learning that scripts are generated for performing 'mathematics learner' in the classroom. Teachers promote particular scripts and students may find some scripts more available to enact than others. In some ways scripts can be considered as being similar to *discourses* about mathematics learning.

I primarily utilise data from interviews with the Year 9 teachers to locate themes relating to expected or desired performances in Year 9 students. These performances can be seen as part of the script for the mathematics learner, as suggested by the teacher. Questions such as: "What do students need to do to be successful at mathematics?" "How do Year 9 students in general compare with students at other levels?" "What do you think is the most important thing for a Year 9 student to learn in mathematics?" "How does --- usually act in class and how does this compare to the other students?" and "Can you describe for me a perfect lesson?" elicited responses about the types of performances teachers wanted. This enabled a construction of the teachers' script for performing the 'Year 9 mathematics student'. I then turn to the student interview data and classroom observations in order to deconstruct the themes within this script.

Teacher Scripts

A director speaks

You need to question everything. Don't shy away, no matter how simple it is, say "tell me again" *or* "I didn't get that", "tell me again and again". Ask more questions! *I don't want you to be* passive learners who sit back and try to work it out for yourselves. I like students asking questions, that's what I'm *here* for. Relating with me, asking questions and participating in group activities *is what I see in* excellent students. Don't be afraid to ask questions *or* afraid to try because *you* might get it wrong. I want you all to question me or to find mistakes. *And* it's ok to make mistakes. To be able to look back and see where *you've* made the mistake I think is more important than getting everything right (laugh). Everyone makes mistakes, that's how we learn. No-one's going to laugh at you. Have another go at it, keep going until *you* sort it out. *I don't want you to* think, 'oh it's too hard, I can't do it' and *not* start. Trust *your*selves. So many *people* feel they're not good at maths and that's not good. 'Oh I hate maths, I'm not good at maths, I don't like maths. We have to change that thinking. Everyone can do maths. Honestly, everyone can do maths. I want to change that attitude towards maths. *Now* I think maths has a lot to do with being confident*. I want you all to* say to *your* neighbours 'I like maths! I can do maths well!' Speak louder *to* give *yourself* some confidence!

The above depicts a fictional director's speech[21]. The text is taken directly from interviews with the 16 Year 9 mathematics teachers. Italics indicate where I have added my own words in order to link comments or to fit the metaphor of a director's speech. In this speech we can see indications of the three main themes that emerged regarding the teachers' desired performances in Year 9 students. These were: asking questions, persistence and confidence. Fourteen of the 16 teachers mentioned asking questions as important to mathematics learning. Eleven teachers spoke about qualities or behaviours which I have grouped together and labelled persistence; these comments related to learning from mistakes, not giving up and persevering with a problem. Closely related to both of these themes was the third, that of confidence, spoken about by 12 teachers. I will present each of these in turn, and then draw on other data to deconstruct these themes and problematise the ways in which teachers sometimes recognised their students as *lacking* in these performances.

Asking questions[22]

Asking questions can be thought of as part of the script for mathematics learner identity performances at secondary school. Teachers spoke about students as needing to ask more questions and asking questions was seen as a desirable performance:

> I think she's improved actually over the year. I've noticed - and she's trying a lot harder. She produces really good homework and she asks a lot more questions. (Sarah's teacher)

However a reason for teachers' desire to hear students ask questions could lie in their wish to gain feedback on the quality and effectiveness of their teaching.

> But most of the time I want them to - I want them to say what's going on in their head, I want them to, you know, to question me or to - um, to find mistakes. (Abby's teacher)
>
> I like their questions. When I hear their questions I know what they need, what they require. So when I answer them I feel I'm satisfied. (Lauren's teacher)
>
> I'd appreciate him coming to me and saying, "look I don't know how to do this". (Ryder's teacher)

Some of these comments suggest that the students' questions are a teaching tool in the sense they give the teacher insight into how the students are progressing.

[21] I call this speech fictional because it was spoken to me, rather than to the students. The teachers may not have ever *directed* their students explicitly in such a manner.

[22] Parts of the following section and in the students' perspectives section have been published in MERGA conference proceedings:
Darragh, L. (2014). Asking questions and performing mathematics identity. In Curriculum in focus: Research guided practice: Proceedings of the 37th annual conference of the Mathematics Education Research Group of Australasia. J. Anderson, M. Cavanagh & A. Prescott (Eds.). Sydney, Australia, MERGA**:** 175-182.

Year 9 teachers consider asking questions to be vital to the teaching and learning process, the implication being that those students who ask questions will be successful. Furthermore, students are positioned as lacking if they do not ask questions:

> Yeah, she just needs to ask more questions! Quite a few of them need to ask questions. (Hannah's teacher)

This position of lacking is also evident in the other desired performances.

Persistence[23]

The teachers spoke in different ways about persistence and used different terms to refer to this behaviour. I read persistence in comments related to not giving up, attempting problems and not being afraid of mistakes. Such variety of language indicates that the notion of persistence is not deeply embedded in teachers' vernacular in the same way as that of asking questions, or, as we shall see later, of confidence. However, all of these teachers spoke about persistence as something very desirable (and ultimately somewhat lacking) in learners of mathematics.

Many teachers spoke about wanting their students to make an attempt at the mathematics and to not give up. For example:

> See for me it's – they can't give up … that's what I find really frustrating – kids that, you know, before we get down to even trying, they've given up. (Jacinta's teacher)

Linked to this is the impression that if students find the work too hard, then they will not attempt it:

> They think, 'oh it's too hard, I can't do it,' and they don't start. (Axel's teacher)

Other teachers talked about wanting students not to be afraid of making mistakes and to use them as a learning experience:

> [The most important thing is] that they can make mistakes and learn from their mistakes. It's ok to make mistakes. Yeah, I think that's very important - and to learn from them. (Hannah's teacher)

In summary, the teachers spoke about wanting students to give it a go, to try, not think it too hard and not be afraid of making mistakes. It suggests they interpret these behaviours as being required for successful mathematics learner performances. Yet evident in the teachers' discourse is the implication that many students do *not* persist. That they are lacking in this area. This conflicts with research that has found children as young as Grade 3 (Thom & Pirie, 2002) and in Year 8 (Sullivan,

[23] Parts of the following section and also in the student's perspectives section have been published in MERGA conference proceedings, although utilising the term "perseverance" rather than "persistence":

Darragh, L. (2013). Sticking with it or doing it quickly: What performances do we encourage in our mathematics learners? Mathematics education: Yesterday, today and tomorrow: Proceedings of the 36th annual conference of the Mathematics Education Research Group of Australasia. V. Steinle, L. Ball and C. Bardini. Melbourne, Australia, MERGA**:** 218-225.

Tobias, & McDonough, 2006) to be willing and able to persist with long difficult problems given the right situation. Why then do the teachers recognise their students in this way?

In the teachers' discourse, not persisting was sometimes linked to a lack of confidence:

> I think mainly it's um, resilience, you know, not giving up. And I think linked to that is confidence. I think maths is a lot to do with being confident. (Edward's teacher)

Confidence

Confidence is a performance that is clearly interwoven with the first two themes of asking questions and persistence. Students need to be confident (that is, brave) about asking questions during lessons and, according to the teachers' discourse, they also need to be confident (that is, have faith in their ability) in order to begin, and persist with their mathematics learning:

> I think they'll be ok in [mainstream] as long as we - they have the confidence by the end of the year. (Hannah's teacher, bottom-band class)

Confidence is a word used ubiquitously within mathematics education (Burton, 2004; Hardy, 2008; Llewellyn, 2009). Yet confidence is an ambiguous word – it can mean different things at different times (and sometimes simultaneously). For example, it can be conflated with ability:

> [The top stream class] have that confidence, they believe they can do it, you know. (Lauren's teacher, top-band class)

> [This class are] bright, and they are confident children. (Abby's teacher, high stream class)

From these quotes we can see that confident, top-stream, and able or "bright" are treated as synonymous. Other research has similarly found teachers and students to equate confidence with ability in mathematics (Burton, 2004; Darragh, 2013; Hardy, 2007). Conflating confidence with ability may lead teachers (and students) to misrecognise an unconfident identity performance with lack of ability.

This recognition of the students' performances as lacking can be seen in some of the responses made by teachers:

> And Abid, lacks confidence, which I think really prevents him from doing as well as he could. (Abid's teacher)

> Mia needs to have a .... um, ... work on her confidence because that's – learning is, you need to be confident to learn. (Mia's teacher)

These teachers see lack of confidence as being a crucial barrier to success in mathematics learning for their students.

Yet perhaps confident performances may be generated:

> And it's all about making them feel comfortable, confident and so that it's a safe place. So if I'm asking them to solve a problem on the board, their little hearts don't start beating and they don't start freaking out. (Axel's teacher)

In summary teachers construct an idea of the appropriate Year 9 mathematics learner performance to be one of asking questions, persisting with the mathematics and being confident. However interwoven in the teachers' talk was the implication that students are lacking in these performances in the mathematics classroom. The students need to ask more questions, they should not give up, and they will be ok if they just have confidence.

At this point I should note that it is possible the teachers were recognising me as an intermediate school teacher, or perhaps as someone who had influence on students' education prior to secondary, and as such may have been imploring me to fix this problem of lack in the students. Their responses may have been different if speaking to someone with a different background. However, the way in which they recognised their Year 9 students as lacking is illuminating.

We saw in Act Two, Chapter One that the students were enthusiastic about becoming secondary school students, and appeared willing to take on board the required performances that secondary school entailed. If teachers saw students as lacking in these key areas it raises the questions of whether students had received the required performance script from their teachers. Had they read this script? And if so, what might have prevented them from enacting it?

Student Perspective

Although the teachers viewed the asking of questions as a key component of the script for learning mathematics at secondary school, a number of the student participants mentioned a reticence towards doing this:

> And also if I'm not sure I should ask the teacher. But I don't tend to ask the teacher. That's just one of my weaknesses. (Peter, Phase 2)

> I: Do you ever ask the teacher?
> A: Yeah I do, but not really that much. - I don't know I'm just, I'm more comfortable just going home and asking people I know. (Abby, Phase 2)

These students convey an understanding that they *should* ask questions, but are not willing to do so. Peter's reluctance to ask the teacher reads like part of his identity; he does not tend to enact this performance and that is just part of who he is – a weakness. Abby says she is more comfortable asking family members for help.

From these responses we can see the students have received the 'ask questions' part of the script promoted by the teachers, yet some remain reluctant to enact it. The following illustrates some of their reasoning behind such actions:

I: Does anyone stand out in the class?
S: Um - the girls that were at the front. … They're always asking questions or if she asks somebody to write something on the board they'll all put their hand up.
I: Have you ever done anything like that?
S: [Shakes head]
I: No? Why not?
S: Too scared of everyone. (Hannah, Phase 2)

Yeah, I like - Mr N---, I don't really ask him many questions. I just ask my friends more. 'Cause Mr N---'s trying to teach everybody else. (Peter, Phase 3)

I: 'Cause I noticed you didn't ask the teacher anything - in class the other day/
S: (Laughs)
I: Does that happen very much?
S: Um, well usually if I don't understand something someone around me would, so - I don't want to like, stop the whole lesson just to ask a question that others might know and interrupt what he's doing. (Emily, Phase 4)

These quotes speak of the discomfort the students face in speaking up in class. While the teachers wanted students to ask questions and participate in lessons, the students did not view asking questions as a necessary act for success in mathematics. However, elsewhere in the student interviews the theme of questioning did emerge. When responding to the question of how to be successful in mathematics only two students said they should be asking more questions; but a number mentioned asking for help when they did not know how to proceed with a mathematics problem.

In order to unpack this further I returned to the full data set and examined an interview question from Phases Three and Four: "What do you do when you find you don't know how to do something in mathematics?" With this question I was originally trying to gain an insight into whether students would persist with problems during mathematics lessons.

An overwhelming majority response was: "Ask someone". Twenty-one of the 22 students said this as part of their response in at least one of the interviews. This highlights the importance of considering the context in which an interview response is made. While only a few students talked about asking questions when we were discussing *success* in mathematics, nearly all of the students said they would ask someone if they did not know *what to do* during a mathematics lesson.

This suggests two things. Firstly, it appears that students are hearing their teachers' promotion of asking questions; yet they may be performing from this script in the wrong situation. This means the asking of questions becomes a reactive act rather than a pro-active one. My understanding of the teachers' promotion of asking questions (based on my own teaching experiences) is that a pro-active and successful mathematics learner would ask questions to clarify their thinking and push their

understandings further. Secondly the performance of asking questions (read 'asking for help' here) when stuck on a mathematics task is a passive action and works against the act of persistence.

The persistence part of the script was the least talked about by students. This may have been because teachers did not communicate this desire. Or perhaps the constraints of direction and the stage worked effectively to obscure the possibility of this performance. I am not suggesting that students did not persist during mathematics lessons, it is likely that many did, rather that they did not perceive this as a key component of the script for 'mathematics learner'. These students did not talk about persistence when describing mathematics learning to me during interviews, whereas they did talk about other parts of the teacher script.

What then did students have to say about confidence? Ten students never mentioned the words confident or confidence at all, in any interview, and many only mentioned this performance once, briefly. Those who did speak about confidence spoke about it in conflicting ways. This reflects the research literature on confidence. For example Burton (2004) found differences in perception of confidence from teachers and students.

Many students in this study conflated confidence with ability. This too is reflected in research literature, both in empirical studies and also within broader mathematics education discourses (Hardy, 2007, 2008; Llewellyn, 2008). But there were other meanings for confidence evident in the students' comments as well. The students use of the word 'confidence' were as synonymous with: comfort (Abid), speed (Anja), ability to understand (Anja, Ryder), preparedness (Anja, Abby), arrogance (Emily), not being scared (Abby), unafraid of being wrong (Abby), not hesitant (Chad), not reserved (Chad), not quiet (Hannah), feeling positive (Peter), sure (Ryder), enjoyment (Brad), and having knowledge (Anja). Such variety suggests it may have been difficult for students to interpret which kind of confident performance their teacher desired. Furthermore some of these meanings for confidence describe feelings which students may have little control over.

Hardy made a distinction between the *performance* and *feeling* of confidence:

> It seems that the performance stands in for the learner, that is the performance is used as a basis for judgement and so produces the learner as confident or not. The students are aware that to be attributed with confidence you must act particular ways. (Hardy, 2008, p. 3)

This highlights the sometimes tenuous links between recognition and identity performance. It also suggests that students may not always perform in ways expected of a learner of mathematics.

Reading and rejecting the scripts: Abby

Abby seemed to be a student who was very aware of the script she should be performing as a mathematics learner. This is evident in her response to the question of successful learner performances made at the Phase Three interview, a response that stood out from all the others.

> [To be successful at mathematics] I think you have to be - if you're not particularly amazing at maths, like me, I think you have to be more dedicated and not give up just because it's really hard and just keep trying - oh that sounds really cheesy. (Abby, Phase 3)

This was the only response from any student that indicated an awareness of the desirability of performing persistence in learning mathematics. No other student made a similar comment in reply to this question at any interview; and yet this is one of the main performances valued by the teachers. It seems most students have not read this part of the script. Yet mid-reply Abby reflected on how her response sounded. Perhaps she was imagining what I may have thought of this response. Perhaps she was taking the part of her own audience and did not like how it sounded. I found it ironic that the very thing the teachers would wish to hear was dismissed by Abby almost as soon as she said it. The performance did not ring true and the script was discarded.

Similarly Abby discussed the fact she *should* ask more questions, and then explained to me why she didn't:

> But I don't really feel that comfortable, 'cause like, sometimes the teacher thinks I don't get a certain part of the problem, but actually I don't get something that's a lot more basic than that. … I'll just pretend I understand her and I'll go home and ask my dad. [Or I prefer to ask my friends because] my friends don't really - they won't think I'm stupid if I say … "What? I don't get that at all." (Abby, Phase 4)

Asking the teacher a question had potentially negative consequences: Abby did not want to reveal exactly how much she did not know, or perhaps she did not want her teacher to think her stupid. Such concerns compelled her to pretend she understood and to maintain the charade until she could gain help at home instead.

Abby also spoke about confidence in mathematics learning. She related it to ability, but also as the opposite of being scared or afraid of giving the wrong answer publicly. Consider also the following interview excerpt:

> A: [My mum] always says that I'm fine at maths I just need more confidence. But I think that not having confidence is better 'cause it kind of makes you study harder and you know, sort of work more towards it.
> I: So you think if you were confident //you would just
> A: //Then I might mess up, 'cause sometimes over confidence gets to my head 'cause I don't study and then I do the worst I've ever done. So I don't think getting confident is really...
> I: Did that hap - do you feel confident in any of your other subjects?
> A: Yeah, I feel quite confident in social studies and science and stuff. 'Cause mostly when I have the tests I find them really easy.
> I: So, does your confidence go to your head in science or social studies?
> A: Noooooo.... (Abby, Phase 3)

Clearly Abby did not quite see confidence as the same as competence; if it were then the notion of "over-confidence" would surely make no sense. However it is also interesting to note how Abby constructed her mathematics learning experiences differently from those of other subjects. Being too confident in mathematics may have led her to not study and gain a bad test result, but there appeared to be no risk for this in other subject areas.

Abby was a student with high achievement in many subject areas, although less so in mathematics. She was very self-reflective and perceptive, as evident in the fact she seemed to have read the performance script promoted by secondary school teachers. Yet despite having read it she did not enact it. This suggests there are constraints working against students' uptake of the performances that their teachers desire.

Constraints

In order to understand the contrast between student and teacher comments we need to reconsider the *stage* for mathematics identity performances and the change that occurred at transition for these students. Arguably the biggest pedagogical difference with the move to secondary school was the change to whole class teaching from learning in small groups. All 22 students experienced this change, regardless of which secondary school they moved on to. Asking questions (for any reason) had suddenly become a very public performance. It either required putting a hand up and asking in front of the entire class or walking up to the teacher's desk, which was at the front of the room in the majority of the classrooms. For some students this may have required acting in a way that made them feel uncomfortable, evident in Hannah's "too scared" response above. The following interview excerpt gives insight into the emotionally charged nature of public performances:

I: And has there been a time when you've felt really bad [while learning mathematics]?
C: ... Not really. I've never really been humiliated or anything like that.
I: Has anyone?
C: I think so last year. Like someone got an answer really wrong.
I: And how did they get humiliated?
C: Well it was just - I think it was a really easy question and they got it really wrong. They probably felt humiliated, we probably weren't - we probably didn't, um, make them feel like that but um, if it's a really easy question and you get it wrong, you yourself will just beat yourself up about it.
I: So you thought they might have been humiliated because you would //have felt humiliated if that was you?
C: //Yeah. ... Might not have been, but that's how I would've felt. (Chad, Phase 4)

Ryder's teacher also spoke about the possibility of humiliation, or being "looked down upon":

T: Ah, I would say he's a bit withdrawn. But I've tried to find out the reason for that. I think he doesn't feel comfortable sort of speaking up – his mind. So he's more concerned about what answers he's going to give and what his peers are going to think about his answers and

maybe as well his teacher. So I think that's one thing that's holding him back. [….] So he's trying to impress me. And not only me, I mean, his peers as well [...]

