Academic Target Setting:

Formative Use of Achievement Data.

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Abstract

Improving student achievement is an ongoing challenge for schools with a great deal of data collected to ascertain improvement trends. In this thesis, possibilities for using this achievement data to improve outcomes for students, through establishing academic achievement targets was explored. Longitudinal achievement data were collected about students, over time and analysed for patterns and trends. This information was then used to formulate individual academic achievement targets for students in Year 9 and Year 11. All the academic targets for the students incorporated an element of challenge and were intended to lift individual student performance but were not designed to be predictive. The targets (specifying standards, credits and levels of achievement) were then shared with students as part of an academic counselling programme. The study also explored classroom teachers' experiences of the target setting process in the subject areas of English and mathematics.

The results indicated statistically significant higher achievement outcomes for students with academic targets compared to those without such targets. The students involved in the intervention were 1.9 times more likely to gain the Level 1 National Certificate of Educational Achievement, than those students not in the intervention, when controlling for prior achievement, ethnicity and gender variables. In addition, being part of the intervention allowed those students who entered the school with a significantly lower intake score (as measured by the Middle Years Information System (MidYIS)) to be more successful in gaining the Level 1 Certificate, than students in previous years. The quality of achievement in Year 11 was also improved as measured by a grade point score in the subjects of English and mathematics. The study demonstrated the benefits of the systematic use of longitudinal achievement data as a basis for establishing achievement targets for students.

The teachers reported that discussing the targets with students helped improve relationships between themselves and the students. However, the provision of targets did not change teaching practices and in some cases created an element of tension when teachers' expectations of students conflicted with the targets established through the models explained in the early parts of the study.

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Contents

CHAPTER ONE

Introduction and Overview

Over the past several decades there has been considerable pressure on schools to improve the educational outcomes of students, particularly in relation to lower achieving students and students from ethnic minority groups. This pressure to improve has arisen from two main sources. The first arises from the argument that if a country requires its economy to be competitive internationally, there needs to be an improvement in student educational outcomes (Bils & Klenow, 2000; Warrington, 2008; Whetton, Twist, & Sainsbury, 2000). The second source is governments wanting to ensure they are getting value for money from their investment in education (Linn, 2000). New Zealand is no exception to these pressures and external demands; however, there is a further pressure that is more specific to New Zealand as it has been classified as a 'high quality, low equity' nation. This classification has come from New Zealand having one of the widest ranges of achievement, that is, while it has relatively high average achievement, the variability around this mean is large. Of particular concern are the many students at the low end of the achievement distribution according to the Programme for International Student Assessment (PISA) tests (OECD, 2003, 2006a).

The specific approaches to schooling improvement are many and varied within and across countries, but most have some commonalities. Schooling improvement initiatives usually provide a range of support through extra resourcing in the form of the development of programmes and/or the delivery of professional development initiatives (Coburn, 2003). Accountability measures typically accompany this support and its associated funding. The assumption here is that, by providing both pressure and support (Barber, 2000; Earl & Lee, 1998) through professional development and accountability for schools and teachers, changes in expectations and actions in the classroom will lead to improvement. These accountability measures take different forms in different countries but all involve some sort of goal and/or target setting. The goals and targets may come from many sources: national, federal, state or locally determined depending on the educational structures within each country (DCSF, 2007; DfES, 2004; U. S. Department of Education, 2004). However, all are designed to be mechanisms for improvement. Typically the goals and targets are externally set as an aspiration for achievement but often they are set in isolation, away from the school and are generally related to students' past achievement rather than current achievement (Blanchard, 2002, 2003). At times, these goals and targets are perceived to be punitive by teachers and schools because of the accompanying accountability consequences that can range from

funding cuts to school closure in some countries (Goldhaber, 2002; U.S. Department of Education, 2004).