I: Do you think he's quite concerned about the way his peers see him?

T: Yes - oh, I mean, I'm not isolating him.

I: They all are?

T: Yeah, most of them are. But as I said, there are quite a number of them who have sort of learned how to ... address that problem of, you know, being looked down upon if they give the wrong answer. (Ryder's teacher)

According to this teacher, some students are more worried about the audience reaction to this act of speaking up. If teachers recognise asking questions as an essential part of the performance script for the Year 9 mathematics learner, then we must consider whether all students are equally able to perform this act. Research in New Zealand suggests Pasifika learners are unwilling to ask questions in the whole class setting of the traditional mathematics lesson (Hunter & Anthony, 2011), and Zevenbergen (2001) has found class-based differences in following the hidden classroom rules of interaction; these Lerman calls "recognition and realisation rules" (2009, p. 155), drawing on Bernstein. The scripts for performing in a secondary school classroom may be less available for some learners to take up than for others.

Secondly we must also examine the direction given in the classroom. To promote persistence students need to be given a problem that they can actually persist with. For example Brodie et al.'s research at Railside school found students developed a willingness to persist when faced with challenging problems (Brodie, Shahan, & Boaler, 2004). During a research interview, Sullivan et al. (2006) found that students were able to persist with very difficult problems and concluded it was the classroom environment that mitigated against persistence. My observations of the Year 9 mathematics lessons did not reflect the valuing of persistence in mathematical problem solving, as exemplified in Chapter Three of Act Two. The majority of teachers delivered mathematics content in small bite-sized pieces. These bites students either could or could not do. Mathematics was considered either easy or hard, rather than something one persists with.

If teachers valued persistence as much as the interview data would suggest, why was this not usually reflected in their pedagogy? I discussed in Act Two the role ritual (McCloskey, 2014) may play in teachers' resistance to reform pedagogies. However the data also suggests that the examination culture of secondary schools may be in part responsible for this. Teachers face pressure to get through a huge amount of content, despite the first national assessments not occurring for another two years in Year 11:

> We've still got to cover the same content to prepare them for Year 11, so it's kind of like, you don't get that time to really enforce that understanding that they kind of need. (Belinda, Abid and Brad's teacher)

> Year 9 constitutes maybe half of Level one, which is Year 11, full assessment, whole exams. Everything we learn is important. We don't teach them what they don't need for NCEA - I would love to do that because for me it's more exciting, more interesting. But I have to stick with curriculum. (Brendon's teacher)

> I mean, you look in a level one NCEA paper and it tends to be a problem that has multi levels within it. Um, ... the whole holistic, you know, contextual, um, ... way to maths I think. And so that's the ultimate skill that we need to give our kids in Year 11 so we've got to start it back at Year 9. (Axel's teacher)

The teachers felt constrained by the requirements of NCEA examinations to deliver up to half the content of the Year 11 (level one) examinations in Year 9 and this mitigated against the teaching of more exciting or interesting topics. Whether they saw the need to focus on problem solving (as did Axel's teacher) or the development of skills (as did most other teachers) they felt the need (or were instructed) to begin this in Year 9. The constraints of preparing students for tests has been found in other research (Walls, 2010). In this study it seemed that the Year 9 mathematics programme was enslaved to the demands of NCEA assessments despite them being scheduled for more than two years in the future.

Another possible reason for the disparity in teachers' talk versus their pedagogy may stem from a belief that their students arrive in Year 9 with negative feelings about mathematics:

> I mean at the beginning they have a lot of fear of um, math. (Lauren's teacher)

> Maybe he has got a fear, --- maybe from his past experience. (Ryder's teacher)

> When they come to Year 9 --- a lot of them already have a dislike of maths. (Hannah's teacher)

> So they get this um, hatred of it from a very young age. (Jacinta's teacher)

However, the perception of fearing or disliking mathematics conflicts with the National Education Monitoring Project findings that mathematics was the third favourite subject surveyed, chosen by 30 percent of Year 8 students (Crooks, Smith, & Flockton, 2009). Despite such findings, it was the teachers' pre-conceptions that appeared to be influential on their practice:

> I don't want to make it too hard so they'll stop liking it and think they're not good at it. (Peter and Sarah's teacher)

> And they look at the too hard thing and they won't even try the stuff they can do, they go, oh, it's too hard! You know, so you try and avoid frightening them I s'pose. (Jonathan, Robbie's teacher)

These comments hint at the ways in which teachers may adapt their pedagogy in order to alleviate the fear and loathing they perceive in their students. The procedural approach to teaching and short answer problems, as described in Act Two, Chapter Three, may be a way of avoiding "frightening" the

students and helping them to realise that “everyone can do maths.” During interviews, however, and supporting the NEMP findings, the majority of the students did not perform negative mathematics identities of fear or hatred; they were generally quite positive about the subject. Perhaps this perception of the teachers comes from wider societal discourses about mathematics.

Finally, it is more difficult to consider the constraints on a performance of confidence. To adapt a cliché, confidence is in the eye of the beholder. That is, we recognise confident performances in other people, but we often base this recognition on actions that may stem from other factors. The teachers may say they desire confident students, but this desire can only be understood when paired with another action. They want students to be confident enough to ask questions and say when they need help. They want students to have enough confidence in their ability to persist with mathematics problems. Those students who do not ask questions or do not persist may be recognised as lacking confidence. In this way their actions are read as an internal characteristic rather than stemming from other constraints, such as those due to the pedagogy of the secondary classroom.

Concluding Discussion

The director’s speech at the beginning of this chapter is fictional. It is comprised of the comments teachers made to me during interviews where they demonstrated their passions and their frustrations in teaching mathematics. The director’s role is to bring about the best performance from their actors. In the world of theatre there are as many different approaches for directing as there are ways to teach. Some directors spend one-to-one time with each actor helping them to tap into their past experiences in order to generate real emotions that come out in the performance. Others require the actors to simply act the emotion and this becomes embodied; in other words they act first and feel the emotion consequently. How might the teacher as director bring about the best mathematical identity performance in their student actors? They want to build confidence, create a stage upon which the student feels comfortable to ask questions and be unafraid to try, and not worry about making mistakes. They want to make mathematics less scary but in doing this they may provide mathematics tasks that are very achievable and doable, that is, easy, over-explained, short and plentiful. They want students to keep trying, not give up, demonstrate persistence – and yet the short, explained, easy questions do not provide the opportunity to do this. The directions are contradictory and they are misunderstood by the students.

The students received the ‘ask questions’ part of their teachers’ script but appeared to misapply it. They said it was when they did not know the procedure for solving a problem that they asked questions and this worked against a performance of persistence. The persistence part of the script, on the other hand, was one the students did not appear to have received and this may have been due to the pedagogy of the secondary school mathematics classroom, a pedagogy that is itself constrained by factors such as the examination culture. The misalignment of the students’ performances with the teachers’ script lead teachers to recognise students as lacking; they did not ask the right questions at the right times, they did not persist and they lacked the confidence to do these things.

What does it matter if a teacher views a student as lacking? As argued by Walshaw (2011), "the student's construction of herself as a learner in the classroom is highly dependent on the teacher's image of the student as a learner" (p.100). If a student is seen as lacking in their mathematics learner performance then they may come to see themselves similarly and continue to perform a negative mathematics learner identity in the future.

Furthermore, by enacting the ask questions performance at the wrong time, students are negatively affecting the quality of their mathematics learning experience. Rather than engaging in high level discussion and asking probing questions to clarify their understanding they are instead listening passively to teacher explanations. When they could be persisting with mathematics problems and attempting to solve them by exploring different avenues they are instead asking someone, most often a friend, to tell them what to do. In this manner the students are constructing their own script for mathematics learning at secondary school as an extremely passive endeavour.

When students do not perform as their teachers expect or desire they are further recognised as being fearful or disliking mathematics. This then impacts on pedagogy and leads to more constraints on subsequent performances. In this manner the figured world of mathematics learning is continually constructed. It involves complex interactions between performance scripts, direction, performances and audience recognition.

I wish here to take the notion of recognition one step further by suggesting a possible recognition cycle that may look something like figure 2 below:

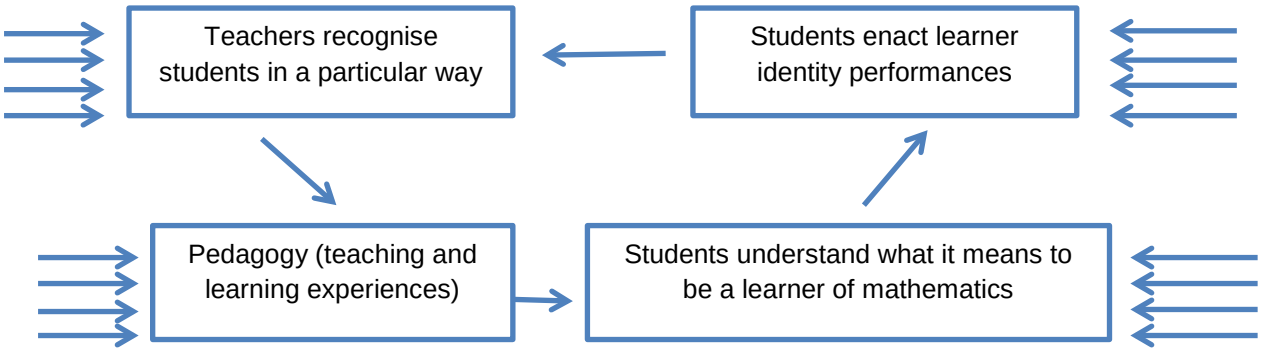


Figure 2: Recognition cycle

Constraints and other influences operate at each of the steps in the cycle (represented by arrows from outside the cycle). For example, many constraints operate on the pedagogy of the classroom, and many other things influence understandings of what it means to be a learner of mathematics. There are also other influences and constraints on the enactment of identity performances, and upon others' recognition of these performances, as is discussed in other chapters. Yet the data discussed here demonstrates the way in which this cycle may operate. For example, teachers may recognise Year 9 students as fearful, then teach in a way to avoid frightening them further by making the mathematics easy and procedural. Students may then understand mathematics as being something that can be solved in one quick step and so give up rather than persist with more difficult problems.

Finally the teachers recognise the students as lacking in the confidence to try these difficult problems and the cycle continues.

Of course this diagram oversimplifies a complex world and many recognition cycles may be in operation at any one time. However by considering this process we can then look at ways to disrupt the cycle. We can consider what scripts are being promoted and whether they are overtly promoted or more subtly implied, and also whether these scripts need to be made more explicit or avoided completely. We can consider the ways in which teachers recognise the students and whether this is an appropriate recognition, or whether the students are performing in a particular manner for another reason entirely. Finally we can consider the ways pedagogy can generate different performances and open up possibilities for different mathematics learner performances.

Chapter Two: Assessment Scripts

Assessment emerged in the last chapter as a constraint operating on the practices of teachers. It is also something that is considerably different at secondary school from intermediate. In Act Two I discussed change at transition with respect to identity performances. In this chapter I will provide evidence of the changes that occur through the large increase in and focus on assessment. This change is evident in the increased use of the language of assessment (by students and teachers) and in the ways in which students referred to examinations to describe how they were doing at secondary school.

Assessment does more than constitute a change in the figured world of mathematics learning. It also can be considered as generating particular types of performance, that is, scripts. By *assessment scripts* I refer to the way in which assessment practices impact on the students' understanding of how they should *be* when performing the mathematics learner. During tests and examinations, students are required to act in particular ways as mathematics learners, but the assessment culture also influences more general mathematics learner performances in the classroom.

Assessment also works through the power of recognition. We recognise students as certain types of learners through assessment results and this leads students to recognise themselves in these assessment categories. In the second part of this chapter I will share some stories of changing assessment experiences and assessment incidents at secondary school. I conclude by defining the act of recognition through assessment as an act of power. Recognising students as particular types of learners through assessment exerts power on students in a way that influences students' future identity performances.

The Language of Assessment

During the first interview, at Year 8, the students did not talk about assessment much – unless I brought it up myself. I tried to engage them a number of times in a discussion about the secondary school placement test that many either had sat recently or were due to take soon. But most of the students did not perceive this event to be as important as I considered it to be and did not engage in much talk about it. However upon the transition to secondary school students began talking about tests more often.

In New Zealand schools high stakes assessments occur in Year 11, 12 and 13. For most schools these are NCEA assessments, which consist of levels one, two and three. The grades awarded in these examinations are 'achieved', 'achieved with merit', 'achieved with excellence' and 'not achieved'. The preparation of students for these examinations begins as soon as they enter secondary school and this was evident in the way the terminology of NCEA was used in the data.

The students increasingly used these terms throughout the interviews. At Phase Two, one or two months into the secondary school year, six students had already begun to refer to their tests using this language, describing their attainment in terms of achieved, merit or excellence. At the Phase

Three interview, six months later, 16 students spoke about assessment and learning using the language of NCEA.

The teachers also used these terms regularly when speaking about tests. But more significantly some teachers used this language to recognise the *students* in terms of their test marks. In some cases it even became an adjective for the student:

> [Jonathan's friend] is a very good, you know, he's a keen motivated sort of kid. Not an excellence kid but a merit kid, possibly with an excellence here and there. (Jonathan and Robbie's teacher)

> I would assume his marks mostly around merit, […] He had an excellence for one topic, I would say that's an accident. (Brendon's teacher)

> Ah, they are ... excellent students ... But I wouldn't straight away put them in an excellence category, from an exam point of view. (Anja and Jacob's teacher)

Top-, middle- and bottom-stream students may automatically be recognised as being in a corresponding assessment category of excellence, merit or achieved:

> In this [bottom stream] class … they're at the level they should be for achieved – the excellence in this class is at the level of achieved in [mainstream] classes. (Hannah's teacher)

In that class then, the top grade possible, although labelled excellence, was only an achieved grade. Such expectations are communicated to the students in subtle (and not so subtle) ways. Consider the following excerpts from my observation notes:

> Teacher: "Practice your reasons. If you practice your reasons you'll get merit, otherwise just achieved." One girl asks what is needed for excellence. T: "You lay it all out" – perhaps the girl does not understand (as I don't) because she responds by indicating that she won't get excellence. (Field notes, Messina, August 2012)

> T: "I don't expect students in this class to get excellence." (Field notes, Venice, August 2012)

During the lesson depicted in the first excerpt the teacher was emphasising what would be needed for a merit mark but was very vague about the requirements for excellence. This gave a message that there was no point aiming for excellence and the girl who asked the question certainly picked up on this message. It was evident in her response that she wouldn't get that mark. The second observation excerpt, from a middle-stream classroom, spelled out the expectations for the students even more clearly.

Did the students begin to take on board these expectations? At the final interview it appeared students were happy if they had attained the result expected of them. As Brendon, a student in a middle stream class commented:

I: Um, so what was the highlight of the year?

B: I guess getting merits in my exams. I guess.

[….]

I: Um, if you could do your year differently, what would you change?

B: ... ... um, I'm not sure, um, .,.. ... maybe try to get excellences in my exams?

I: But you sounded quite happy with merits anyway.

B: Yeah. (Brendon, Phase 4)

The highlight of Brendon's year was achieving a merit grade. When asked how he might have done the year differently it took him some time to think of any answer. When he replied "try to get excellences" I interpreted this as him telling me something he thought I wanted to hear rather than it being something he might have desired for himself. His teacher suggested gaining an excellence would be an "accident" for Brendon, and it is possibly because of this that Brendon is pleased he has attained his potential by achieving at the merit level.

Assessment as a measure of general success

After more than a year at secondary school, students seemed to be well versed in the assessment scripts of this figured world. I was particularly struck by the number of comments about assessment made at the final interview, early in Year 10. My first prompt at this interview was: "Tell me about how the rest of Year 9 went for you."

> It went very well. I got a very strong grade on my exams, end of year exams. (Brad, Phase 4)
>
> Ah pretty good, pretty good, yeah. Um, I didn't do, I didn't do too bad in the maths test last year, I don't think - in my final one. (Abid, Phase 4).
>
> It went quite well. I got an excellence on my exam which I was really happy with. The year was good .(Lauren, Phase 4).
>
> Ah it was good um, ... the, my exam I ... I passed it but I passed it by [only just] that much… (Ryder, Phase 4)

Although I did not intend to ask about assessment results until much later in the interview, twelve of the 21 students responded to the very first question with a comment about assessment. Prior to this interview, when I asked how things were going, students usually made the assumption that I was interested in the transition to secondary school. They spoke more about whether they were feeling settled and coping with the challenges of the new school. In contrast, at the final interview only five made comments like that, two said that things were pretty much the same, two made vague comments such as: "good, yeah," (it later transpired that these two students were the participants who did not pass their examinations). As stated above, the other twelve told me about their examination results, as if this were the main indicator of how things were going. The assimilation of students into the secondary school assessment culture was well under way after little more than a year at secondary.

Yet the importance of assessment at secondary school was evident for some students very soon after transition:

I: So tell me a little bit about what happens in maths.
R: Um, like there's a lot more subjects to learn in maths. And like, you learn a lot more about algebra and stuff. And the tests are ... worth more than intermediate.
I: Oh, ok. What do you mean worth more?
R: Ah, you have to study more, because it goes into your record. (Robbie, Phase 2).

After less than two months at secondary school Robbie understood that assessment *marked* him in some way; results were recorded and "worth more", which I interpreted as meaning they had more power.

The way in which assessment exerts this power is in part through the recognition of students' identity. Teachers recognise students through assessment results and categorise them according to the terminology of assessment. Students have already been categorised as top, middle or bottom *stream* through an earlier assessment, usually at the end of Year 8, and their achievement in assessments are predicted on the basis of this categorisation. It generates a recognition cycle whereby the recognition of being a certain type of learner actually creates that type of learner in the student.

In the following section I first provide vignettes of identity performances which draw on assessment scripts to describe two different stories of experience. Second I present two tales of assessment incidents which illuminate the uncomfortable way assessment can intrude on mathematical identity performances for students.

Stories of Assessment Experiences

Students' identity performances are implicated in assessment and assessment works to recognise students' mathematical identities. It is a recursive process. Yet for individual students it works in different ways. Abby spoke a lot about assessment; it played a highly visible role in her performances. In contrast, assessment for Jonathan seemed somewhat invisible in his performances at the start of this study, but it had begun to feature more prominently toward the end. Abby's story can be read as a tragedy and Jonathan's as a comedy in the tradition of Greek theatre.

Abby

End Year 8
But sometimes I get really mixed up and when I'm tense, like about to do a test or something I always mix things up, even though I know the answer. (Abby, Phase 1)

Start Year 9
No I think nervous – being nervous does help me concentrate a little bit more, but ... it also makes – it also makes me panic. And I've been studying for a long time but it flies out of my

head and I'm like, 'no, no, no, just think back to it. […] I made so many careless mistakes I can't believe it. (Abby, Phase 2)

Mid Year 9
Once I had a test on ... I think it was ... .. .um, it was algebra and I only got achieved because - and that was the only time I'd gone into maths when I wasn't feeling very comfortable about the test because I hadn't had very much time to practice and my stomach just turned over and the page was just all ughh. […]... I notice that some people don't really seem to focus at all, but then they still don't get bad marks. I think it's very unfair. […] Maybe they have a natural talent or maybe they go home and study a lot. […] I think I'll study harder for the end of the year, probably get at least a merit. (Abby, Phase 3)

Start Year 10
And actually the end of year exams didn't go too well for me. I actually got kind of distracted with, like, my friends and didn't focus too much on my studies, which was terrible. […] Like, ... like, it's kind of embarrassing but ... I started to like, go out more and not ... focus as much on studies and it really had a terrible impact on my marks. […] Ah, they weren't awful and I did get achieved, merit and excellence but a lot of my friends who were, you know, doing what they were supposed to, moved up, and to think, if I had just put like a little more effort in I would have been with them, but yeah, I didn't do that. […] Oh my God [this year's first test] was terrible, don't ask me about that! […] I only got achieved. Like half my class failed in that test. I don't know why, I thought it was easy when I was doing it, then I got an achieved, I was like, noo! (Abby, Phase 4)

Abby was a very high achieving student and I suspect she found it difficult to reconcile her performances in mathematics with that of other subjects. Abby recognised the importance of assessment at least as early as intermediate school. Even then tests made her tense, and her obsession with assessment increased at secondary school where there was more emphasis placed on them. Abby's thoughts about the state of being nervous as meaning she could concentrate more seriously on the test were remarkably self-reflective. But she walked a thin edge in which nervousness could easily descend into panic, negating the effects of studying.

There is a mixture of agency and helplessness in Abby's responses. Her belief that studying will result in good marks is evident and she attributed lower marks with not studying enough. However she was sometimes at the mercy of her emotional state; panic and being tense may have resulted in the answers flying out of her head. Her sense of agency may have been further disrupted when she noticed some people got good marks despite a lack of "focus". While she acknowledged that they may have studied at home, she suspected the unfairness of natural talent at play.

This story is a tragedy; Abby's emotive descriptions of poor assessment results foreshadow the ending of her Year 9 mathematics drama. We are set up for the final act with her comment: "I think I'll study harder for the end of the year, probably get at least a merit." However, when I interviewed her

early in Year 10 she explained she had been distracted by her friends, did not focus on study, and had been complacent with high grades throughout the year. I recognised a fourteen-year-old girl performing a 'teenager' identity. Abby felt she missed her opportunity to move up a stream, as her friends did, and this is the tragedy. Finally, by Year 10 Abby's sense of control over her mathematics learning was further diminished. Her first test results of the year took her by surprise; despite this time conscientiously playing the role required of her as a secondary school mathematics student, and studying for the test, she did not get a good result. The assessment recognised and categorised Abby as "only" an achieved student in mathematics.

Jonathan

End Year 8

I thought [the secondary school placement test] was going to be a bit harder. […] I always finished [each section] before the time. (Jonathan, Phase 1)

Start Year 9

[Secondary school is going] good. Um, ... got the highest marks in maths. […] Yeah. I got 89% […] I'm not normally the highest. […] Science is also one of my favourites because I've been getting the highest marks in that as well. (Jonathan, Phase 2)

Mid Year 9

[I'm] not getting as high marks now at maths, but excelling in Japanese and English. […] I'm not getting the working, which is most of the marks. […] I'm writing it down how I think it, but I'm not writing it down how I'm meant to [… So I get] merit and I used to get excellence. […] I think [the test] might be tomorrow.

I: What's the test on then tomorrow?

J: Don't know.

I: How are you going to study for it if you don't know what's in the test?

J: I have no idea. I never really study for tests. (Jonathan, Phase 3)

Start Year 10

I think [my exam mark was] a merit […] Pretty pleased […] Probably one of the higher [marks]. […] I wasn't quite prepared for secondary school because I] didn't really study enough […] I didn't know] just what to study. (Jonathan, Phase 4)

If Abby's story is a tragedy then Jonathan's is a comedy. When he spoke about his secondary school placement test in the first interview, saying it was easy and he had plenty of time to spare, I listened with teacher ears and a sinking feeling that this meant he had done poorly. I felt like the audience in a comedic play when the characters are set up for future laughs yet are unaware of the situation themselves. The audience knows what is to come and the laughs are at the character's expense. Indeed Jonathan was placed in quite a low-stream class based on the results of this test. Yet this had an unexpected benefit: his first experience of a test at secondary school resulted in him gaining a

result that was top of the class. This is a position he had never been in before; suddenly he had a starring role after years of performing in the background cast.

Jonathan performed very differently from Abby. He did not initially talk about the importance of assessment. I could hardly contain my incredulity when he told me he did not even know the topic of the next day's test; his comment was perhaps an attempt to perform 'naturally good' at mathematics. But by the middle of Year 9 Jonathan was beginning to gain an understanding of the performance script for assessment. He knew he needed to write down his working to get full marks for each question, but this script was still somewhat mysterious. It was not enough to get the correct marks; at secondary school one also had to have the correct procedure.

Like all comedies, this one ended well. Jonathan moved up two streams in Year 10. He suggested in his final interview that he had not been prepared for secondary school in that he did not study enough, or more accurately did not know *what* to study. At some point he learnt the secondary school assessment script and learnt how to perform it.

Assessment incidents

Here I re-tell two stories told to me by Mia and Peter. These stories are of a failed test. In each case the student had to find a way to incorporate this recognition of themselves as a failed learner of mathematics in a way that could fit with their other identity performances, including those made to me, to their teacher and to their parents. With an increased focus on assessment at secondary, when students fail a test it requires them to do significant identity work to fit this recognition of their mathematics ability with other identity performances they may give.

> [The test went] pretty not good. […](Laughs) I got a 'not achieved' […] I don't know, I just didn't understand everything in the test […] I'm going to tell [mum and dad] soon […] I'm probably going to tell them tonight. […] Some of the parts of measurement were easy and some of it was hard. And that's what went wrong in the test. (Mia, Phase 3)

The not achieved grade Mia attained just prior to my Phase Three data collection came as quite a shock to her. Although she laughed about her not-achieved result when she told me about failing, this may have been a defensive response (Black, Mendick, Rodd, et al., 2009), especially when compared to the emotional reaction described by her teacher:

> And when I [interviewed Mia about her test results] she was in tears in the first two minutes. I said, "look, I just want to understand you better and I want you to also know my expectations." And she was, "I'm so sorry," I said, "no I don't want you to say sorry, I know you had reason for writing, giving these answers, you tell me. I want you to know, for example, changing centimetres to millimetre, what part of it is hard for you? I want to help you, let me help you." She was in tears and so upset. […] Mia was SO upset, so upset – she's so insecure I think that she couldn't even. She said, "sorry," – I said, "no, I didn't call you to hear that." […]I tried to – no, I couldn't, I tried to, I said, "Mia, can you dry your eyes? If you want to have water, you go

and come back. I just want you to tell me, because I know you are doing your work, you are a good girl, you're sitting quietly, but obviously you're not learning as much as you're supposed to be learning, so tell me, how can I help you? That's all I want to know." And then she started smiling and she said, "ok, I'll come back." But she was so upset that I had this ... conversation with her. (Mia's teacher interview)

The teacher recognised Mia as a "good girl" who did her work and sat quietly, the performance of a 'good student' perhaps. But the assessment recognised Mia differently and when confronted with this she was inconsolable. It is difficult to know whether Mia was more upset with her result or with the situation of speaking to the teacher about it. Mia may have felt that being recognised as a good girl who was still not learning as she was supposed to (perhaps indicating she was not so 'good' after all) was a difficult performance to incorporate into her repertoire.

I interviewed the teacher after the student so was unable to ask Mia about how she felt, not knowing about the incident at this time. The only sign that this was a significant event occurred when I was talking with Mia about her sister's mathematics tutor and an admission slipped out:

I: That's interesting. ... And have you told your mum and dad/
M: Not yet.
I: … Not yet what?
M: I'm going to tell them soon.
I: Tell them what?
M: About what I got in the test.
I: Oh, ok, I was actually going to ask, have you told them […] how helpful you find the tutor? (Mia, Phase 3)

Mia may have been embarrassed to tell me about failing and she had certainly delayed telling her parents about the result. The type of mathematics learner Mia performed for her parents is unlikely to have included a performance of failure.

Peter was similarly unwilling to perform failure as a mathematics learner:

I: […] You were saying before you've got a few excellences, so have you had quite a lot of tests this year?
P: Yeah, we have ... we've had quite a few yeah. We've had one in each subject, like one on fractions one on - like that and a few they do it in two [topics at a time]. I got one not achieved though.
I: Did you? What was that for?
P: Oh, I can't remember. I think it was ... like volume and area and all that. But I felt quite sick on that day as well. And my dad was off to work so I couldn't stay home so I had to go to school.
I: So you think that affected your test result?
P: Might have, might have been a little bit.

I: How did you feel about that topic while you were learning?
P: Alright, I felt like I actually did ok. But in the test it wasn't that good. (Peter, Phase 3)

Peter's not achieved did not fit with his other performances and he explained to me that he felt sick that day. He explained similarly to his teacher, but the result had to stand. The significance of this event for Peter is made clear when I asked him six months later what he remembered the most about mathematics in all of Year 9 and he again recounted this incident.

I: So looking back on all of last year, what do you remember the most about maths?
P: […] and getting a not achieved on - I can't remember what test it was but I was having a real bad day and I got a not achieved on that, then the next test we did on the same subject I got an excellence. (Peter, Phase 4)

Peter took care to explain that in the final examination he got an excellence in this particular topic, although he could not remember exactly which topic of mathematics this was. This perhaps indicates Peter's desire to perform as an able mathematics student to me, an invested audience member.

Concluding Discussion

Assessment of any kind is high stakes (Black, Mendick, Rodd, et al., 2009), it has "far-reaching social consequences" (Morgan, 2000, p. 225). Further, social processes also intervene in assessment (Pollard & Filer, 2001). Yet it is so entrenched in secondary education that it is difficult to even imagine schooling without assessment (Broadfoot, 1996). "[A]ssessment influences what is to be learnt, how it is to be learnt, and even what it means to be a learner. Ultimately assessments even shape who you can be" (William, Bartholomew, & Reay, 2004, p. 50); it has a "powerful impact on identity and identifications" (Hall, Collins, Benjamin, Nind, & Sheehy, 2004, p. 814). It is this impact that I wish to discuss here.

When we handed in the [exam] paper it was like - you could breathe again. (Emily, Phase 4)

Although the metaphor of breathlessness is extreme, assessment events generally came to be seen as important for students as they became more versed in the figured world of mathematics learning at secondary school. Understanding their importance was a crucial step in performing as a successful secondary school mathematics student. Yet while students were embracing assessment scripts in their enactments of mathematics learner, these assessments were used to recognise students as particular types of learners. The end-of-year examinations became *the* measure of the more general success as a secondary mathematics learner for most of these students.

Assessment plays a big role in the production of secondary school mathematics. Assessment contributes to the figured world of mathematics learning and generates performance scripts. By this I mean that assessment provides a script for performing mathematics learner that encourages particular ways of acting and being and discourages others. Other researchers call this process "SATurated pupildom" to refer to the way SATs success are the main driver for models of pupildom

that are available (Hall et al., 2004, p. 814). Such scripts (or models of pupildom) include a particular vocabulary, and it is in part through the increased use of assessment vocabulary that we can see students progressively taking up these assessment scripts and incorporating them into their performance repertoires.

Assessment provides labels and categories for students that serve to recognise them as being particular types of people. In extreme cases teachers use assessment vocabulary to affix seemingly permanent labels to students such as “excellence student” or “merit student”. Any future identity performance made by that student will be filtered through the label. The permanence of such a label can be seen when a merit student’s subsequent attainment of an excellence grade is constructed as being an “accident”. It is likely that the teachers’ categorisation of the students as merit or excellence (or not), will have eventually, over time, come to work as the students’ own self-categorisations, or at least provide a ‘cap’ or a personal boundary (M. Brown, Brown, & Bibby, 2008) for which they might expect to be able to achieve.

In Chapter One of this act we saw how the ‘recognition cycle’ may work. In the case of assessment the recognition cycle may work in a more direct way. Students are recognised through assessment as being a particular type of learner. Assessment is institutionally endorsed and the institution of school is a significant audience member. The process of recognition is an enactment of power, and assessment is a particularly powerful recognition. Students come to see themselves through the eyes of the ‘other’, in this case the institution of school, and come to self-recognise in the same way. This is how students such as Brendon gain satisfaction in achieving a merit grade; he has fulfilled the potential of a merit student.

Finally the recognition cycle of assessment works on students differently, as demonstrated by the stories of assessment experiences above. Abby was well versed in the assessment script (as she was in other learner scripts seen in Chapter One of this act). She talked about assessment often and saw it as an important part of being a successful mathematics learner. In this way assessment is even more powerful. The way in which Abby was recognised through assessment had a negative impact on her self-recognition and contributed to the lack of control she felt in the subject. Jonathan on the other hand did not initially read the assessment script and appeared unwilling to perform it: “I never really study for tests”. However being recognised as top of the class in the first test he took at secondary school was a powerfully positive recognition. Jonathan gradually appropriated the assessment script into his learner performance repertoire and was rewarded at the end of Year 9 with another kind of recognition in being promoted to a higher stream.

Mia and Peter both faced the situation of being recognised as ‘failed mathematics learners’ with one assessment result. Mia found it extremely difficult to merge this performance with her usual performances to her teacher, her parents and also to me. She avoided performing failure and when forced to with her teacher it generated much distress. Peter took care to explain his failure performance as sickness to his teacher and to me also. In doing so he was able to reject this performance from his repertoire and maintain a more able mathematics learner performance. In each

case assessment exerted the power of recognition on the students and they were required to appropriate this recognition in some way.

Assessment is powerful (Broadfoot, 1996); we recognise students' mathematical identities and label them through the results. And the students may be relatively powerless to perform otherwise in the face of it.

Chapter Three: Recognising Ability

This chapter explores the practice of grouping by 'ability'[24], which is a consequence of assessment. At secondary school ability was determined by a placement test, usually held at the end of Year 8, prior to transition. In most schools students were then streamed according to general ability. Some were streamed loosely into top, middle and bottom *bands*, others more rigidly into ranked and numbered classes. In some schools the students were then re-streamed (or setted) for mathematics[25]. Internationally the terms used for ability grouping vary. In the U.S. students are "tracked"; in the U.K. "streaming" is a general term and "setting" is commonly used to refer to ability grouping in a specific subject (Boaler, Wiliam, & Brown, 2000). The secondary schools in this study all used the term streaming, whether their practice was rigid or freer.

In this chapter I will begin by presenting excerpts from my field notes of observations in top and bottom-stream classes in order to exemplify the different performances evident in these classes. Following this I look at the differing ways teachers recognised the top, middle and bottom-stream student, and use their comments to deconstruct assumptions about the purpose of streaming. Finally I look at vignettes from two students who had to reconcile the school's recognition of them as certain types of learners, through streaming, with their previous identity performances when at intermediate school. I conclude by bringing this data together to argue that ability grouping works alongside assessment as a mechanism of power.

Streaming at Secondary School

For all the students in this study transition to secondary school entailed the move away from within class ability groups towards being taught as a whole class:

> I can't really remember maths at intermediate but I remember it was set in groups and then you just worked – you like, did what your teacher thought you were capable of. But in high school you're just doing what everyone else is capable of in your class. (Callum, Phase 3)

Callum's comments are perceptive and illustrate his understanding of the purpose of ability grouping, which is to cater for the level of the individual student. Walls (2004) draws on Foucault to call this grouping and teaching by ability as "the apparatus of 'catering for needs'" (p.554). This is an apparatus of both primary and secondary education in New Zealand. Ability grouping and streaming serve to institutionally recognise what type of learner a student may be.

Top-stream observations

When I initially observed in these classrooms I had not been told they were the top stream. However I recognised them as such almost immediately.

[24] I use inverted commas to indicate the ambiguity of the term ability.
[25] See Appendix I, page 181 for a list of the classes, including streams or bands, in this study.

> The class are extremely on task. They are discussing quietly in pairs or in groups. Some are working individually. They are silent at first – seem to be trying it on their own – and then discussion slowly begins...perhaps they turn to peers when they realise they can't solve it on their own? […] Still a low buzz in room. Very on task and lots of discussion […] Lesson is kept very pacey. (Field notes, Verona, March 2012)

> Class have 10mins working independently. T: "… means I don't want to hear any voices" […] Emily is focused and engaged (as is the whole class - they are silent!) […] 10mins is over. Students are now able to work in pairs. […] T directs those who have it right to wander/move around room and work with someone who has it wrong (positioning them as teacher). […] A group are discussing: "It's mathematically impossible" a boy says … he queries to T "Yes, you'll get a ridiculous answer in this context." (Field notes, Verona, August 2012)

> Student asks T something. When he goes back to neighbour he says: "Yes, we got it wrong" Someone from Chad's group tells him something and his reply includes "genius" and "I love you" […] Class are allowed to do work individually or to talk. At the moment they are silent. Chad is checking with a partner. […] Perfectly acceptable to speak academically in this class – "It's just an inaccuracy of the question…" (Field notes, Sardis, August 2012)

These top-stream classrooms seemed to be characterised by two particular mathematics learner performances. The first included silent engaged work and the second main type of performance was highly interactional and included communication using academic language. I did not see these two performances in the bottom-stream classrooms.

Bottom-stream observations

In the bottom-stream classes I observed three general performances that were different from the top streams. The first performance was that of 'silent avoider'. In this case the silence did not mean high levels of engagement as it appeared to in the top streams. Those students who performed silent avoider were almost invisible in the classroom. I noticed one such silent student because (and perhaps only because) she was my research subject:

> Hannah's head is down on her desk. Her partner has the worksheet – what is H doing then? (Field notes, Mantua Girls, August 2012).

The silence indicated work avoidance and avoidance of attention. In Hannah's case her head down seemed an attempt to hide herself further[26].

A second typical performance was to call out answers and questions in a loud voice:

> There are a few booming voices dominating this class too. Boys often yelling out the answer – almost like the pace is too slow and they seem desperate to show they know the answer. […] A

[26] During the interview with Hannah's teacher I was able to confirm that this performance was typical rather than an effect of a researcher observing her on that day.

> number of boys glare at another boy. Later they are annoyed when yet another boy calls out. The class seem to be getting annoyed when these boys slow the lesson down. When a 'loud' student has a misconception the whole lesson virtually stops until he gets it. (Field notes, Messina, March 2012)
>
> There seem to be 3 or 4 loud caller-outers in class. They are confident to yell out … but wrong. I wonder if it confuses the others. (Field notes, Mantua Girls, August 2012)

And finally there was the action of disruption:

> One boy is flicking balls of paper with a ruler. (Field notes, Messina, March 2012)
>
> A kid is kicked out of class – I didn't notice him being bad. T decides to move him to the back of the room instead. T talks quietly to him and makes him write lines. (Field notes, Messina, August 2012)

The teacher responded to calling out and disruptive acts with constant behaviour management:

> T says: "That's not good manners ... put your hand up" […] T emphasises manners and says he is disappointed then raises his voice – resulting in silence for a moment […] Names are put on board – six so far – now seven. (Field notes, Messina, August 2012)

In summary the performances on the stages of top- and bottom-stream classrooms almost form a series of dichotomies. The first is of engagement versus work avoidance and both these performances are silent. The second is a dichotomy of behaviour: on-task versus disruptive. The communication style of top-stream classes is that of peers interacting together while in bottom-stream classes individual students yell out answers and questions to the teacher and these are either ignored or force the teacher to stop and explain. The dichotomy here could be seen as productive versus non-productive interaction, reminiscent of Black's (2004) research. Finally another dichotomy exists in terms of pace: fast versus slow, and this dichotomy is found extensively in the international research literature (Boaler, 1997b; Solomon, 2007a; William et al., 2004; Zevenbergen, 2003).