There has been one by-product that has arisen from the governments' accountability requirements, particularly in the United Kingdom (UK), the United States of America (USA) and now in New Zealand, and that is the massive amount of achievement data that is being collected about students. In this thesis, the possibility of using student achievement data in secondary schools to raise expectations and lift achievement by developing goals and targets is explored. The intention is that these goals and targets can be used in a formative and positive way, firstly, by using student achievement data to develop student and school goals and targets that allow the school to answer the question 'How well can we do?' and, secondly, by developing a model that details the mechanisms by which the goals and targets can be used systematically to raise achievement within a school.

This thesis is designed to address the following questions: '**To what extent does the development of individual student academic targets impact on student achievement?**', '**Does the development of individual academic targets impact differently on different sub-groups of students in the school?**' and finally '**What are teachers' experiences of target setting?**'

Global Context

In many countries across the world, political and economic pressures are influencing change within the education system. Underlying the desire for change is the perceived need to raise educational standards because these are believed to have a direct link to future economic success (Whetton et al., 2000). This apparent link between education and economic success is believed to exist because education provides access to employment and employment is a key facilitator in economic growth, not only at the national level but also at the individual level. An Organisation for Economic Co-operation and Development (OECD) study indicated that improved educational outcomes were also related to greater personal income levels (OECD, 2007).

The link between economic success and educational performance is supported by many international surveys and studies, particularly those of the Organisation for Economic Co-operation and Development (OECD). Studies in the United States of America (USA) also show that raising student achievement leads directly to national economic growth (Bils & Klenow, 2000; The Teaching Commission, 2004). The Teaching Commission report estimated that statistically significant improvements in educational achievement over a 20-

year period could lead to as much as a 4 percent increase in gross domestic product. In New Zealand too there is a growing awareness that developing and sustaining a high income, high value, knowledge economy relies on the educational achievement of New Zealand students (Salmond, Tolley, Shulruf, King, & Dixon, 2005).

The resulting drive to improve educational standards has resulted in many school improvement initiatives. Reezigt and Creemers (2005) argue that the concept of an improving school is firmly embedded in the context of the country in which the school is situated, with government policy on education directly shaping the educational climate of that country. Research carried out by Lagerweij (2001) and Sun (2003) has identified three common factors relating to context; these are the pressure to improve, the resources available and educational goals. These factors are elaborated in Table 1.

Table 1.

Factors within the Main Contextual Concepts of the Effective School Improvement Framework (adapted from Reezigt & Creemers (2005, p. 409)).

Pressure to improve	Resources/support for improvement	Educational goals
▪ Market mechanisms ▪ External evaluation and accountability ▪ External agents ▪ Participation of society in education/societal changes/educational policies which stimulate change	▪ Autonomy granted to schools ▪ Financial resources and favourable daily working conditions ▪ Local support	▪ Formal educational goals in terms of student outcomes

Annan (2007) compared the policy contexts of schooling improvement initiatives in England, the United States of America and New Zealand. In England there is tight central control where the government legislates for improvement by setting challenging targets for literacy and numeracy, by providing professional development for teachers, by re-defining the national curriculum and by inspecting schools to ensure compliance with the legislation. In the USA control of schooling improvement is delegated to each state and as such each state is required to develop accountability plans. In their plans states have to explain how they

are going to reach federal targets, and what will happen to schools that do not reach the standards set out in their targets. Many of these consequences are designed to be punitive towards those who fail. An integral part of this accountability plan is the definition of adequate yearly progress (AYP). The New Zealand policy toward school improvement is a mix of central control and local autonomy, with much of the administration and accountability measures passed on to individual schools (Timperley, 1994). The following sections explore the policy contexts of goals and targets in England, the USA and New Zealand in more detail. These countries were selected for comparison to New Zealand because they are similar educationally (they have a national/state curriculum, defined standards of achievement and high-stakes testing) and because much of the relevant research is dominated by research from the English and American context.

England

In 1988, the *Education Reform Act* introduced a national curriculum to the education system in England (DfEE, 1988). As part of this national curriculum, a series of expectations of what students should be able to do at various key stages of their educational development was also published (DfEE, 1988). There are four key stages in education, which refer to student age groups, these are: key stage 1 (five to seven years old); key stage 2 (eight to 11 years old); key stage 3 (12 to 14 years old); and key stage 4 (5 to 16 years old). Alongside the new national curriculum, compulsory testing of all students was introduced at the end of each key stage (DfEE, 1988).