The different learner performances in the different streams are a product of many influences. Every past performance from a student influences their future performances. The past mathematics learning experiences of students who are placed in a low stream at secondary school are likely to be different to those of the students in top-stream classes. Engaged behaviour and on-task work may relate to whether a student believes they will be successful with a given task. However there are influences outside the individual students also. The *stage* of the classroom promotes particular performances, and the other performers on this stage create opportunities to perform in particular ways and shut down others. Whether students access their peers for help or engage in productive interactions or work together depends in part on how their classmates perform mathematics learner. Finally the teacher directs the performances differently according to the stream of the class. The pace of the lesson is one example of this. Whether the teacher encourages peer interaction or ensures individual

work is another. This differing pedagogy derives from the teachers' recognition of these students as being particular types of learners.

Teachers' Recognition of Ability

> If you're going to interview another teacher from another school from a streamed class, her talk would be definitely different to mine because she's going to deal with a streamed class. And she knows all her children are one level. And here I'm going to differ with that lady because my children, my students are at different levels. (Anja & Jacob's teacher)

This quote from the interview with the teacher of the only mixed-ability class[27] in this study highlights a common assumption that students in streamed classes are all working at the same level. Streaming and any form of ability grouping work on a number of assumptions: firstly that the assessment given to students in order to stream them is an accurate reflection of 'ability'; secondly that it is possible to form groups of students at the same level, that is, with exactly the same learning needs; and finally that such a grouping would be beneficial to their learning.

Research critiques all these assumptions. "It is now widely accepted that any kind of educational measurement can be at best only a rough estimate of particular kinds of ability" (Broadfoot, 1996, p. 13), and "even the best constructed tests are likely to result in a relatively large proportion of pupils being allocated to the 'wrong' ability group" (Hodgen & Marks, 2009, p. 213).

However many secondary teachers cling to the notion that teaching is easier in streamed classes, that streaming caters for students' needs better, and that less able students require a different teaching approach to that of more able students (Hallam & Ireson, 2005). Such views are also critiqued in the literature, suggesting that streaming is "more about handling the challenges teachers face when working with a range of students, than the challenges faced by the students themselves" (McFeetors & Mason, 2005, p. 16); and makes teaching to the test easier (Hall et al., 2004). In other words streaming serves the teachers rather than serving the students.

That streaming might serve students is an assumption belied by some of the comments made by teachers during interview. Consider for example the following:

> Now this year [the streaming] hasn't worked. This year, um, something happened in the testing, and they still haven't analysed what actually went wrong but it meant that we moved 70 kids up and down throughout the year. Usually you might get apparently ten to fifteen, this year it's over 70. So the streaming was poor. (Jacinta's teacher)

This statement indicates that students were not expected to achieve higher or lower than the level of the class they were placed in. In this case the streaming was considered "poor"

[27] At this school there was only one Year 9 class so streaming was not possible.

because some students in lower streams achieved better than students in higher streams. The school reassigned around 70 students in order to fix this problem of the streaming gone wrong. This negates any argument that students in lower streams may be better catered for through the practice of streaming. Some of the students in lower streams *did* achieve higher than those above them, yet rather than being an indication that the learning situation has catered for them appropriately, instead the streaming was considered faulty.

The notion that streaming caters for the learning needs of the lower streams was also contradicted by another teacher at a different school:

> T: Um ... this particular year, um, this particular class, they're actually pretty good. I mean, not - the one's that have been ... what I would consider a weak middle band student but, I think they'd be able to cope, I've actually put up to the [mainstream] classes. I haven't ... there's another, there's another one I would've liked to have put up, but there isn't room for her. Um, and there's another ... about three that just need the confidence, you know, I think they'll be ok in [mainstream] as long as we - they have the confidence by the end of the year.
> I: Ok, so there is scope within the year, to move up// to the next...
> T: //Oh yes, definitely.
> I: And, and do you feel that they're better off moved up?
> T: Yes, if I think that – the ones that have ... I've moved about five or six students from the class up because – one I think she was wrongly placed and it was pretty obvious, you could tell. (Hannah's teacher)

Again the argument that a student is better catered for by being in a lower stream is negated with the agreement that students would be "better off" moved up to a mainstream class. Most of the students in this low-band class are seen as lacking the confidence for mainstream. This positions these students as needing *protection* from the middle band classes or perhaps from higher-level mathematics. This teacher would move a student from the bottom band up to mainstream if the student could "cope" with it. In this way these (low-stream) students are positioned as 'pathological', as opposed to the 'normal' learner (Walkerdine, 1989) who is able to cope with mainstream mathematics learning.

In order to unpack further the way in which teachers may have recognised their students differently, I analysed teachers' responses to the question: "Do you teach this class in a similar way to other classes?" This question provided an opportunity to talk about Year 9 in comparison to other levels and also to compare the class to other streams. Three of the teachers did not engage in talk about streaming, but the others did. Teachers mostly spoke

about the stream they happened to be teaching, rather than making comments about streaming in general. Here I present a summary of their comments in the form of three monologues[28].

Top-stream monologue

Actually this is the first time I've actually taught in this top, this level class. What I find with this class is actually they're really capable. They're quick to pick up on things. They don't need to have everything explained, they're actually drawing their own assumptions. And making their own connections, which is good. With this particular class there's no questions, everyone has got it, all set to go, let's move on, so, you know, they're pretty keen to learn because they understand them faster than *a mainstream* class, so um, the pace is, you know, faster. I've found I've been able to get through stuff a lot quicker. They work very well and also - I guess they learnt how to be a team worker, team players. So, ah, that's also important because a lot of time we work in groups. Most of them have already been trained how to work with each other, like if I tell them make a group of four and you're going to do this together, they already know how to sit there, organise themselves and be on task and do it. Bright children, they will challenge you in everything and they will test what you say. Because they're bright and they're confident they're very demanding, but in other ways they're very easy. *There're* no discipline issues. You don't have very *much* anti-social behaviour. And also, obviously, my expectations of them are higher as well.

Middle-stream monologue

This year I ask for middle. Last year I had two top and two very bottom ones and I felt burnt out. Both ends are more work than middle band. Because I've got the middle stream *I*'ve got kids who do better in some topics than other topics, but overall their ability is just mediocre. They're a little bit atypical in that there are some excellence kids in there, I wasn't expecting those. Some of them are really naughty and I have to spend a lot of time to manage the class. There's a core of students who're quite advanced for *middle-stream*. They probably should be a level or two higher. *But overall,* academically, saying this just comes out of their academics, they're not as strong as last year's group.

Bottom stream monologue

I'm interested in Year 9 *bottom-stream*, the lowest class, because I think I can make some changes into their learning habit*s* and I can make a difference. I took the low ability Year 9 and I got a lot out of it, 'cause I had the idea that you can change the world with those kids. After teaching one year, I can see that yeah, I had my blinkers on there. No matter what they learn something today, they show interest, but next week they say, "I don't know what you're talking about". *In Year 10* they do trig, they

[28] Each monologue captures the comments of all the teachers who spoke about that particular stream. Four to six teachers contributed to each monologue. Italics are my own words, used to help keep the flow.

do geometric reasoning, they do measurement, all of that kind of stuff, but they stay away from anything with the letter a, x or y (laugh). They don't like those.

Teachers recognised their students differently based on the stream in which they were placed. Top-stream students were recognised as capable, bright, fast learners. The descriptions match remarkably with findings in international research (see for example, Boaler, Wiliam, & Brown, 2000, p. 637). These students could be demanding but they did not misbehave and knew how to work in groups. The comments about top-stream students throw new light on the teacher scripts discussed in Chapter One, Act Three and the directions of performance described in Chapter Three of Act Two. "There's no questions" and "they don't need everything explained" are comments that suggest the desired and promoted performances of a Year 9 mathematics student are not necessarily expected of an able mathematics student.

As stated earlier, recognition is likely to impact on pedagogy. Seeing students as being fast learners means the teacher can increase the pace of lesson delivery. In many of these schools, top-stream classes were accelerated and given NCEA level 1 examinations a year early, in Year 10. This practice works to improve the schools publicised NCEA results and improve its standing in the market-driven educational system. This analysis resonates with Boaler's (1997) findings that "[t]he set 1 lessons … were taught with an air of urgency almost as though the status of the students meant that the lessons had a completely different agenda to lessons given to students in other groups" (p.171). A notion of agenda raises the question of whether a fast pace and an accelerated mathematics programme are beneficial to students or simply beneficial to the school in the figured world of 'school choice'.

Top-stream students are seen as able to work together as a team, and this is perhaps due to having fewer students who are seen as disruptive in these classes. Thus the teacher may be more inclined to incorporate group work and learning with peers in these classes. Correspondingly this is not seen as possible in the lower-stream classes.

Middle-stream students were considered a diverse group; some students were naughty, some were high-achievers whereas others were mediocre. It was interesting to note how often the teachers were surprised by their middle-stream students. One group was considered atypical because it had a number of high-achievers. Another was not as strong as expected. Another two classes were getting higher results than the higher streams. Despite this diversity they were considered easier than the other streams. However if the diverse middle-stream students are considered easier to teach then an assumption that streaming makes teaching easier is illogical.

Teachers believed they could "change the world" or "make a difference" with bottom-stream students but simultaneously felt that the realities were that these students did not remember anything from week to week and could not do algebra. The idealised way in which some teachers spoke of teaching in the low streams, as "making a difference", positions students as 'needing to be fixed' – and therefore as broken or not normal. Again, they are made pathological (Walkerdine, 1989). Yet

experienced teachers feel that the reality is that these students do not retain their learning; they cannot be fixed. The pathologising of these students positions the problem with them and not with the way in which they are taught, nor with the repeated effects of being recognised as a particular (abnormal) type of learner.

Students appeared to believe that the stream they were in was the correct one. Despite being based on a single examination mark from an examination administered by secondary school whilst students were still at intermediate, the subsequent stream appeared to be accepted without question by students. This acceptance may in part reflect the fact that students chose their secondary school. Implicated by their choice, they may have been compelled to believe the school had done the right thing, even if they were placed in a stream below that which they hoped for. Axel, for example was very keen to be placed in a top stream (as seen below), but when he was placed in the mainstream he was quick to say he was happy with his class placement. Yet such institutional recognition did not provide the definitive word on the students' own view of their mathematics learner performances as seen in the two examples presented below.

Reconciling Recognition with Ability Performances

In this section I introduce two students who needed to adjust their identity performances to reconcile the way in which the institution of secondary school recognised them with other learner identity performances given earlier or to other audiences.

Axel

I: Yeah, are you hoping to get in a particular class next year?
C: Um, yeah I'm hoping to get into [top band].
I: Any particular [top band] class[29] or/
C: Oh, any would do to be honest. Any [top band] would be pretty fine for me.
I: And you don't mind which, or you don't have any prediction as to which?
C: No, I don't mind where I go in and I don't have a prediction where I'm going to go in. Um, I just would like to get in [top band]. (Axel, Phase 1)

However Axel was placed in the mainstream at secondary school.

I: Alright, and, ... were you happy with your class?
C: Yeah! ... I'm glad I'm not in [top band] or anything 'cause that would be a bit too much pressure. (Axel, Phase 2)

It required some work for Axel to reconcile his identity performance of high achiever, given at the Phase One interview, with the recognition of middle ability by his class placement. When I interviewed

[29] Previous students had informed me that the three top band classes at this school had differing foci. These were: literacy focus, mathematics focus and general focus.

Axel's mother she spoke of him as being very academically able, citing examples from a very young age. She too had to work to explain his placement in mainstream.

A: This year um, Axel didn't get into the, the top streams and ah, I, but they actually haven't streamed the rest of the classes, because he would have been in one of the top mainstreams.
I: I see.
A: Yeah, they've added some sort of logic test? A third one, yeah, and yeah, Axel didn't do very well in it. I don't know, he, he, analytic…, he found he couldn't get the concepts they wanted. […] So he did very well in the maths, alright in the English, and bombed out in the third thing.
I: Did, do you get the results?
A: I rang them, I wanted to make sure, 'cause when I knew he wasn't in [top band], which is where my daughter went through, I wanted to know where he was going to be mainstreamed. Because ... depending where it is, it can be a bit of a zoo (laugh) and I just wanted to make sure that he was – I didn't care that he was mainstreamed, in fact I'm pleased he was, because he's a stresser. And I wonder if that's one of the other reasons he wasn't put up in [the top band class], is because he stresses and – where was I going with that?
I: You were pleased he's in mainstream.
A: Yes. And he's really pleased now that he isn't in that – because he's always been the average in the bright class. And now he's finding he's towards the top of the mainstream and he's quite liking – it's good for his self-esteem. (Interview with Axel's mother)

When students are misrecognised or recognised differently by the institution of schooling from the way they see themselves, then they (and/or their parents) must work to reconcile this. We can see this work through Axel's mother's description of her son as a "stresser". This personality trait is easily aligned with that of a highly-strung intellectual. Axel could continue to perform an 'intelligent' identity and continue to be recognised by his mother as such.

Edward

I'm a bit nervous [about the test] because it's streamed. And I wanna get into a good class. (Edward, Phase 1)

Edward's secondary school employed rigid streaming practices. Approximately sixteen classes were streamed from top to bottom and every student knew the relative position of their class. At the end of the first term (after two months at school) the students sat another set of exams and the results of these were used to re-stream the students. In the subject of mathematics the streaming went one step further: after every topic test (of which there was two or three a term) the class was streamed internally and students were seated at desks from the back to the front of the class according to their result. The students attaining the lowest results were seated right at the front, where all students

could see them and under the nose of the teacher. Edward's desire, at Phase One, to get into a good class was understandable.

> I was a bit nervous [on the first day], 'cause um, there was a test like, right at the start […] but then we did a common test which is to grade you in the class. […] it's like graded over all […] like there's a kid who got 100% in the common test [… This class is] good for me because it's ... it's with people, it's competitive but then it's also, like … yeah … (Edward, Phase 2)

Edward gained a place in the third stream class, which was higher than he said he expected (and then after the first term he was re-placed into the second stream class). This meant Edward had achieved very well in his examinations in all subjects overall. It also meant there were some students in his class for whom mathematics was the result that lifted their overall score and they did extremely well in this subject. Indeed one boy in his class achieved 100% on a topic test.

> Um, well, I didn't do that great in the exam, like I was near the bottom but in the common tests. I've been doing ok [… I am a] bit nervous 'cause ... I'm better at the sort of visual stuff […] But this one - well there's stats - but there's like algebra with brackets and algebra with fractions and yeah, that's probably not my forte. (Edward, Phase 3)

Edward talks of being nervous about tests and there was nothing done by his secondary school to allay these nerves. My impression was that the school fostered such feelings. For example, while other schools had a variety of different methods for easing the transition to secondary, Edward's school began Year 9 with a formal test in the school hall.

> I didn't do too great in the last, the last exam. It was pretty hard […], but it got scaled up […] Yeah I was probably in the bottom half of the class. [If I could do my year differently] I would've changed *myself …* so that - I would've been better. (Edward, Phase 4, my emphasis)

Although Edward said he liked the competitive environment, and he spoke positively about being competitive in mathematics at intermediate school, he spoke in increasingly negative ways about his achievement in mathematics at secondary school. He noticed when he was in the bottom half of the class and did not reflect on the fact that the bottom half of the second stream of 16 classes would still be very highly ranked. When I asked him what he would change about Year 9, his reply of: "Can I say I would've changed *myself* … so that - I would've been better?" demonstrated how he had internalised the way in which he was recognised by the assessments in this high-stream class. For Edward the institution of secondary school worked to recognise him and help him recognise himself as a below average mathematics student despite the contradiction in the recognition of ability through his placement in a high-stream class.

In Axel and Edward we can see the way in which their relative position in the class is utilised as a greater influence on their learner identity performances than that of the institutional recognition of streaming. It is important to note that this is an effect of generalised streaming that has not been made on the basis of mathematics alone. In this way the two boys can perform a mathematics learner

identity that is distinct from their general learner identity, this general identity having been categorised by the school's streaming processes. Axel (and his mother) reconciled his recognition of average ability by performing 'big fish in the small pond' of mainstream and maintained a view of him as intelligent, particularly in mathematics. Edward by contrast adjusted his performance of good at mathematics (awarded at intermediate school) to that of below average due to his perception of himself relative to his classmates in his high-stream class.

Concluding Discussion

Streaming and ability grouping work via assessment to recognise and position students as certain kinds of learners, and these are acts of power.

> Rather than seeing assessment as the attempt to discover the truth of a student's state of understanding, it is thus useful to look at it as the process by which a student may gain or be denied access to particular forms of privilege or power. (Morgan, 2000, p. 231)

The effects of this power on students can be seen in a number of ways. The placement of students in ability groups impacts on their own recognition of themselves. In particular they take on board the institutional recognition of them as particular types of learners and incorporate this into their future learner performances. Similarly Zevenbergen (2003) used the language of Bourdieu to describe the way in which grouping students by ability created very different learning environments and she argued these impacted on students' dispositions towards mathematics.

The different streams at secondary school formed distinctly different stages for identity performance. These differences could be seen in dichotomised performances of engagement versus avoidance of work, and productive versus non-productive interactions. The stage provided a further dichotomy of a fast versus a slow pace of teaching. The disruptive behaviour in low-stream classes constrained the teacher, forcing them to take action in a way as to further limit access to learning and slow the pace of the lesson.

Finally the placement of students in streamed classes worked to affect the teachers' recognition of the students as specific types of learners, possibly even before they had met these particular students. The previous chapter outlined the ways in which teachers had capped expectations of the students in various streams regarding NCEA attainments, recognising and labelling students as achieved, merit or excellence students. New Zealand-based research has found that teacher expectations influence students' self-perceptions and further that students "could tell whether their teacher considered them 'smart' or not", in part from the practices of ability grouping (Rubie-Davies, 2006, p. 538).

The ways in which teachers recognise their students impacts on their pedagogy: "It has long been established that teacher expectations and teacher stereotyping of student characteristics can lead to differential treatment of students" (Morgan, 2000, p. 236). This initiates the recognition cycle, as discussed in Chapter One of this act.

Teaching practices in general also change due to streaming. With streaming comes the assumption that the students in a particular streamed class are a homogenous group, all diversity being taken care of (Hall et al., 2004). This promotes whole-class, explanation-based teaching and has been seen to impact on students' learning experiences and mathematics learner performances as described in previous chapters. Other research has found that the same teachers taught their streamed classes differently to mixed-ability classes, and concentrated on "chalk-board teaching and text book work" in the streamed classes compared to more diverse pedagogy in the other classes (Boaler, Wiliam, & Brown, 2000, p. 641). In general the pedagogy promoted by streaming has been found to be negative in the literature (Boaler, 1997b; Boaler, Wiliam, & Brown, 2000; Boylan & Povey, 2014). Furthermore the ways in which practices of streaming advantaged students in top-stream classes were more significant in the schools which employed whole class teaching (Wiliam & Bartholomew, 2004).