In 1997, the Government brought more emphasis to achievement in literacy into the national curriculum by introducing the National Literacy Strategy (DfES, 2003). A similar strategy for numeracy was also introduced and both were extended into secondary schools in 2001. The new focus on literacy and numeracy brought with it a requirement for schools to set student achievement targets. Schools had to set a target for the proportion of students who would achieve Level 4 of the national curriculum in English (by the end of key stage 2); another target was required in mathematics and another in science. The government also set its own targets, one of which was, 80 per cent of 11-year old children should achieve Level 4 or higher in English by the year 2002. The then Labour Secretary of State for Education and Employment, David Blunkett, famously promised to resign if the target was not met (Coe, 2000). Fortunately for him he was reallocated to a new portfolio before having to act on his promise. The 2002 target was not reached (The Guardian, 2003).

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In England in the 1990s, individual student targets were generated from Local Education Authority (LEA) targets which were derived from National Government targets (DfEE, 1997, 1998). These targets had been developed away from the context of the school and represented a strategic intervention rather than a pedagogical one. They were a 'top-down' intervention that paid more attention to group performances and scant attention to individual students' abilities and aspirations (Blanchard, 2003). A top-down intervention is one that is typically determined by the upper hierarchies of education and delegated to the lower hierarchies to action without any input from the people carrying out the intervention.

The targets were produced based on data collected from the (Standardised Assessment Tests) SATs which were sat at the end of each 'key stage' of schooling. The data collected from the SATs examinations were collected and analysed by groups independent of the school and the Local Education Authority (LEA). The data were analysed and returned to schools from three main sources, RAISEonline, the Fischer Family Trust (FFT) and the Data Enabler Toolkit (Ofsted, 2008). The information contained in the analysis was for individual students and aggregated for the whole school. Information regarding targets for each student and the school were also included in the data based on the national targets. In 2004, in an effort to address the criticisms, such as the ones made by Blanchard, schools in England were asked to set their own annual measurable performance targets in consultation with the Local Education Authority (DfES, 2004).

The latest target setting agenda (DCFS, 2007) outlines a move from absolute targets (for example, the percentage of students gaining a particular curriculum level) to an emphasis on progress (for example, two levels of progress within a specified time frame) as this is considered to take into consideration the different starting points of each student.

Another feature of the English education's system of tight central control over education policy and practice concerns the evaluation of teacher performance. Teacher performance is based on student performance (DfES, 2006) such that, to satisfy certain dimensions of the criteria for teacher performance, teachers must demonstrate that they have met the student, class or group targets they have. When teachers reach the top of the pay scale they can apply to receive a 'threshold' payment. In the application for this payment amongst the numerous criteria teachers have to demonstrate they satisfy, one of these criterion specifies that teachers should 'have teaching skills which lead to learners achieving well relative to their prior achievement, making as good as, or better than, similar students nationally' (Teachernet, 2009, p. 3).

United States of America

In 2002 the *No Child Left Behind* (NCLB) *Act* came into law in the USA (US Government, 2001). The purpose of the law was to introduce state accountability policies that would make schools, teachers and students responsible for improved educational outcomes. By making these groups accountable for outcomes, it was thought that changes in expectations and actions in the classroom would result and this would lead to improved academic achievement, particularly for low income and minority students. The act ensures accountability and flexibility as well as increased federal support for education. NCLB allows schools considerable flexibility with regards to the management of federal funds and the funding can be used in ways that allows the pursuit of excellence by the means the school deems best (U.S. Department of Education, 2004).

The ultimate goal for schools under NCLB is that 100 percent of students achieve proficiency in English language arts and mathematics by 2014. Progress towards this goal is broken down into Adequate Yearly Progress (AYP) targets against which states and schools are measured.

The implementation policies for the *No Child Left Behind* reform vary in detail from state to state however almost all states have introduced a curriculum, performance standards and some kind of assessment to measure student learning against the standards. Accountability comes in the form of setting standards of achievement for every grade level, and in some cases every half year within a grade, and the requirement that measures of student progress are made in comparison to the state-determined grade-level standards.

In the USA failing to meet the Adequate Yearly Progress targets comes with particularly strong sanctions. Schools that consistently perform well with regard to their AYP targets are financially rewarded, while those schools that do not do well against the targets are financially penalised and students are given greater choice to attend other schools. If schools consistently fail to meet the AYP targets over several years, then the Principal may lose his or her job and staff may be reallocated to other schools (Doran & Izumi, 2004; U.S. Department of Education, 2004).

New Zealand

In the *New Zealand Education Standards Act* (2001) the government introduced a change to school charter requirements. Schools were required to set specific strategic planning targets and report against them. A critical part of the Act is that strategic and annual planning should be focused on raising academic achievement. Specifically, a section of a

school's strategic plan must include 'goals for improved student achievement' and 'an annually updated section that sets out the school's improvement targets for the current year.' (Ministry of Education, 2005b).

The target setting required by the Ministry of Education is directed at the whole school level. The 2001 Act does not give explicit guidelines for the process of developing individual student targets. Within the legislation of the *Education Standards Act* (2001), schools are required to examine the difference between the school's performance and the relevant aims and objectives as described in the school's charter. Such target setting and seeking evidence of reducing the variance between the targets and the actual attainment of students in schools is part of the mission that has cascaded down from the government to schools, and as such is intended to help identify areas on which future targets could be focused. In New Zealand, failure to meet the goals and targets set out in the charter are not sanctioned in the same way as in the USA. All that is required by New Zealand principals is an explanation of the variance between the goals and targets.

New Zealand ranks in the top ten of the Organisation for Economic Co-operation and Development (OEDC) countries for the performance of 15 year old students in reading, problem solving, mathematics and science according to the Programme for International Student Assessment (PISA) study of 2006. New Zealand has the third largest variation in student achievement within schools, meaning that within a school there is a wide variation around the mean achievement of students. There is little variation, however, in achievement between schools in New Zealand. In addition, New Zealand students have relatively high average achievement compared to other countries in the OECD, however, the variability around this mean is also large, in particular there are many students at the low end of the achievement range (OECD, 2003, 2006a, 2006b). There are no specific targets to reduce this gap, but there is a great deal of rhetoric and pleas for schools to be attentive to reducing the variance.

In 2002 New Zealand introduced the National Certificates of Educational Achievement (NCEA), a new standards-based qualification system. NCEA is a standards-based assessment system meaning that student performance is expressed in terms of what students can do in relation to a standard rather than how they perform compared to one another. Certificates are awarded at three different levels, Level 1, 2 and 3, typically in Years 11, 12 and 13, respectively. Each certificate is awarded when a number of credits are collected from passing different types of assessments, called standards. 'It was intended that NCEA be better suited to supporting learning for all students, and not only those who were

high achieving' (Meyer, McClure, Walkey, McKensie, & Weir, 2006). This system replaced the previous norm-referenced qualification system that used scaling where students were given a score that effectively allowed students to be ranked. One criticism of NCEA, however, is that students are not stretching themselves to aim for the higher levels of achievement (Meyer et al., 2006) and it could be argued that target setting in the light of this new assessment system would seek to address this problem.

Issues and Gaps

In two of these countries, England and the USA, goals and targets are externally imposed with governments setting their own goals and targets for the student population. Those federal and government goals and targets then cascade down into schools, via state systems or local education authorities. This is not the case in New Zealand. In New Zealand, goals and targets are required to be set out in a school's strategic and annual planning documents, but there is no guidance given on how to set the targets, or how to use them in a formative manner. There is also no guidance on how to link the targets to individual students (or how this might raise academic performance), nor is there a requirement for schools to do this.