These effects of streaming all highlight the way in which the practice of ability grouping is a matter of equity. "Setting practices are deeply inequitable. Some gain at the expense of others and often the ones who appear to do well out of setting tend to be the students who are already advantaged" (Boylan & Povey, 2014, p. 11). More middle class students are in high streams whilst working class and other marginalised groups are found in lower streams (William et al., 2004; Zevenbergen, 2003). Some research lays the rationale for streaming within the figured world of school choice, suggesting that schools employ this practice due to the value ascribed to it by middle class parents who assume their child will be placed in the high streams (William et al., 2004).

Yet streaming does not have a blanket effect on all students in a particular stream. The culture of the top stream has been found negative for some students in particular, such as girls (Boaler, 1997b; William et al., 2004), and it has a complex role to play in the recognition and production of students' identities (Solomon, 2007a), as Edward's vignettes illustrate. Students may still find ways to recognise themselves as 'not good at mathematics' despite being in a high-stream class. It is the recognition of self and others as being good at mathematics that I turn to in the next chapter.

Chapter Four: Scripts of Success[30]

[C]onsiderations of *who* is good at mathematics should be accompanied by questions of *why* people are good at mathematics, and more importantly, *how we know* (Gresalfi, Martin, Hand, & Greeno, 2009, p. 52, italics in original). In this chapter I will present the themes that I constructed from responses to a line of questioning pursued in every interview. In the first phase I asked all the students the question: "Who in your class is good at maths, and how can you tell?" In Phases Two and Three I asked: "Does anyone in the class stand out for any reason?" as I was interested in also hearing about students who stood out for reasons other than being good at mathematics. In the final phase I asked: "Can you describe for me what someone who is good at maths would be like?" I followed this question with: "Are you like that? Or is anyone in your class like that?" Despite the different wording, all of these questions gave me data about how students recognised someone who was good at mathematics, whether they were talking about someone in particular or an abstract idea of a good mathematics learner.

Recognising 'good at mathematics'

Monologue of 'good at mathematics'[31]

I can tell they are good at maths because they always score really highly on the tests. And in the test *we did just* before, they got both excellences and stuff. *This one girl,* she's, like, always up in the 90s in the tests, like 95 and stuff like that. Yeah, she's my inspiration.

People who are good at maths are usually, um, finished first (laugh), and usually have the best answers; *they* just finish really quickly. *One boy* I don't actually see him do his maths but he's always finished before everyone else and stuff. And *this girl,* she's like finished before everyone *too*. Pretty much as soon as the question's up they take about ten seconds to figure it out, *yeah* pretty much like, whizzing through it really.

And they, um, they just always seem to know the right answer. Like *this one girl,* she's pretty smart at everything, like she always knows what to do. She always, like knows what the answer is and you'll be like how did you work that out? And she'll go through all the thing and you'll be like, "woah!" *And* the guy at front, he's real good, he just knows everything about maths. I'm not sure *why*, he just seems to, like, know the answers. They always just know it. Know the answer and stuff.

[30] A version of this chapter has been published: Darragh, L. (2014). Recognising 'good at mathematics': Using a performative lens for identity. *Mathematics Education Research Journal.* doi: 10.1007/s13394-014-0120-0. Permission has been given by the editor to use this text in the thesis document.

[31] These monologues are drawn from interview transcripts. The italics are my own words used to keep the flow.

There was large variety in students' answers. I made 35 different codes when initially analysing these responses. Some of these were repeated by a large number of students, others by only one or two. There was a lot of consistency in responses made both before and after transition, with two notable exceptions. The most common response was recognition through test results. Twenty-nine responses made over the four interviews related to test marks. The next most common response recognising good at mathematics related to finishing work quickly; twenty such responses were made. Another common group of responses relate to "getting it"; "knowing it"; "having the right answer" or "understanding it". These responses appear to treat this sort of performance as somehow mysterious. Nineteen responses of this type were made. These three themes are reflected in the monologue above. These most common responses are reminiscent of the performances of 'mathematics learner' described in other chapters. Assessment results are called on to lend support for recognising 'good at mathematics' as discussed in Chapter Two of this Act. Finishing work quickly is a performance promoted by the director and afforded on the stage of secondary school as seen in Chapter Three of Act Two. This, along with having the right answer, is also evident in the literature (Solomon & Black, 2008).

There were two common responses to this question that appeared to reflect a change before and after transition to secondary school. Ten of the 22 students told me in the first interview that they knew someone was good at mathematics because they could explain it, or they could give them help:

> Oh 'cause A-----'s always like helping other kids, all the other kids are always going up to him for help when the teacher's doing GloSS testing or whatever and so yeah he's always helping other people. (Callum, Phase 1)

> Um, 'cause I can go to them for advice on how to do it and stuff and they'll always know how to tell me and stuff. (Peter, Phase 1)

This supports the discussion in Act Two about helper being a performance more available at intermediate school. Following the move to secondary school helping or explaining as an indicator of being good at mathematics was only mentioned twice in all three other sets of interviews.

In contrast, once at secondary, eight students described putting a hand up first to ask or answer a question as an indication of being good at mathematics. No student mentioned this sort of performance before the move to secondary:

> Yeah, um, there's this girl called M---. And she knows so much, she like, her hand is the first to be up every single time and I can remember like wishing I was more like her. (Abby, Phase 2)

> They're always asking questions or if she asks somebody to write something on the board they'll all put their hand up. (Hannah, Phase 2)

The performances of putting a hand up and asking questions are also promoted by the teachers' script, as discussed in Chapter One of this act.

These common responses can be considered to constitute the *performance script* for good at mathematics. It includes, as mentioned: high test results, finishing work quickly, just knowing the answer or how to do it, being able to help or explain (before transition) and putting up a hand to offer an answer (after transition). Other performances also mentioned included: being focused on the work (mentioned six times), studying and revising or working hard (five), having a mathematical brain or natural talent (four) and a number of other performances mentioned only once or twice.

Such a variety of performances, some of which could be contradictory, suggests that this is a flexible script; there are a large number of different performances students can refer to in their recognition of a good at mathematics performance. Some aspects of this script are institutionally endorsed, some are considered natural, some appear to be derived from hard work, and others are somehow mysterious, such as the 'just know it' routine.

With such a range of performances to choose from, one might think it would be easy for students to recognise in themselves the performance of good at mathematics. However, the students used this script as a means of recognising good at mathematics in *others* rather than themselves. At this point I should acknowledge the possible influence of the way in which I asked these questions in the first few interviews. "Who in your class is good at maths?" is a question that perhaps assumes that the person I am talking to is not good at mathematics themselves. My very question may have constrained their performance, making it difficult to describe themselves in their answer. My question in the final interview allowed students to answer in a generalised way and also to talk about their own identity performance. In the second part of this chapter I seek to consider the ways in which students may (or may not) recognise a performance of good at mathematics in themselves.

Recognising 'Good at Mathematics' in Oneself

During the research process there were a number of ways I was able to ascertain whether or not the students were good at mathematics. I could recognise them through their identity performances during interviews, the way they performed during lessons, their teacher's comments and self-reported test results. Nine of the 22 were placed in high-stream classes at secondary school and eleven got high marks in their end of Year 9 examinations. It is also possible that the participants were more positive about mathematics than the general population, as these students volunteered for the study. I was interested therefore to see whether they recognised themselves as good at mathematics in similar ways to how others recognised them. In the last interview (Phase 4), I asked students to describe what someone who is good at mathematics would *be* like, and followed this with: "And are you like that?"

Only one student indicated that he recognised himself in his own description of good at mathematics:

> Well, yeah, um, I could've gotten [top of the class] but, um, I got one less merit award than her. (Axel, Phase 4)

A second student initially described a couple of students in her class as being good at mathematics, but then discussed how these behaviours were not essential for performing good at mathematics:

> Which I don't really think you need to be good, they don't talk or they don't work things out together, they just sit and do it, but I don't really think you need to be like that to be good at maths, you just have to listen […] I don't know, everyone's sort of good at different things. (Lauren, Phase 4)

Although Lauren did not actually say she was like her description of good at mathematics, this answer, and elsewhere in her transcript, implies she did recognise her own performance as evidence that she was good at mathematics. With this response she appeared to be adjusting her description of good at mathematics to fit with the type of performance that she usually gave. Unlike the students she initially described, in mathematics lessons Lauren talked through the mathematics with her friend and listened to the teacher; in this way she performed good at mathematics.

Of the rest, five students said they were partly like that:

> Not all the time, sometimes. (Brendon, Phase 4)
> I'm ... I'm kinda half there I think […] I'm really slow when it comes to just putting it all together. (Abid, Phase 4)
> A little bit. (Mia, Phase 4)
> Um ... well, I ... I think I'm good at maths, but like I'm not the best. (Anja, Phase 4)
> I'm kinda in the middle. (Brad, Phase 4)

All the other students said they were *not* like their description of good at mathematics as shown in Figure 3 below[32]:

No (laughs), definitely not. (Abby)	... No. ...I need quite a bit of help. (Jonathan)	I spend ages on a question… (Blair)	Kind of - not. (Emily)
(Shakes head) Like, I know some stuff, but some stuff I'm not very good at. (Ryder)	[I spend] Hardly any time [Studying] really. (Chad)	I don't think so. I like English more than maths. (Belinda)	No (laugh). I would like to be, but I'm not. (Jacob)
Nah (laugh). (Robbie)	Not really. (Sarah)	No. (Callum)	Not really, no. (Peter)

Figure 3: Students 'no' responses to the prompt: "…and are you like that?"

This group included students in top-stream classes and accelerated programmes for mathematics and therefore they were certainly recognised by their school as good at mathematics. Of those students who said they would not fit their description of good at mathematics, six had received very high marks for mathematics in their end of Year 9 exam. There is clearly a mismatch between the students' responses and others' recognition of their performances.

[32] Note – I did not ask the question of three students: one because this student did not have a fourth interview due to changing schools, the other two because the question was not appropriate in the context of the interview.

The phenomenon of students not recognising themselves as good at mathematics has been noted by other researchers. Mendick (2005a) found only four of her 43 participants self-identified as such. Bishop begins her article with the following interview extract:

> Interviewer: What do you think a good math student looks like?
> Bonnie: Not like me [she laughs] … (Bishop, 2012, p. 34)

This extract resonates with my data, including the laughter, which is perhaps an indication of incredulity that such an idea would be even considered.

In order to understand these results further, I will illustrate with vignettes of two students. I chose these students because they are students who I came to recognise (very early in the research) as being extremely able mathematics students. They were mentioned by their classmates when I asked who was good at mathematics. They were also recognised as such by their teachers and schools, being placed in the highest mathematics groups at their intermediate schools and placed in the top stream at their secondary schools. I wanted to gain some understanding into why they did not appear to recognise themselves in their own descriptions of good at mathematics, despite what appeared to be evidence to the contrary.

Chad

Chad was a high-achieving, soccer-playing boy who spent most of his primary education in kura kaupapa[33] before moving to mainstream education in Year 8. When I first met Chad he told me he liked all subjects but maths "slightly more" than the others and was thinking of pursuing a career in engineering. He performed a positive mathematics identity to me at the first interview, his first response being:

> I do like maths, I've always liked maths, yeah I like maths. (Chad, Phase 1)

At secondary school he was put into the top-stream mathematics class, which he was pleased about. It was when I asked him about his new classmates that he began to talk in a way that seemed to be distancing himself from mathematics and from his classmates:

> C: They're nerdy. They're quite nerdy (laugh). But it's it's ... kind – it's good to have everyone – they're all good at maths and the conversation doesn't ever get boring 'cause I'm always learning. […] ... I don't know. They just have a nerdy sort of feel about them. Not that nerds are bad but ... [… They are] smart but they kind of – their whole, their whole – I feel like their whole life kinda revolves around school and they kinda study lots. I'm not really worried about getting bad test results but I feel there's the um, ... – This Chinese girl, she just studies all the time. 'Cause I'm in another class with her and she just studies all the time. […] And she got – oh we actually got joint top achievement in the class. I thought she was just going to be outright [winner] but actually I got it as well.

[33] Māori immersion education

I: Do you study all the time?
C: No but I do want to get top marks, I'm weird about that.
I: So you'd like to get top marks but you don't want to study all the time.
C: No. [...] I have soccer a lot so it is hard to fit in homework as well. (Chad, Phase 2)

In this interview Chad appeared to position himself in relation to this classmate (the Chinese girl who he finally named as Jane at his Phase Three interview). Yet it was a difficult position to take. Did he want to perform good at mathematics alongside her or leave her to perform nerdy while he performed soccer player? When, at the final interview, I asked Chad to describe someone who was good at maths, it was this same student he referred to, again saying she studied all the time but he was not like that. Again he said he only studied for examinations and he was too busy with things like soccer.

Chad connected people being good at mathematics to studying a lot. This contrasts with other common discourses of ability in mathematics as being something that comes naturally. Such a view suggests that Chad felt in control of his mathematics learning. It was not mysterious, rather he could do it if he chose to. Although he distanced himself from a performance of someone who studies, at other times he appeared to see the necessity for study and this was something that he would do when required.

I: So looking back on last year, what do you remember most about maths?
C: Um ... probably end of year exams. They were pretty - very stressful actually. I studied a lot and ... think - and obviously it paid off because I'm in the accelerate class this year as well. […] Well I, I like to do well in tests. I'm a bit of a perfectionist like that. (Chad, Phase 4)

Throughout Chad's interview responses we can see a linking of mathematical ability or success with hard work. Good marks alone were not evidence of ability. Looking back on his initial Year 9 experiences he said he got good marks but he wasn't quite sure of his ability. "But towards the end I felt that my work had paid off" (Chad, Phase 4). While good marks alone were not enough recognition of his ability and/or hard work in mathematics, he was later chosen for a special withdrawl extension group and this appeared to be a solid form of recognition. But perhaps an award (delivered in front of peers) would be the ultimate in recognition. When I asked about the highlight of Year 9, he replied:

C: Probably prize giving. I got lots of awards at prize giving.
I: Ok. What did you get?
C: Best in English, social studies, PE and Chinese.
[…]
I: But not best in maths?
C: Oh I know who's best in my class.
I: Who's best?
C: Ah Jane.
I: So she's - she got best in maths?

C: No! Surprisingly not. That was - I found that really weird. Everyone knows she's better than - better than everyone.

I: So who got best in maths?

C: Sally. She's average. (Chad, Phase 4)

It seemed that for Chad even winning the award for best in mathematics was not the definitive word on being good at mathematics – Sally was only "average".

Clearly Chad was a student with extremely high achievement, in a large range of subject areas. Perhaps he did not need to have 'good at mathematics' in his repertoire as well. If Chad felt that studying and hard work was generative of being good at mathematics then performing as such may have meant a co-performance of nerdy. This was the way he recognised his classmates' performances and it seems logical that he would turn this recognition upon himself. Whatever the reason for the change in Chad's mathematics identity performance, it was evident in this interview response from the final interview:

> Oh I think I've probably changed a bit (laughs). I mean I've - I've grown to actually - English is probably my favourite subject. […] I find I'm just naturally good at English. (Chad, Phase 4)

Chad's mention of being "naturally good" at English is illuminating. While he did not call upon this description when talking of mathematics ability, he did so for the subject of English. He would rather be good at English naturally than study lots in mathematics and perform as nerdy.

We do not have to look far to imagine where such a view of mathematics learning may come from. Popular media, as discussed in Act Two, portrays mathematics and mathematicians as nerdy and geeky (Damarin, 2000; Epstein et al., 2010). But in Chad's case we can also look to the way in which his own mother has constructed mathematics learning:

> And all of my – none of my friends were mathsy. I think at a certain point the nerdy ones – which up until then I had been, the nerdy ones kind of keep on trying with their maths and the naughty ones don't. And maybe they were never that wicked at maths, I don't know. I was always in – they streamed at [my school], so I was always in the top class but, um, yeah, there were the ones who – my friends just did arts and they were good at them, you know they would get good marks but they didn't excel at maths. So maybe I just kind of fell in that way. But I could have done – I could have done it. I like maths, I like um, yeah I like puzzles and problem solving I'm kinda addicted to Sudoku. I need to do number things. So, yeah (laughs). (Chad's mother)

Family members can play a significant role in influencing the way people think about themselves in relation to mathematics (Epstein et al., 2010). Chad's mother seemed similarly conflicted in trying to co-perform good at mathematics and "naughty" (by which she may mean cool or not nerdy): "I like puzzles and problem solving [and] I'm kinda addicted to Sudoku."

Chad, like his mother, constructed a discourse of working hard and being nerdy as being the part of the script for performing good at mathematics. It seemed that he would rather perform the role of naturally brilliant English scholar and soccer player.

To have the choice to succeed in mathematics with only a little hard work is an agentic position to be in. Many other participants in this study did not seem to have such a choice or such control. But is this apparent choice necessarily a free one? Mendick et al. (2009) see choice as "always and inseparably both active **and** passive" (p. 73, emphasis in original) and discuss how we can consider people choosing a subject, such as mathematics, rationally and consciously or as "passive consumers of meanings, subject to the undue influence of the media and other people" (ibid., p. 73). On the one hand Chad chose to be more of an 'English learning' type of student, and he had the luxury of being able to choose from a position of success in all subjects, yet on the other hand he may also have been influenced by popular culture depicting mathematicians as nerdy and by his mother's own similar script.

Emily

We met Emily in Chapter Four of Act Two. Of all the students in my study I first recognised Emily as being a mathematician. Her responses in the first interview constituted a strong and positive mathematics learner identity.

> E: I really enjoy maths. I feel that it's quite a strong subject for me. And, ... um just doing it makes – it's enjoyable for me and it's really cool learning new stuff and finding out how everything links together and stuff […] Probably because I really like numbers (laughs) I just like, I just enjoy working with numbers and seeing numbers and just playing around with numbers. I just find it, like, enjoyable.
> I: So, when you say, 'playing around with numbers,' what do you mean?
> E: Like, just making little pictures out of numbers and writing down random numbers and just seeing what different equations I can make out of those numbers and ... just ... and sometimes giving like some random problems to my brothers to solve and .. .it's just really fun.
> […]
> E: Yes! I'm actually excited to go to secondary school next year because um, I've seen the work that my older sister's done, when I was small I used to watch her do work and I was just like, really curious about what she was doing. (Emily, Phase 1)

At the next interview, soon after transition to secondary school, she appeared somewhat disenchanted with mathematics lessons, and similarly later that same year:

> Um, say like, in maths we like, we just learn rules. We don't really learn what it's really about. We just have to memorise rules and then write about it (Emily, Phase 2).

> Um, ... a lot of rules we have to remember. And just - a lot of problem solving. We start with like a problem, we figure that out then we ... do ... um, she writes some problems up on the board and we figure out as a class and then ... we see what we got wrong and go from there and we just learn the proper rules and the proper procedure of working stuff out. (Emily, Phase 3)

Emily's pairing of rules and problem solving at first seems somewhat incongruous, but this is explained by her use of the word "proper". After the students attempted to solve a problem, they were then given the proper rules and the proper procedure to work it out. In this manner their ownership of the mathematics was undermined and mathematical authority was returned to the teacher.

In the final interview, Emily again referred to rules when she described what someone who is really good at mathematics would be like, yet revealed her positioning of mathematics as more than just rules:

> E: Well, um, I used to think it was just someone who would do really well in tests and memorise all the rules and stuff but - I mean that is good and all, but ... now I find that the person that I think would be really good at maths would be someone who actually understands all the different rules and why they're there and stuff like that. Do you know what I mean? […]
> I: Are you - are you like that?
> E: Kind of … not. Well I try my best to be like that but ... yeah. ... That didn't really make sense. (Emily, Phase 4)

Whilst we all know what the word "understands"' means, we may not all have a similar way of conceiving what it means to understand mathematics. Llewellyn (2012) discusses how mathematics education research promotes a "romantic discourse" of understanding as the "Holy Grail" of research and pedagogy. She argues that research by authors such as Boaler (see for example Boaler & Greeno, 2000) constructs an unnecessary division between knowledge and understanding which can position events and people into conflicting, hierachical boxes (Llewellyn, 2012). Llewellyn draws on Walkerdine (1989, 1990, 1998) to argue that understanding, rather than being girls' liberation, serves to discursively construct girls' mathematics performances in such a way as to be further evidence of their not being good at mathematics.

It is possible that Emily's description of "someone who actually *understands* all the different rules" excluded recognition of her own self as such. Possibly she too visualised understanding as being the peak of mathematical attainment, but had such a stringent conception of true understanding that it always remained at the end of the rainbow, just out of reach. In this manner, despite being a very high achiever in mathematics, she could talk herself out of the identity of good at mathematics. However, even in this her answer is somewhat conflicted. "Kind of … not" is hardly a firm answer. On the one hand she tried her "best to be like that" and on the other hand her "but …" leaves us to wonder what it was that prevented her from reaching the end of the rainbow.

I am also left wondering how much Emily's dichotomising between rules and understanding, so perfectly mirroring discourses of the mathematics education community (see for example Skemp, 1976), has to do with the fact her mother was a teacher and her older sister had recently completed an honours dissertation in education. This family situation must have played a part in her high achievement, but may have also influenced her extremely high expectations of herself.

So if Emily was not quite recognising herself as good at mathematics what about her other mathematics learner identity performances? At the final interview she again talked positively about mathematics:

> I: What do you think the purpose for learning maths is?
> E: ... Um, ... it's ... it relates to so much things in life. […], … like the golden ratio for example. It appears so much in nature and stuff. It's pretty amazing, it's just - wow, I never knew this, it's so amazing, I want to learn more. It's really interesting when you find out those things. (Emily, Phase 4)

Emily performed for me during interviews as a 'mathematician', and her performance as such was consistent over all the interviews. In her narrative described in Chapter Four of Act Two, she positioned herself positively or even dominant in relationship with mathematics. Yet, as discussed in the last act, the figured world of mathematics learning had changed at secondary and this demanded different performances from her as she maintained this positive mathematics identity. At the beginning of my study Emily talked about mathematics as her favourite subject, whereas by the end it was third equal with science. It appears that her experiences of secondary school mathematics, as focused on rules over understanding, and her expectations of herself regarding 'understanding' in mathematics, both worked to constrain her mathematics learner identity performances and her recognition of herself as good at mathematics.

Concluding Discussion

In this chapter I have described how students recognise a good at mathematics performance in other students in their classes. While there are a huge variety of performances that can be considered part of the good at mathematics script, some of these are well worn, called upon again and again to be enacted by different individuals upon different stages, and yet recognised nonetheless. As discussed in other literature (Solomon & Black, 2008), performing quickly and knowing the right answers are two such chestnuts within mathematics learning discourses.

This chapter provides further evidence that performances are constrained or enabled by the stage, and recognition of such performances is similarly affected. While helping others may be recognised as part of the good at mathematics script on one stage, on another it may be the performance of putting up your hand to answer a question.

However it is the way that students recognise themselves that is arguably most important for future participation and self-identification in mathematics. It is the students' lack of recognition of themselves

in the performances of ‘good at mathematics’ described to me that is perhaps most significant. It is the consistency in their ‘not me’ responses that is worth further consideration.

The performance vignettes of Chad and Emily demonstrate that there is more than one way to *not* recognise a good at mathematics performance in oneself. The other students in this study indicate yet other ways of not recognising themselves as such. With Chad and Emily we saw how the wider society, family and the pedagogy of the classroom all may have contributed to the ways in which these able students recognised a good at mathematics performance in others rather than in themselves.

The way in which recognition of identity performance is endorsed by the institution of school Gee calls institutional identity (2000). It is the very structure of schooling that imposes categorisations on students as either good or not good at mathematics (Solomon, 2007b). There is evidence both in the literature and in my data of how this may be done through assessment (Reay & Wiliam, 1999; William et al., 2004), through the lived curriculum, through streaming practices (Solomon, 2007a) and through the nature of teacher-student interactions (Walshaw, 2011). Yet the students are constructing identities for themselves, they are recognising themselves, and they have some agency in their performances. Perhaps this is the very crux of the tragedy. In this example two very able mathematics students did not recognise themselves as good at mathematics and their possible loss to the discipline of mathematics is a significant problem.

Chapter Five: Discussion

Act Three extends the metaphor of identity as performance by looking at the notion of scripts and audience recognition. In this chapter I will draw together the findings related to scripts for performing the Year 9 mathematics learner and the way in which the audience may recognise this performance. In doing this I answer my third and fourth research questions: *How does recognition of identities impact on the students' experiences of mathematics learning?* And*: How are issues of equity implicated in identities at the transition to secondary school?*

In the first section I argue that the scripts for performing mathematics learner are misaligned and this leads to the pathologising (Walkerdine, 1994) of the mathematics learner. Secondly I look at differential access to scripts for mathematics learner performances and this demonstrates the ways in which access to powerful mathematics learning may be different for different groups in our society. Finally I look again at audience recognition in a discussion of how we construct the mathematics learner, particularly through the power enacted by our recognition. I conclude by troubling this construction and questioning why some performances are attributed to identities while others are not.

The Scripts

Scripts are constructed within figured worlds (Holland et al., 1998). They provide us with the ways of being that we may call upon when performing various identities. The notion of scripts are similar to the term *discourses*, used by others in identity research (Black, Mendick, & Solomon, 2009; Lerman, 2009), to talk about how the subject is constructed through systems of knowledge and practice. In order to make clear my meaning of the term scripts, it is perhaps useful to talk about another identity performance, such as the performance of 'mother'. In performing mother we may draw on a script called 'earth mother' and with this script may come acts of breastfeeding and co-sleeping and sling-wearing. Or we may draw on a script called 'working mum' and with this may come acts of hiring a nanny and enrolling children into after-school classes. These performances will be recognised in particular ways and (from this recognition) assumptions will be made about the type of mother we are. It is important to realise that these scripts are constituted historically and geographically. Different scripts are available depending on the time and location we are in, and they are recognised differently. For example, the same performances would be recognised differently in a western city and in a small village in Africa.

Enacting mathematics learner – misaligned scripts

We saw in Act Two that both the stage and teacher direction constructed the mathematics learner in a certain way. That is, they led to particular performances of mathematics learning: individual work, passive listening to explanations, being serious and quiet, and quick completion of large numbers of problems. The students in this study were generally motivated to make a successful transition to secondary school. They were receptive to the new ways of being a learner as promoted in this new context. They performed mathematics learner in the way that they thought was an appropriate

performance. From their performances we can see the scripts for Year 9 mathematics learner that were received, read and enacted.

However, in the chapters of this act I have deconstructed this script by highlighting contrasting performance scripts. I suggest that these various scripts for enacting mathematics learner at Year 9 are misaligned. I argue that this misalignment between the different scripts for enacting mathematics learner works to *pathologise* students.

The teacher scripts for students' learner performances described in Chapter One are much more active in comparison to those passive performances promoted and observed in the classroom. The teachers expected a different performance of mathematics learner than they directed for and this contradiction led them to recognise the students as lacking.

At secondary school students were expected to attend to the requirements of assessment which had an increased role in the performance of mathematics learner, although not all students realised this importance immediately. They had to study for examinations and during these they were expected to approach the mathematics in particular ways, such as writing the working procedure correctly. Assessment scripts required different performances than the usual learner performance of listening and completing numerous problems quickly. During lessons mathematics procedures were over-explained and then this pedagogical crutch was removed during assessment.

The performances of mathematics learner appeared to differ depending on the particular stream students were in. The top-stream script entailed silent engaged work, academic communication with peers and being quick. In contrast, in a bottom-stream class the script included performances of silent work avoidance or calling out questions and answers in a loud and sometimes disruptive manner. Enacting the mathematics learner required uptake of different scripts when in differently streamed classrooms.

Finally, in Chapter Four we saw how students described a number of different performances which they recognised as being those of good mathematics students. Significantly they used these performances to position the role of good at mathematics with someone else, not themselves. In this way they constructed a script for 'good at mathematics' that was different from that of performing 'Year 9 mathematics learner'. The alternative would be to consider a good at mathematics performance to simply be the perfect enactment of mathematics learner rather than being a qualitatively different performance script.

In summary it seems there is much misalignment in the scripts for performing mathematics learner. The performances produced by the stage and direction during lessons do not closely match those scripts suggested by the teachers, endorsed by assessment, produced by different streams or recognised in 'good' mathematics students.

Pathologising the mathematics learner

The misalignment of scripts raises the question of whether teachers, as directors of students' mathematics learner performances, make explicit to students which performances are appropriate, beneficial or likely to be recognised positively. Socio-mathematical norms (Cobb et al., 2009) can be seen as analogous to performance scripts for mathematics learning. However, "[m]any teachers avoid, intentionally or not, making their interpretations of socio-mathematical norms explicit and negotiable" (Planas & Civil, 2002, quoted in Planas & Gorgorio, 2004, p. 24).

We can see some measure of whether the teachers adequately communicate desired performance scripts in students' enactment of mathematics learner. It appeared most of these students received the asking questions part of the script and eventually the assessment script also. This was evident in their discussion during interview. While some students talked about the performance of confidence, it was not always when referring to themselves. Persistence however, was barely spoken about at all. Not all aspects of the teachers' script were clear to students.

Although students talked about asking questions they seemed to do this when unsure of procedure and thus performed this as a passive act. They were reluctant to ask and answer questions publicly in class. This may be because the mathematics classroom constructs (or the teacher directs) the quiet learner, as discussed in Act Two. Consider, for example, the reported way Mia's teacher's spoke to her after her failed assessment: "… because I know you are doing your work, you are a good girl, you're sitting quietly, but obviously you're not learning as much as you're supposed to be learning" (Mia's teacher interview). The message was clear: sitting quietly is the performance of a good girl. Yet when Mia was described as a good quiet girl who does not manage to learn, she was pathologised in this performance in a manner that is reminiscent of the good, hard-working girls of Walkerdine's (1989, 1998) study. Mia was positioned as being at fault in not learning.

Finally, the notion of confidence is pervasive. It appears related to the other aspects of the teacher script: asking questions and persistence. Confidence may help or hinder assessment performances as discussed by Abby (see page 119). It is often conflated with recognition of ability by teachers and by students. As such it is the point of commonality in the performances of mathematics learner desired by teachers and the good at mathematics performance recognised by the students.

If confidence is considered a key part of the script for performing mathematics learner we need to explore how this performance is enabled in mathematics classrooms. Whilst confident may sometimes mean certain, it is often recognised in the performance of speaking up in class (Burton, 2004; Darragh, 2013; Hardy, 2007). The quiet learner constructed in the mathematics classroom, and directed for by teachers, works against this sort of confident performer. Passive listening to explanations is not a performance that complements that of confidence. Walkerdine (1989) distinguished between overt and covert messages in the classroom. She argued that the covert messages of exploration and play operated alongside the overt messages of rule-following, good behaviour and neatness. Further, teachers "pathologise [the appearance of such qualities] in girls,

while failing to recognise that they are demanding the very qualities they simultaneously disparage" (Walkerdine, 1989, p. 271). Similarly I suggest that the direction given in mathematics classrooms demands the performance of quiet listener and then pathologises those students who perform as such instead of displaying confidence.

To summarise all of the above we can see misalignment of scripts in many directions. I argue that this misalignment of scripts works to construct the student as pathological. The pathological learner is abnormal; lack of learning is thus their own fault. While Walkerdine was looking at gender (and class), I suggest such an act of positioning could potentially marginalise *any* student of mathematics.

Access to Scripts

In this section I will explore the ways in which students may be differentially able to perform from appropriate scripts for mathematics learning. While the above section discusses the potential for all students to be marginalised, I suggest that some *groups* of students may be less able to perform to the desired teacher script, raising the issue of differential access.

I begin with a discussion of agency. Students may choose not to access the appropriate scripts, demonstrating their agency through resistance. I discuss below the ways in which students may resist the scripts for mathematics learner and speculate on the effects of this resistance. I then consider whether all students have equal access to appropriate learner scripts. I counter-pose this question with an alternative: How might impossible co-performances lead to unequal access to productive mathematics learner performances? I suggest that 'access to scripts' is a common way to look at inequity in mathematics education, whereas the notion of co-performances may provide a more nuanced understanding of marginalised experiences.

Agency

> [A]n individual's agency refers to the way in which he or she acts, or refrains from acting, and the way in which her or his action contributes to the joint action of the group in which he or she is participating. (Gresalfi et al., 2009, p. 53)

Throughout this thesis we have seen evidence of the ways in which students' identity performances are constrained. The above section highlights the limited scripts available to performing mathematics learner (or for performing good at mathematics). The stage (and theatre) provides constraints on performances, as shown in Act Two. And students are positioned into roles by teachers, peers, and the institution, through assessment and streaming. However, as stated by Askew (2008), "I can position a knight on a chessboard, but children have considerably more free will than chess pieces" (p. 65) and by Holland et al. (1998), "Human agency may be frail, especially among those with little power, but it happens daily and mundanely, and it deserves our attention" (p. 5). Students have some agency beyond the constraints of the classroom stage, performance scripts and positioning acts.

Agency can be seen in acts of resistance. In Act Two, Chapter Two we saw students, such as Robbie, resisted choosing an appropriate seat mate, instead choosing to sit with friends. A boy in the play depicted in Chapter Three ran out of the classroom, resisting the required learner role. In other incidents, also described in that chapter, some girls resisted the role of passive learner by taking on the teacher position at the whiteboard to explain the mathematics to their friends. In another case it seemed the entire class resisted the script promoted by their teacher, trying to show a video, clearly demonstrating their expectations and preference for textbook work. In the chapters of this act we saw Abby (and others) resisting the teacher scripts of asking questions, persistence, and confidence – despite appearing to know these were expected of her. Jonathan resisted assessment scripts by not studying for tests and Hannah resisted the learner role by not participating in class. Finally Axel and Edward resisted the positions conferred on them by their ability groups of mainstream and high-stream classes, and recognised themselves as able and not able[34] mathematics students (respectively).

The acts of resistance described above can be conceived of as *improvisations* in that they entail deviation from the usual performance scripts. Holland et al. (1998) use the term improvisation to describe the actions of a woman in Nepal climbing up the outside of a house in order to preserve caste relations. Such improvisation is made in the face of being positioned in two or more conflicting ways. It is an act of agency and it may "become the basis for a reformed subjectivity" (Holland et al., 1998, p. 18). Improvisations may generate new scripts for performance.

However, in the data above most of these improvisations were acts of resistance that were likely to confer disadvantage to students in terms of their learning. When a student's choice is only between engaging in one particular way or not engaging at all (Gresalfi et al., 2009) then arguably the student has little agency. Do some students resist these scripts because they do not really have an alternative? This question requires consideration of whether the agency implied in *resisting* the scripts is in actuality *not having access* to more appropriate scripts.

Access to scripts and co-performances

The choice to be a 'good student' and follow the script or to resist "often reflect the conflicts between the school discourse and broader socio-political discourses to which the students belong such as class, race and gender" (Chronaki & Christiansen, 2005, p. 28). Much research in mathematics education and also within the literature on mathematics identity looks to category identities such as race, class and gender to understand inequity of access to and outcomes of education (Chronaki, 2009; Damarin, 2000; Esmonde, 2009; Martin, 2000; Noyes, 2006; Solomon et al., 2011).

The notion of access to scripts aligns well with the research on categorical identities. We can consider how students of marginalised groups in our society may not have equal access to the scripts for

[34] However it could be argued that Edward, rather than resisting a streaming positioning was actually being positioned by *assessment* as being 'not able'.

performing mathematics learner or good at mathematics. This idea of access to scripts is reminiscent of Bourdieu's notions of cultural capital, or habitus, and Bernstein's notion of linguistic code. For example Zevenburgen (2000) draws on Bourdieu to argue that students have patterns of language use that are "embodied to constitute a linguistic habitus" (p. 202). For working class students there is a mismatch between this and the formal language of school. This mismatch impacts on the student's "capacity to make sense of the discursive practices of the mathematics classroom" (p. 204). One example is responding inappropriately to micro-interactions with the teacher in whole class discussions. Zevenburgen notes that these classroom interactions have unwritten rules that students are differentially aware of. In this way "the practices of mathematics can be exclusory for some students" (p. 219). In other words, working class students may not have access to the appropriate scripts for being a mathematics learner.

Similarly Lerman draws on Berstein's description of recognition and realisation rules at work in educational settings and argues that "these rules may be hidden, to the disadvantage of students from working-class backgrounds" (Lerman, 2009, p. 151). He illustrates with students' responses to mathematics tasks. Those students who have not learned to read the task as school mathematics, as opposed to an "everyday" task, form incorrect answers. Again, it appears these students may not have had access to the scripts for performing mathematics learner.

But in this study we can see evidence of the students knowing the script and yet not performing it; Abby provides a comprehensive example of this (see page 119). Peter too, was able to identify the appropriate performance of asking questions but said he didn't really do that, and it was a just a "weakness" of his. The notion of access, then, does not provide the full story. Abby and Peter seemed to have access to the scripts, so why did they not perform them?

It appears that sometimes students choose not to enact the appropriate learner scripts, despite evidence that they know these scripts. For example, Chronaki draws on Butler's performativity to analyse the learning situation of Tsiggano (Roma) girls working with a tutor on mathematics. At times these girls were "meticulously engaged in imitating the performance of certain behaviors with mathematical objects and rituals … and, at other times, they resisted by either being silent, ignorant or diverting the focus from the mathematical task" (Chronaki, 2011, p. 213). These acts can be seen as alternately following the appropriate scripts and then resisting them. In analysis, Chronaki suggests "the identity of the so-called mathematically able or the so-called Roma learner are constructed as 'marked categories' and seem to represent two opposites of a pendulum" (ibid., p.223). Another way of conceiving of these two opposites of a pendulum could be as two performances that are difficult or impossible to co-perform.

For some students performing appropriately for (or performing in ways that have been constructed by/through) their gender, social class or ethnicity may work against the type of performance promoted in mathematics. I suggest that rather than considering access to scripts we can look instead at the impossibility (or difficulty) of *co-performances*.