Because of the gap in both policy and research literature on how global targets can be related to individual student performance and classroom practices, the research reported in this thesis used individual student achievement data to set individual student achievement targets. The targets were internally generated and based on the achievement data from the actual cohort of students within the school, rather than being based on aspirational educational requirements driven by government without consideration of the school's student population. The key assertion here is that global targets can be set from the aggregation of individual ones but not vice-versa. This is a key pedagogical issue, not just an organisational or accountability one.

In England, the United States of America and New Zealand, the national goals and targets that are set are not explicitly shared with students, for example, where they are now, in terms of achievement, and what needs to be done to achieve the target. In this study, the targets and goals were developed with the intention of sharing them with teachers and students so a dialogue between the stakeholders could develop in a formative manner and, as a result, teachers and students could work together to reach the student's targets and goals. This study differs from the setting of targets in England by establishing targets that have been 'moderated by bottom-up feedback of information' (Blanchard, 2003, p. 258) from teachers

and students. This means the targets are not linked to any external accountability system and are not linked to the evaluation of teacher performance.

One aim of this study was the development of students' individual academic targets that utilised the large amount of data collected by schools to focus the efforts of staff and students on raising achievement. The development of these targets aimed to give students a clear goal and increase their motivation for high academic achievement. This process should also help address some of the criticism aimed at the National Certificate of Educational Achievement (NCEA), regarding the motivation of students and their tendency to 'count credits' rather than aim for higher standards of achievement (Meyer et al., 2006). A second benefit of this approach to target setting is that it provided subject teachers with information derived from the data used to develop the targets about the strengths and weaknesses of their students, information that could inform teachers' practice in the classroom. Having this information also provides the opportunity for teachers to evaluate the appropriateness of their teaching strategies in relation to student learning and achievement.

Appropriate individual academic targets are something that school improvement literature proposes is important (Reezigt & Creemers, 2005; Sun, 2003; Sun, Vandenberghe, & Creemers, 2003) yet they appear to be missing from the New Zealand secondary school system in practice. Since 2002, when the new standards-based assessment system, NCEA, was introduced, the volume of achievement data available to students, parents and schools has increased. A target setting program within this new framework trialled in this study contributes to evaluating whether it is possible to further raise the academic achievement of students in New Zealand.

Local Context

The next section describes the context in which the target setting worked within an academic counselling programme at the intervention school. New Zealand High School (NZHS), a pseudonym used to represent the school in this study, was the school at which the target setting intervention described in this thesis took place. A process or mechanism was needed by which the targets could be discussed, challenged and adopted by students. At NZHS this occurred through the process of academic counselling, a programme introduced with the specific aim of improving academic achievement of students and discussing student goals, subject choices and long term career plans.

New Zealand High School (NZHS)

NZHS is a large co-educational, mid-decile secondary school with approximately 2500 students on the roll and a teaching staff of approximately 150. The school is situated on the northern boundary of Waitakere City and the student population is made up of a combination of rural and urban students, from a diversity of cultures.

Academic Counselling at NZHS

Academic counselling was introduced to NZHS at the start of the 2007 academic year. This programme involved a series of interviews with students to consider three main areas of focus: academic achievement, career intentions and extra-curricular interests. The purpose of the interviews was to develop goals and targets associated with these three areas.

The rationale behind the choice of these three areas of focus was that the school wanted to raise academic achievement and close the education gap between the different sub-groups of the school population. This reduction was a goal considered to be an essential part of the core business of schools. Further, the school wished to improve participation in extra-curricular activities as the principal believed that those students who are more engaged in the wider life of the school will stay at school for longer and be more successful. Another area of focus was a career goal; again when visiting the USA in 2006, the principal was of the view that having something to aim for after completing high school improved motivation at school and led to improved student achievement outcomes (Ritchie, 2007).

So with these three areas of focus in mind the academic counselling programme was developed. NZHS is divided into five 'schools within a school' for student pastoral matters, with each school being managed by two Deans. The academic counselling sessions were run by the Deans of the school.

The ten Deans saw all students in the school three times a year. At first, this took place in small groups of up to four students. There were two reasons for seeing the students initially in small groups; firstly, to make students comfortable during what for many would be the first time the students had spoken to the Dean and, secondly, to facilitate seeing all students before the parent teacher interview in the second week of Term Two.