The research literature provides many examples of this difficulty in co-performing mathematics identity and other identities, albeit utilising different terminology. For example Alro, Skovsmose and Valero's (2009) research discusses the way Razia, an Iraqi immigrant in Denmark, struggled to co-perform her religious identity with the performance of Danish student. She expressed her religious identity through wearing a headscarf (in this metaphor perhaps a *costume*) and it was a performance of "diversity". Razia perceived her peers, teachers and even family members did not like the headscarf and that it may have served to limit future opportunities. Discussion of her headscarf was a major feature of her interview and served to demonstrate that sometimes "many other issues than mathematics play important roles for the incitement [of] learning mathematics" (Alro, Skovsmose, & Valero, 2009, p. 34).

Reay's (2002) research highlights the plight of a student, Shaun, for whom conflicting identities made it extremely difficult for him to construct a positive identity as a learner. Reay writes eloquently of this:

> When I query how he is going to reconcile being tough in the playground with being hardworking and achieving in the classroom he replies, 'I am just different in the class to what I am out in the playground. I'm just different'. This duality of being is something Shaun returns to time and again in his secondary school interviews: 'You see, when I get outside I go back to being cool and bad but not when I'm in class' ... Yet, this double perception of the self, tough in the playground and scholarly in the classroom, as becomes evident later, is riven with contradictions and requires almost superhuman efforts to maintain. (Reay, 2002, p. 226)

Reay uses Bourdieu and also psychoanalytic theory to make sense of Shaun's story, but equally we could view his situation as one of almost impossible co-performances.

Researchers such as Mendick (2005b, 2006) argue that the masculinity of mathematics makes it more problematic for girls to choose to study and to succeed in the subject compared to boys. This can be understood as difficult co-performances. Similarly Boaler (1997a; Boaler & Greeno, 2000) discusses the ways that girls found it difficult to merge their identities of creative, verbal or humane with the pedagogy promoted in their mathematics classrooms. This could again be understood as the near impossibility of performing these identities together.

Within the New Zealand context Hunter and Anthony (2011) discussed how Pasifika students found it difficult to speak up in class discussions and give explanations. They attributed this reticence to shyness and the need to maintain face. With the changes of an inquiry-based classroom they grew to participate in a variety of ways. However these practices remained "emotionally charged" (Hunter & Anthony, 2011, p. 114). This study highlights the initial difficulties for these students of co-performing mathematics identities with other identities and the ways the stage and direction in the classroom can alleviate this difficulty.

I am not suggesting that the students in these studies were performing their religious identity, class, gender, or ethnicity, exactly. Rather, they were performing identities that related closely to and were in part constructed by their religion, class, gender and ethnicity. These were performances of diversity, toughness, femininity, creativity, and humility. Such performances are drawn from the scripts available

to these students by virtue of their religion, class, gender and ethnicity – but the distinction is important.

By attempting to understand the identity performances students may be compelled to give, and the difficulties of co-performances, we can better understand the ways in which they may have limited access to mathematics learning and may be recognised as lacking or as pathological learners. But these are not qualities of the students, by virtue of a *category* identity; rather they are limitations of the stage and theatre for performance and limitations of the available scripts for learning mathematics. With this perspective we can avoid a deficit reading of these students.

But it is not only category identities that can be explored and understood better through the notion of co-performances. Co-performing any type of identity may be problematic for students. It is this multiplicity of possible co-performances that demonstrate the complexity of understanding students' experiences with learning mathematics. Some examples from the data in this study include: performing grown-up/teenager, friend, soccer player, and cool. Each of these was at times difficult to co-perform with the type of mathematics learner the students felt they were supposed to be.

I argue therefore that co-performances provide a more nuanced way of understanding differential experiences of mathematics learning for any groups of students. It promotes a way of looking at the situation that does not encourage deficit theories, instead turning the gaze to the stage for performance rather than the individual performer. Questions such as: "Are students able to co-perform the identities that are important to them in this mathematics class?" may be asked, rather than questioning why large groups of students are not performing as they 'should'.

The Audience's Recognition

Recognition is implicated in the above discussion of category identities. In fact this theme is intricately woven throughout the thesis. It could be argued that studying identity is actually about studying recognition of identity, whether that is self-recognition or recognition by another. A performance becomes identity in the moment it is recognised.

In the discussion chapter of Act Two I introduced this notion of audience recognition. I highlighted the ways in which students' performances may be misrecognised. I raised the possibility of recognising a students' performance in a categorical sense, using the example of gender. In this section I will discuss the ways that the various audience members recognise the Year 9 mathematics learner and how this recognition works power over students. Ultimately recognition leads to self-recognition as the students see themselves through the eyes of others. Finally I discuss the problematic nature of labelling identity performances.

Recognising the mathematics learner

In this thesis we can see the ways in which different audiences recognise students as certain types of mathematics learner. They are recognised by the institution of schooling, their teacher, and their peers, by their parents and also by themselves.

I opened Act Two with monologues depicting the students' performances of transition and the teachers' recognition of these students. The teacher was a key audience member for students' identity performances. However they were an audience who came to the production with a pre-conceived idea of the sorts of performance they would be seeing. The teachers recognised the students as "little kids" needing to be trained in how to learn and having a "fear of math" or being over-confident. Seeing the students in these ways had an impact on pedagogy and constrained students' subsequent learner performances as depicted in the recognition cycle drawn in Chapter One of this act.

The students came to these teachers also having already been recognised by the institution of schooling. They were assessed and streamed and this led to them being recognised as particular types of learners before their secondary schooling experience had yet begun. Those placed in low-stream classes were pathologised as abnormal learners, those in middle-stream classes were seen as "merit kids," whilst those in top streams could be fast tracked through early NCEA exams for the future glory of the school.

Such recognitions fed into a cycle leading students in general to be recognised by their teachers as lacking. Most were considered to lack the confidence to persist with mathematics or to ask questions. This worked to recognise those students as pathological learners. Such recognition did not take into account the ways in which they were directed to be particular types of learners by the constraints of the stage, pedagogy and various positioning acts.

The discussion thus far assumes that to be recognised as a poor learner of mathematics is negative; however there may also be negative consequences of being recognised as good at mathematics. Damarin (2000) argues that the mathematically able are a "marked category". She discusses how research into gender inequality, for example, fails to take into consideration that mathematical ability may not be universally desirable. She refers to the original meaning of "stigma" (drawing from Goffman) and makes an analogy to being marked as deviant, using examples of "women, blacks, people of color, Jews, criminals, homosexuals, or persons of disability" (ibid., p. 72). Damarin contends that the mathematically able are similarly marked as deviant, and for marginalised groups in our society this means being doubly marked.

This argument could explain students' unwillingness to describe themselves as good at mathematics. I suggested in the first section of this chapter that the large numbers of students who did not recognise themselves in this way could be linked to not having access to the appropriate scripts for this identity performance. I also suggested that students may find it difficult to co-perform good at mathematics with their other identities. However it may also be that the students were *unwilling* to be

recognised as good at mathematics. Jacinta's classmates recognised her as "girl who likes maths", "nerd", and "geek", illustrating the deviance of the label. Chad's mother recognised her own schoolmates as either nerdy or as naughty. Although she positioned herself as good at mathematics and as liking it, she "fell in" with the naughty group who did the arts subjects.

From this I argue that whether students are recognised as lacking in mathematics and therefore pathological learners, or as able mathematicians and therefore deviant, it is the recognition of identity that exerts power on the subject.

Recognition as power

"Power not only *acts on* a subject but, in a transitive sense, *enacts* the subject into being. As a condition, power precedes the subject" (Butler, 1997, p. 13, italics in original). That recognition enacts power is evident in the previous chapters. Teachers enact the power of recognition through positioning the students as lacking in their identity performances. The institution of schooling enacts power on students through the labelling and categorisation of students as certain kinds of people; it does this through assessment and streaming. And in Act Two we saw the way peers enact power through their recognition and labelling.

Recognition works power through categorising and labelling students as particular types of mathematics learners and it also works power through recognition of students through other categories. There is much literature recognising people based on the categories of gender, class or ethnicity. Such recognition may feed into deficit theories, as suggested above. Gutiérrez (2013) discusses this as she takes a historical look at mathematics education research within social contexts and argues for more research attending to identity and power issues in society.

Another type of categorical recognition evident in this data is the recognition through assessment and streaming. The categories of attainment: excellence, merit and achieved are re-constructed as categories of people. Top-, middle- and bottom-stream work similarly to categorise students into certain types of learners. At times the stream, the label and the recognition of a student as a type of learner are used interchangeably. This is despite the category being based on a (possibly arbitrary) artificial cut-off point. For example the top 30 students may be placed in the top stream; the student ranked 31st is thereafter considered a different type of learner than the student ranked 30th. Other research has suggested the ways in which these ascribed identities are used to forecast students' performance in school and to predict learning obstacles (Stentoft & Valero, 2009). In this study we saw how students' examination results were predicted as excellence, merit or achieved based on the stream they were in. Students are type-cast and this has implications for their future mathematics learning experiences and subsequent identity performances. Type-casting works the power of recognition.

But perhaps the most insidious form of this power is the way it works through the students' own self-recognition. "Power acts on the subject in at least two ways: first, as what makes the subject possible, the condition of its possibility and its formative occasion; and second, as what is taken up and

reiterated in the subject's 'own' acting" (Butler, 1997, p. 14). This can be seen most obviously in Chapter Four, with the students self-identifying as not good at mathematics. It can be seen in Chapter Two with those who were happy with a merit grade (having fulfilled their potential). It can be seen in Chapter Three when Edward says he wished he could change himself, so that he could have been "better", as he recognised himself as bad at mathematics due to test results lower than some classmates.

In Act One I drew on Mead to argue that identity is enacted when the individual finds herself acting with reference to herself in the same way as she would in reference to others. The recognition by others, that is the audience, provides the model for an internal audience. These self-recognitions feed into subsequent identity performances. This is how the power of recognition becomes power enacted by and on the self.

In discussing performativity, Butler elaborates:

> So, yes, there is an aspect of performance, but that does not mean that the meaning of the performance is established by the intention of the actor - hardly. What are being performed are the cultural norms that condition and limit the actor in the situation; but also in play are the cultural norms of reception, which may or may not accord with the ones that are constituting a situation so that we actually have a retrospective of constitution of the performance through the norms of reception - and this can produce really interesting problems of cultural translation and cultural misunderstanding. And those problems are very productive. (Butler, 2004, pp. 345-346)

With this interview response, Judith Butler demonstrates the intricate binding of identity performance and audience recognition and also explains the level of agency an individual may have. The actor's performance is constrained by cultural norms. This means the actor draws on scripts for performance from the figured world; the mathematics student performs in a way constrained by the norms of mathematics learning situations. At the same time the cultural norms of reception are at play. In other words the audience recognises the students' performance from within expectations and norms of mathematics learning.

Butler goes on to argue that this can produce problems of cultural misunderstanding. This cultural misunderstanding within the mathematics classroom occurs when, I argue, the student may be enacting an identity other than that of mathematics learner. Throughout this thesis I have provided evidence of the other identities students enact during mathematics learning, and yet these may be received as mathematics identities.

Labelling identity

The notion of recognition as power is also central to a consideration of the *misrecognition* of identity performances. As discussed in Act Two, not all performances are mathematics learner performances. I may be recognising the students' identity performances as being about mathematics learning when they are performing friend, cool, humble, girl, available bachelor or any other identity. Researchers

themselves may be particularly at risk of recognising mathematics identities when the participants are performing something else:

> [R]arely if ever do researchers raise the question of the relevance of the specific categorisations and identities chosen to represent the participants to the research. Consequently, particular identities are taken for granted and assumed to reflect the identities actually realised, felt, or believed by the participants. (Stentoft & Valero, 2009, p. 61)

This study did not begin with pre-conceived ideas of identity categories and the participants are not deemed to be representative of an identity category. However as the researcher I was a key audience member for the participants' performances and I recognised and labelled these performances as being indicative of particular identities, as described throughout.

Stentoft and Valero (2009) raise two important questions of identity research: "Do the categories or identities used in research reflect identities visible in mathematics classroom interaction? And is it possible to take particular identities as for example an identity ascribed to students as learners of mathematics for granted?" (p. 58). The categories, identities and labels I have used in this research were derived from observations of classroom interactions and also from interview responses. However I wish here to address the second question and look at the ways in which I took for granted the identities I ascribed to students.

For example, whilst the performance of quiet was evident in all streams, in my observations and analysis I recognised the quiet learner differently in top and bottom stream classes. Quiet in a low stream I took to be work avoidance whereas I took it to be engagement in top streams. This was in part due to the amount of work I saw these students complete during observations; nevertheless I interpreted quiet in differing ways. Further, in low-stream classrooms I observed students confidently calling out answers and asking questions. Yet on this stage such an action appeared to annoy their peers and disrupt the teachers' explanations. It is likely that such a confident performance in this situation was not seen as desirable by the teachers either. In the teacher monologues of Chapter One, Act Two, students were recognised as either being very confident (erroneously) or fearful of mathematics and needing more confidence. I recognised 'confident' acts in the low-stream classrooms as the performances of 'disruptive' students, while the label of confident was reserved for other students in higher streams.

I am complicit in the identity recognition process. Law and Urry (2004) wrote about research being performative, that is the process of research helps bring into being what it claims to discover. Throughout this research I have recognised certain acts as being identity and mathematics identity performances. I have labelled these performances and theorised them. As such I have created this set of mathematics identity performances and made them seem natural, normal or inevitable. I am myself a product of the discourses of teaching and learning (and researching) mathematics, I too am

drawing my scripts from the figured world of mathematics learning and my understandings are framed by this very figured world I am attempting to delineate.

How then have I constructed the Year 9 mathematics learner? I have suggested that Year 9 generates quiet, passive, listening, serious and solo performances. The teachers expect students to be confident, ask questions and be persistent and they construct the Year 9 students as lacking when they do not. Yet I observed many performances in the classroom that I have not similarly labelled. In interviews students many times made responses that I did not label as being a particular identity.

Chinn (2010) draws on Foucault and Butler to argue that sexual identities are not fixed or natural but produced by systems of power. She notes that "only some practices get attached to identities, mostly in connection to the gender of the partners; other practices are just 'preferences'" (pp. 109-110). Similarly we can question which practices of mathematics learning get attached to identities, and correspondingly, which do not. For example the practices of working alone or of collaborating with a friend are simply learning preferences. However the practice of asking and answering questions publicly is attributed to confidence. In this study, and in others, the confident mathematics student is an identity that carries with it further recognitions, such as that of competence.

It is possible we construct identities of mathematics learner as a series of dichotomies (see also Mendick, 2005a). Confident is an identity we attach to students, as is its opposite, the quiet learner. The quick learner, commonly recognised in top-stream classrooms, can be paired alongside the slow learner, such as self-recognised by Abid in Act Two (see page 98). Walkerdine writes of the hard-working versus naturally-able dichotomy representing girls and boys respectively (Walkerdine, 1994, 1998) and also of real understanding as opposed to rote-learning (Walkerdine, 1989). Teachers appear to direct passive performances and yet desire active performances. Furthermore, with each of these pairs, one is constructed as positive and the other negative. One performance is good or correct and the other is bad or counter-productive.

The recognition of mathematics learner identities as dichotomies also works to prevent students from the in-between performances. I suggest that promoting the in-between performances may generate more possibilities for enabling productive identities. For example, students saw others as being good at mathematics because they "just knew it". This pairing of good with the mysterious (and instantaneous) 'just knowing' means the corresponding performance of 'working at it' (recognised by teachers as persistence) is positioned on the negative end of the dichotomy. When confidence is recognised as meaning 'sure of the answer' it works against the performance of confusion. Yet what if confusion was recognised as desirable in the mathematics classroom? I challenge the assumption currently permeating the figured world of mathematics learning that a student's own confidence in their ability motivates their persistence; I suggest that celebrating the state of confusion may do this more effectively.

Summary

Issues of equity and the notion of recognition are intimately bound with performing mathematics identities at transition to secondary school.

Students' performances are recognised as (mathematics) identities; that is, students are recognised as being a certain type of person based on their performances. They may be recognised by their peers as deviants; by their teachers as lacking; by the institution of school as (not) an "excellence kid"; or as a particular category of learner based on the stream they are in. The recognition may not take into consideration the constraints of the stage, the impact of teacher direction, or the impossibility of co-performances. Yet there are two main effects of this recognition: It leads to the students' self-recognitions and also has implications for issues of equity.

Students recognise themselves through the eyes of the imagined other. Repeated recognitions by peers, teachers, and the school all work to influence the way they see themselves. But students also self-recognise based on the performances they find themselves giving. And like others they may not consider the constraints and external influences on such performances. The students' performances in mathematics are constructed by the figured world of mathematics learning, and follow scripts generated by this world, and also these performances constitute the students' identities. This is how students find so many ways to not recognise good at mathematics in themselves.

The recognition and misrecognition of students strongly influences their future experiences of mathematics learning. When teachers recognise their students as lacking, it constrains their pedagogy. This works to further limit students' mathematics identity performances. Assessment and streaming recognise students as particular types of learners, which results in categorisation and pedagogy that caps their achievement potential. When students perform other identities, but are recognised as performing a deficient mathematics identity, the subsequent recognition of them as a particular (abnormal) type of learner confers disadvantage.

Intermission

The curtain descends and it is time for us to squeeze out of our seats and head to the foyer. We may now suspend our role as the audience and take up the position of critic to discuss and deconstruct the show. What do we think of the performances, the characters, the sets? What are the themes and messages portrayed? Where will this drama go next? Let us top up our wine glasses and first be critical.

Limitations

The main limitations of this thesis derive from: the subjective methodology, having non-representative participants, the context-bound nature of the study, and the use of the metaphor to frame it.

As discussed in the methodology section, the data collection process was subjective. Interviews were co-constructed by me, field notes were filtered through the lens of my own perspectives and whilst the data analysis was rigorous, I myself constructed and pursued the themes that I believed were pertinent. This means another researcher would likely generate different findings from a similar study. Yet my background experience was in intermediate schools and I was making the transition to secondary school along with my participants. Therefore my view was similarly fresh; what I saw to be important was based on this valid perspective.

Twenty-two students and 26 other participants provide a wide range of persons through which to discuss identity. However this large number means we are unable to form an in-depth understanding of the sort we may have gained from a smaller study. Fewer participants would have given a fuller picture of the individual. And yet more participants would have meant these results were more generalisable. Further, the participants did not quite represent the demographics of the city in which they were situated. For example no Pasifika males volunteered to be part of this study and therefore their views are missing.

The 22 student participants all came from similar contexts in the same city of a small country. Their experiences are not immediately generalisable to the wider world of mathematics education. And yet, as I noted at various places while discussing the results, the experiences of these students resonated with the research conducted on students in other countries. The findings from this specific context may be easily compared to other contexts; the questions raised from this context may be asked of others.

Finally, using the metaphor of performance enables data and analysis to be constructed in a particular way. Presenting the data through this metaphor also guides the reader to interpret the findings in a particular way. While this metaphor has afforded a powerful understanding of identity and transition it is likely to have blinded us to other data, analysis and findings that we can only speculate on. Further, the metaphor relies on *recognition* of identity. It is impossible to tell where an identity performance begins or ends or which aspects of any action are not about performing identity at all. However I

argue that all research on identity faces this same limitation. We can only study identity as we recognise it, no matter which way it is defined.

Despite these limitations, the data and analysis have provided answers to the research questions. These answers have implications for the teaching and learning of mathematics and for future research. They also generate many additional questions.

Findings

What types of identities do students enact as they transition to secondary school? Students enact passive mathematics identities of the quiet, individual listener. Such a performance is created by the constraints of the classroom stage and teacher direction. Students also enact many other identities that may be misrecognised by the teacher and other audience members.

How does transition to secondary school impact on students' mathematics identities? At transition to secondary school students perform consistently to past identity performances. Yet the figured world of mathematics learning changes at this transition and it works to change students' identity performances through changing their understandings of what it means to be a learner of mathematics.

How does recognition of identities impact on the students' experiences of mathematics learning? Teachers recognise Year 9 students as unconfident (or over-confident), fearful and lacking. Such recognition feeds into a cycle, affecting pedagogy, students' understandings of mathematics learning and their subsequent identity performances. Recognition of identity by teachers, and by the institution of schooling through assessment and streaming, affect students' self-recognitions and again their subsequent identity performances. Recognition exerts power. It categorises and labels students as certain types of people. This can lead to differential treatment and it can lead to the students recognising themselves as not mathematical.

How are issues of equity implicated in identities at the transition to secondary school? Equity is implicated firstly through the power of recognition, as discussed above. Secondly, students may struggle to co-perform mathematics learner when the narrowly available script for this performance does not align with other identities they may be compelled to perform. This may restrict their access to powerful mathematics learning. And yet this is not a deficit of the student, rather it is a limitation of the stage, the direction, the theatre, or the available scripts generated by society and constructed within the figured world of mathematics learning.

Practical Implications

The findings of this study have many implications for the teaching and learning of mathematics at secondary school.

Teachers must change their perspectives of the Year 9 students. The view of these students as babies or little kids who may have a fear of mathematics constitutes a wasted opportunity. Teachers

should harness the excitement students face when they begin secondary school and also take advantage of their malleability. The students look forward to having a specialist teacher and they are ready to reconstruct their understandings of what it means to be a learner of mathematics. For example, mathematics could be promoted as confusing and time-consuming – yet ultimately achievable. Behaviours of persistence should be promoted through problem solving activities that take time.

Teachers need to communicate their 'good at mathematics' script to students. The messages about what it means to learn mathematics, and to be *good* at it, need to be well considered and made clear. These messages about mathematics learning must also be consistent. Teachers need to ensure that the stage of the classroom and their direction clearly communicate their desires. Teachers must recognise that failure to act in the way expected is not a quality of the student but more likely a constraint of the stage and the direction. For example if students choose not to contribute to class discussion then it should not be seen as lack of confidence (competence), rather the stage or other/past identity performances make it difficult for the student to do so. It is the responsibility of the teacher to ensure that the performances they desire are enabled by their practice.

Teachers must resist the desire to explain away the mathematics. Doing so means they are doing the mathematics themselves rather than letting the students do it. The view of students as fearful, for example, promotes pedagogy that is over-explained and procedural. This leads to the students developing passive learner identities through a misunderstanding of what it means to do mathematics at secondary school. Performances of quiet listening and asking for help when faced with difficulty follow such pedagogy. Yet these performances are not appropriate during assessment tasks. Some students who found the mathematics easy during lessons found it difficult during examinations. Their results led them to be recognised as a particular type of learner by their teacher and pedagogy was again adjusted. Increasingly the students failed to see themselves as good at mathematics.

The role of good at mathematics should not be a starring role for just one individual in the class. All students should have the opportunity to perform this role. Teachers must consider the ways they can enable this. Further, this role should not be one that excludes other performances. Teachers need to carefully consider how to prevent the performances of cool or friend or teenager, or performances generated through race, class or gender, from working against the performance of mathematics learner.

Finally, and arguably most importantly, teachers need to take care when recognising students as particular types of learners. Often that which is recognised as mathematics identity is another performance entirely. For example, students who perform humble may be seen as lacking confidence and when confidence is conflated with competence then this is a problematic recognition. Assessment results and streaming are products of the school. Students should not be assumed to be a certain type of learner based on a label affixed to them.

Above all else, teachers must resist any temptation to see students' failure or negativity in mathematics as being inevitable; they must help us to write new scripts for positive relationships with mathematics.

These recommendations for teachers also have implications for pre- and in-service educational programmes. The extended metaphor of identity as performance would be useful to frame (prospective) teachers' reflections on their practice. It highlights the importance of attending to constraints and affordances of the stage and the influence of direction on students' identity performances. Further, it illustrates the complexity of mathematics learning, going beyond any notion that a teacher's job is just about instilling cognitive competence in their students.

Theoretical Implications

A major contribution of this research is in the development of a language of analysis through the metaphor of performance for identity. Research on identity in mathematics education generally attempts to situate this concept within a social context, as discussed in Chapter One of Act One. The performance metaphor enforces the social context; using this definition for identity makes it impossible to view identity as belonging only to an individual. Performances are inherently social.

This study has allowed us to attend to students' experiences of schooling (and mathematics learning) from a variety of viewpoints. First we may consider the individual. Interviews can be seen as *identity performances* and interview data can therefore be understood in terms of the ways in which people present themselves as a particular type of person and also position themselves in relation to mathematics. Students' actions during lessons (and at other times) can also be seen as identity performances, providing complementary or contrasting data to that of interview situations.

The metaphor of performance encourages us to look at the context in two ways. Firstly it can be seen as a *stage* (within a *theatre*). Within this frame we can consider the way in which acts of positioning work with the metaphor of performance. People position themselves physically in the classroom, and this act is recognised in a certain way. People position themselves (and each other) in relation to the other performers on the stage. Further, the layout of the stage (classroom) works to position actors in relation to mathematics learning. Secondly, it has allowed us to consider the *audience* for performance as a more nuanced aspect of context. Analysis of the audience' *recognition* has enabled us to consider how power works on individuals and groups. By viewing the teachers as an audience for students' performances of transition, the interview data of the teachers provides insight into how the students' are recognised in ways that will have implications for pedagogy. Peers and parents can be similarly viewed to provide additional insight into students' varied performances.

A consideration of the teacher as *director* of performances allows us to look at the ways in which the teacher's actions influence mathematics learning experiences in light of the sort of learner students are able to *be*. This can be contrasted with the scripts for learning suggested by the teacher. Theorising about performance *scripts*, whether they are constructed by the teacher, the students, or

elsewhere, such as in the media, allows us to consider wider societal discourses and the ways that people are expected to be.

New Directions

The findings of this research give future directions for identity research. I argue that it is the area of recognition of identity that we need to focus our attention on. Identity only exists from the moment it is recognised, whether by oneself or another, and this is how recognition enacts such power on individuals and groups. This is also why it is so important to develop a strong definition for identity in research; the definition will frame the way the person being studied can be recognised as a particular type of person. This notion of recognition poses a number of possible research questions.

How do we recognise good mathematics students? By 'we' here, I refer to mathematics education researchers, policy makers, schools, teachers and also students. It is worthwhile to further tease out the differences in the answers to this question given by the different parties. The ways in which their answers are different will provide insight into the difficulties students face in recognising themselves as good at mathematics. The parallel question is: How (and why) do we recognise abnormal, pathological or lacking in students? Which actions do we see as indicating pathological, and the lack of which actions is seen as abnormal? This study shows how we recognise students as being particular types of people through their actions or lack of action in the classroom, when in fact they may be acting due to constraints of the stage or influences of direction. How do we mitigate against misrecognition of this sort?

A second area on which we must focus our attention for future research is the notion of co-performances. For those researchers interested in issues of equity, such a perspective provides a way out of deficit thinking, something that is always lurking at the edges of any discussion of marginalised groups in our society. Examining the impossible co-performances highlights the deficiencies of the stage instead. Why do our classrooms not provide the space for students to *be* in any number of ways they need or want to be? This question can be extended to co-performances beyond those generated by class, race or gender. How should we provide the space for students to co-perform cool or good friend or teenager or creative alongside performances of mathematics learner?

Finally further attention must be paid to the scripts for being a mathematics learner. This requires a critical look at the taken-for-granted assumptions that permeate mathematics education, such as confidence being an essential part of this script. There are many other parts of the script that were 'written' so long ago that it is difficult to even question – but question we must. The scripts for being a mathematics learner need to be more flexible. We can ask: Is it possible to harness popular media to endorse alternative scripts for mathematics learning performances? How do we encourage students to *improvise* as they enact mathematics learner, thus generating new performance scripts? Is there a way of promoting the *in-between* performances and shatter the dichotomies that seem to currently describe mathematics learning?

Each of these research directions pulls identity out and away from the individual. We should leave the study of the individual to the area of the affective domain. Identity research looks far more holistically at people's experiences of mathematics learning.

The Mothers

It is still hard to tell what went wrong for the mothers and radio hosts depicted in the introduction chapter or why they were still performing negative mathematics identities despite no longer being learners of school mathematics. Their comments were drawn from scripts within the wider, societal level of the figured world of mathematics learning, scripts which depict performances of being bad at mathematics, having the wrong sort of brain, struggling, teachers ruining the subject, embarrassment and frustration.

It is possible these mothers were unable to merge the performance of mathematics learner, as promoted in their classrooms, with other performances that were important to them. It is possible they were negatively recognised by teachers, assessment and streaming, until they self-recognised as non-mathematical people. It is possible that their experiences of mathematics at school generated passive performances that contributed to a lack of agency in their learning. These mothers do not want the same for their own children. In a few years they may re-live their experiences as they make the choice of which secondary school to send their children.

A dinner conversation – 10 years later

SCENE: *A dinner party. Four women sit around a table with wine, cheese and crackers.*

MOTHER 1: I'm not sure which school to send my child to. We're in zone for Utopia School and also for Tragedy High.

MOTHER 2: Well at Tragedy High they stream the students so that sounds good. That way all the kids will be really well catered for.

MOTHER 1: My son is so quick and confident at maths, I think he will do really well at Tragedy High.

MOTHER 3: Oh? My daughter is going to Utopia School. She enjoys many different subjects and she wants to be part of their soccer programme.

MOTHER 4: I don't know about my son. He gets really confused with mathematics sometimes.

MOTHER 3: Well at the Utopia School information evening they said that confusion is a good thing. They said they celebrate it. Sometimes the students are confused by the weekly mathematics problem and it takes a day or two with the students all working together to really understand the way forward.

MOTHER 1: Wow, a whole week on a single problem? How do they get through the exam material?

MOTHER 3: Apparently the exams are really geared toward contextual problem solving anyway.

MOTHER 2: At Tragedy High they don't do the New Zealand exams, they do those International ones instead.

MOTHER 4:	What school does your nephew go to?
MOTHER 3:	Utopia High. He's in the mathematics tutoring programme.
MOTHER 4:	What's that?
MOTHER 3:	They have a lunchtime programme where older students help the younger ones. It's modelled on the tuakana-teina[35] approach.
MOTHER 2:	(Sarcastically) Lunchtime maths? I bet that's popular!
MOTHER 3:	(Laughing) You'd be surprised. Apparently it is a really social place. My nephew's girlfriend tutors also – that is when she doesn't have rugby or water-polo practice…

END SCENE

I hope I will be sending my children to Utopia High. I hope that at their secondary school they will be able to co-perform many different identities in ways that are not mutually exclusive. I hope that their mathematics learning experiences will promote creative persistence and problem solving that may celebrate confusion as just a part of the process. I hope their experiences of mathematics learning will not be constrained by practices of streaming and assessment, and that achieving in mathematics will not mark them as deviants. I hope they will be able to recognise themselves as good at mathematics and that this recognition will not mitigate against being any other type of person they may also wish to be.

Will this be possible? For such a 'Utopia' to be real, we need there to be greater variety in the script for performing mathematics learner. We need to make explicit which aspects of this script are expected or desirable and ensure we direct for these performances and make them possible on the stage of the classroom. We need to ensure multiple co-performances of identity are possible. We need to take care when recognising students as certain types of people, and ensure that any such recognition does not work to constrain opportunities. There are many ways to *be* and there should be more ways to be a mathematics learner.

The bell is ringing; it is time to return to our seats.

FINIS

[35] Tuakana refers to older brother/sister/cousin and teina is the younger. The tuakana-teina relationship is a buddy learning approach that is typical in Māori learning situations.

Appendix I: The Cast

Intermediate School	Student participant[36]	Secondary School	Year 9 class	Parent interviewed?
Western Intermediate:	Anja	Elsinore	Mixed ability	
	Jacob			
	Belinda	Philippi	Top band	
	Abid			
	Brad			
	Peter		Top band	Yes (father)
	Sarah			
	Axel		Mainstream	Yes (mother)
	Blair	Arden	Stream 4 (of 10)	Yes (mother)
	Emily	Verona	Top stream[37]	
	Jacinta	Venice	Stream 5 (of 9)[38]	
Central Intermediate	Abby	Messina	Girls class, Stream 2 (of 10)	Yes (mother)
	Ryder		Boys class, Stream 8 (of 12)	
	Callum		Boys class, Stream 4 (of 12)	
	Jonathan		Boys class, Stream 6 (of 12)	
	Robbie			
	Brendon	Sardis	Mainstream	Yes (mother)
	Chad		Top band[39]	Yes (mother)
	Edward	Padua Boys	Stream 3 then 2 (of 16)[40]	
	Hannah	Mantua Girls	Low band	
	Lauren		Top band	Yes (father)
	Mia		Mainstream	Yes (father)

[36] The students were given the opportunity to choose their own pseudonym. Five did so, the rest I assigned.
[37] The teacher of this class answered interview questions via e-mail rather than in person
[38] Jacinta moved school to Philippi after Year 9. Her new teacher did not consent to observations at Phase 4.
[39] The teacher of this class did not consent to be interviewed
[40] Edward's first Year 9 teacher participated in the interview. When he changed classes to stream 2 his new teacher did not consent to be interviewed.

Appendix II: Interview Starter Questions

Students

Phase One:

Tell me a little bit about maths.

What are some of the things you've learned this year?

Can you tell me about a lesson that you particularly remember?

What is your earliest memory of maths?

What do your parents think about maths?

What was maths like at primary school?

Tell me a bit about how your teacher teaches you maths.

What do you think maths will be like at secondary school?

Why did you choose that school?

Who in your class is good at maths, and how can you tell?

Why is it an advantage to be good at maths?

How does maths compare to other subjects?

Phase Two:

How is high school going?

Can you tell me about the first day?

Did your school have a special programme to help you get used to school?

What do you find different from intermediate?

Tell me about the first day of maths this year.

Are you happy with class?

What are maths lessons generally like?

Can you describe one memorable lesson you've had this year?

What are some of the topics you've studied so far this year?

Can you tell me about how your teacher teaches maths?

Can you tell me anything about your classmates in maths?

Does anyone in the class stand out for any reason?

Do you work with anyone in class?

Can you compare for me maths to other subjects?

What do you need to do to be successful in maths this year?

What do you think the purposes of learning mathematics are?

Phase Three:

How is everything going?

Can you tell me about something funny, interesting or embarrassing that has happened this year?

How do you think your maths class (and teacher) compare to others in your school?

What are maths lessons generally like now?

What is your favourite part of maths class?

What is the worst?

How do you usually act in maths class?

What are your other subjects like?

Can you tell me anything about your classmates in maths? (Do you work with anyone in maths?)

Does anyone in the class stand out for any reason?

Can you tell me about how your teacher teaches maths?

Can you describe one memorable lesson you've had this year?

What are some of the topics you've studied so far this year?

Looking back on your learning at intermediate, how well do you think you were prepared for high school maths?

Tell me about a time when you've used maths outside of school.

What do you have to do to be successful in maths this year?

What do you do when you find you don't know how to do something in mathematics?

Tell me about the mid-year maths exam.

What do you think your teacher would say about you in maths?

What would your friends say about you in maths?

What would your parent say about you in maths?

Tell me about something you've learnt this year in maths? How did you learn it?

What do you think the purpose for learning maths is?

If I were to interview you in Year 13 about maths – what do you think you would tell me?

Phase Four:

Tell me about how the rest of Year 9 went for you.

Looking back on last year, what do you remember most about maths?

What was the highlight/lowlight?

If you could do your year differently, what would you change?

Is there anything else you would have liked to change?

What maths topics were the best/worst?

Can you tell me about a time when you've felt good learning maths? (and bad?)

What sort of result did you get at end of year? How did you feel about that?

Overall how well do you think you were prepared for high school maths?

Can you tell me a bit about what maths is like this year?

How are your other subjects going?

What do you need to do to be successful in maths this year?

Can you describe for me what someone who is good at maths would be like?

Are you like that? (Is anyone in your class?)

What do you do when you find you don't know how to do something in mathematics?

If I was interviewing you in Y13 about maths, what would you say?

If I was interviewing you when you were 20 years old, what would you say then?

What do you think the purpose for learning maths is?

Are you the same kind of person in maths as you are in the rest of your life? (Or in other subjects?)

Finally, how do you feel about maths overall? Has this changed over the past two years?

Year 8 Teacher Interview

Can you start by telling me a bit about the students?

Do you have any predictions of how they are going to do at secondary school?

Can you tell me a little bit about how the maths learning has gone in this class this year? Has it been typical?

Can you describe for me a typical mathematics lesson?

What teaching style do you think is best for teaching mathematics?

What do you see as fundamental to your job as a teacher of Year 8 mathematics?

So how important is the mathematics that these kids learn in Year 8 for the future?

What do you believe is the most important thing to teach your class in preparation for secondary school in maths?

What topics in mathematics are the most important?

What are your impressions of these students' primary school experiences of mathematics learning?

Can you tell me a bit about your personal experiences of learning mathematics?

Year 9 Teacher Interview

What type of student is _____

How does s/he usually act in class?

How does this compare to the other students?

What were your first impressions of (the participant/s)?

How do you feel he/she has made the transition to secondary school mathematics?

What do students need to do to be successful at mathematics?

What advice would you give to year 8 teachers of mathematics? Why?

Can you tell me about your past experiences of teaching year 9 students?

Is this class typical in your experience?

What other levels have you taught? (Statistics/calculus.)

How do year 9 students in general compare with students at other levels?

Do you teach this class in a similar way to other classes?

Can you describe for me a perfect lesson? (or a 'typical' lesson – are they different and why?)

What do you think is the most important thing for a year 9 student to learn in mathematics? Why?

Which topics within mathematics do you feel are the most important and why?

How important is what these year 9 students will learn for their future?

Can you tell me about your personal experiences of learning mathematics?

What influenced your decision to become a teacher of mathematics?

Can you describe for me what you think mathematics is all about?

Parent Interview

Can you tell me a little about _____.

Tell me about your child's experiences with mathematics from an early age.

How did your child find primary and intermediate level maths?

How did you decide on a secondary school for your child?

How do you feel your child has coped with the transition to secondary school?

Was this in line with your expectations?

What are your expectations for your child's secondary mathematics education? (And further)

Can you tell me anything about your own past experiences of maths?

How do you feel about mathematics now?

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