Prior to meeting with the Deans students were asked to complete a Long Term Personal Educational Plan (LTPEP). The LTPEP was completed only once at the start of Year 9, the first year of secondary school. However, as 2007 was the first year of the academic counselling intervention, all year groups from Year 9 (students aged 13) to Year 13 (students aged 18) were asked to complete the plan. Information required to be completed on

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the LTPEP was general in nature and questions were designed to produce general descriptions of skills the student thought they had, such as team work skills, social skills and problem solving skills. Students were asked to identify or highlight these skills on the LTPEP. The students were also asked to indicate on the LTPEP where they saw themselves in six years time; that is; the first year after completing high school, and also if they had a career aim. Finally, students were asked to identify any specific qualifications they may need to gain at school and record this on the plan. On completion of the LTPEP, which was administered and supported by the students' form teachers and parents, the data were entered onto the school's student database, and able to be accessed in the academic counselling sessions.

On the reverse of the LTPEP was a planning sheet to aid students' subject choices particularly if they already had a career goal in mind. The subject planning sheet was developed in response to criticisms that students may not be able to gain entry to university in New Zealand because they had inadvertently chosen the incorrect combinations of subjects or, more specifically had chosen the wrong combination of university approved and non-approved subjects. This issue was particularly relevant to University Entrance under the National Certificate of Educational Achievement which has a complex structure.

In the next stage of the academic counselling programme, the students met with the Deans to discuss the LTPEP and produced a Medium Term Personal Educational Plan (MTPEP). Targets were mentioned in the Medium Term Personal Education Plan for the first time because it was during the meeting with the Deans that the targets were discussed and developed. On the MTPEP, three areas were raised with students. The first was an academic target, the second a broad target and the third was an extra-curricular goal. The development of the academic targets for individual students was the primary focus of this study. The broad targets were concerned with strategies that would help students perform to a higher level in their studies, for example where relevant broad targets could be associated with attendance and punctuality, being and becoming more organized or perhaps developing revision plans. The extra-curricular goals were associated with other aspects of school life, such as sporting, cultural or leadership goals at school. The Medium Term Personal Educational Plan was updated and reviewed on two further occasions during the school year.

This Research Project

The school improvement and school effectiveness literature frequently contains claims that having goals and targets are important (Reezigt, 2001; Reezigt & Creemers, 2005;

Reynolds, 1985, 1996; Sammons, Hillman, & Mortimore, 1995; Sun, 2003; Sun et al., 2003). School accountability processes use targets and goals as a self-evaluation and an external evaluation technique, yet they are rarely used in a formative and positive manner. To use goals and targets in such a way (formatively and positively), students, teachers and school administrators must all be aware of the goals and targets. Teachers should use these goals in conjunction with student aspirations for the long term with the overall intention of improving educational outcomes during the academic year. The present study was guided by three questions; the first asked, 'To what extent does the development of individual academic targets impact on student achievement?' the second asked, 'Does the development of individual academic targets impact differently on different sub-groups of students in the school?' and the final question asked, 'What are teachers' experiences of target setting?' In essence, this thesis explored a model for using existing individual student achievement data to develop individually relevant achievement targets. The study then examined how to disseminate this information to all parties in the school. Finally, the impact of the target setting intervention on the academic achievement of the students involved was investigated.

It is acknowledged that student achievement at school results from a complex mix of factors, relating not only to individual ability, learning styles and preferences, motivation and engagement, but also to subjects selected, and to the quality of teaching and assessment practices. This study focused specifically on the formation of academic achievement goals and targets and their impact on academic achievement.

In the next seven chapters, the different phases of the research are described. Chapter Two explores goal and target setting theory and locates this theory in the school improvement and school effectiveness literature. The concepts involved in goal and target setting are described and an explanation for why goals help to improve performance is offered. Chapter Two also links together the ideas found in the literature on goal setting, teacher expectations, feedback, use of data and formative assessment as the basis for two models that describe how target setting can work in a school. Figure 1 presents a simplified model of the relationship between goals and target setting and raising achievement.

Mechanisms for School Improvement	Outcomes

Goal and Target Setting

→ Improved Achievement
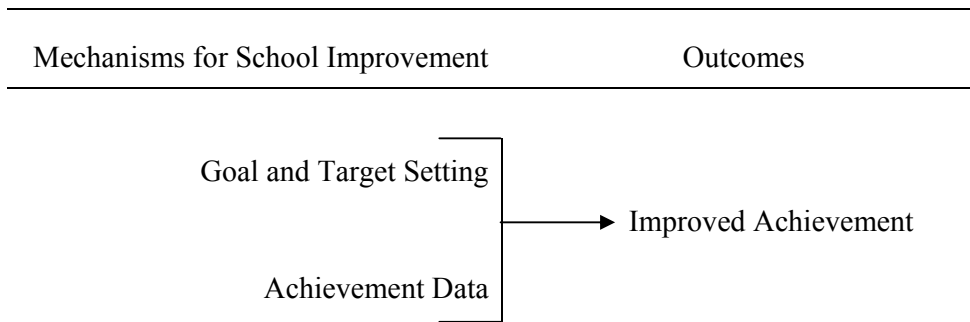
Achievement Data

Figure 1. A simplified model of the relationship between goal and target setting and raising achievement

This simplified model is further developed into two models. The first model is a macro model as it places goal and target setting within the whole school context and explores how information can flow to all parties within the school. The second model is described as a micro model looking at how having goals and targets can affect teacher practice by informing teacher expectations, teacher feedback to students and teacher behaviours in the classroom.

Chapter Three presents the methodological design underpinning each of the studies in this thesis. Details of the instruments used and the participants in the study are presented in this chapter. A discussion around ethics, validity issues and how missing data were tackled are also described. Finally, a brief overview of each study is outlined.

Chapter Four describes the theories and methods that underpinned the development of targets and goals for Year 11 students both individually and aggregated for the whole school. The targets in this study were established for Level 1 of the National Certificate of Educational Achievement (NCEA). How teacher input was incorporated into the target design is explained and an analysis of the effectiveness of the intervention on student achievement is provided.

Chapter Five describes how the procedure known as Data Envelopment Analysis (DEA) was used to establish targets for Year 11 students for the NCEA Level 1 subjects of English and mathematics. In Data Envelopment Analysis the academic performance of students who are on the outside edge of a distribution are identified, as opposed to those students in the middle of the distribution. Identifying students on the outside edge of a distribution allows a target to be set for other students that should be achievable yet is not based on average performance. The details of the data collection methods, sample descriptions and measurement instruments are also presented in this chapter.

Chapter Six further develops the DEA model and applies it to targets developed for Year 9 students in reading literacy and numeracy. An analysis of the effectiveness of these targets on student achievement is also reported in this chapter.

Chapter Seven reports the findings from a qualitative evaluation of target setting and reports on teachers' experiences of target setting, and finally Chapter Eight draws together the key findings of the thesis in a conclusion and discusses the implications of these findings on teacher practice and for further research.

CHAPTER TWO

Literature Review

This study resulted from the need to understand more fully how data collected about students could be used in a formative and positive manner to raise their academic achievement. An argument will be developed from the literature that formative and positive use of academic achievement data could be constructed through individual academic goals and targets for students.

Given the centrality of goal setting to this thesis, the literature review will begin by identifying the attributes of goals that are likely to result in improved student motivation and achievement. If goals are to be realistic, then they need to be based on data. The second section of the review explores how data are used currently in schools and some possibilities for their use in goal setting.

Goal Setting – introduction

In a thesaurus (Encarta, 2007) the terms goal and target were synonymous, both a goal and a target referred to an aim, where an aim was defined as 'something that someone wants to achieve'. Locke and Latham (1990) used the term goal as a generic concept that encompassed the essential meaning of terms such as intention, task, deadline, purpose, aim, end and objective. In most goal setting studies the term goal referred to attaining a specific standard of proficiency on a given task, usually within a specified time frame (Locke & Latham, 1990). In the education context, Lee and Gavine (2003) defined the term target to denote a sub-goal within a curriculum area. Some educational policy documents in the United Kingdom (DfEE, 1996) also used the term target in this way.

No matter whether a target is a sub-set of a goal, or synonymous with a goal, goals and targets as nouns can be considered the same conceptually, as they refer to an aim. As such, the theories that are expressed in all the studies relating to goal setting are assumed to be transferable to target setting. Therefore, in this study, it is assumed that goal setting and target setting are conceptually similar and hence have the same effects on performance.

The next section of the literature review provides a brief description of goal setting theory and explains why having a goal is important and how it is that goals can improve performance on a task by affecting behaviour.

Goal Setting – the theory

Goal setting theory postulates that human action is determined by both cognitive and motivational factors (Locke & Latham, 1990, 2002, 2006). In other words, having a goal can motivate us into action to do something in order to achieve our goal. Locke and Latham have researched goals and goal setting theory for four decades and found that, under the right conditions, goals can affect performance in four different ways. They can lead to greater effort, they create a focus on goal-relevant activities and away from goal-irrelevant activities, they affect persistence, and finally, goals affect action indirectly by promoting the development of task-related strategies for attaining the goal. The ways that goals can affect performance are elaborated in the following sections.

The key finding of goal setting theory is that there is a linear relationship between the difficulty of the goal and performance; that is, the more difficult the goal is, the more effort a person will put into achieving the goal and the better the performance will be, under certain conditions, that are identified in the following quote. 'So long as a person is committed to the goal, has the requisite ability to attain it, and does not have conflicting goals, there is a positive, linear relationship between goal difficulty and task performance' (Locke & Latham, 2006, p. 265). The explanation provided in the literature for this phenomenon is that people put in greater effort and try harder and for longer when a goal is more difficult, except when the individual lacks commitment or has reached the limits of their ability (Locke 1990).

Goal setting theory makes it clear that specific high goals lead to even higher performance than non-specific goals, such as asking people to do their best. Specific goals improve task performance because they provide a template that maps out the type and amount of effort needed to complete the task (Bandura, 1986). The weakness of 'do your best' goals is that they are not defined and have no external reference points against which progress can be monitored. Therefore, for a goal to be 'specific' there must be no doubt as to whether it has been achieved or not. It is desirable that the achievement of the goal must be verifiable in some way or by some objective or accepted criterion (Coe, 2000).

The second way in which goals can affect performance is by focusing attention on the activity being pursued, hence the choice of goal is important as this choice directs attention and action to a specific task and away from other tasks. In goal-related activities, Rothkopf and Billington (1979) found that students with specific learning goals paid attention to and learned goal-relevant prose passages better than pieces of prose that were unrelated to the set goals. Other researchers have argued that this aspect of goal setting can in fact have a

detrimental effect on performance (Ordonez, Schweitzer, Galinsky, & Bazerman, 2009). They claim that removing the focus from other aspects of an activity to focus on only one area may lead to the neglect or exclusion of the other areas of an activity, areas that may be equally important but do not have a specified goal.

Thirdly, many studies (Latham & Frayne, 1989) have found that it does not matter by whom the goals are set; goals that are set by the individual, that are assigned, or that are jointly formulated are all equally effective provided they have been accepted by the individual. Goals need to be negotiated and agreed upon but, most importantly, a commitment to the goal has to be made by the individual.

The effects of goal setting seem to go beyond simply increasing motivation and many studies have found that individuals develop their own task strategies in response to the goals they have set themselves (Locke & Latham, 1990; Locke, Latham, Saari, & Shaw, 1981). The strategies people develop to complete a task and hence achieve their goal fit into three different levels. The first level of strategy involves drawing on skills, knowledge and methods that the individual is already familiar with and in which they are competent. The second level of strategy involves the person applying known methods, skills and knowledge to a new situation. The highest level of task completion strategy involves deliberate planning to develop the skills, knowledge and methods necessary to complete the task and hence achieve the goal (Smith, Locke, & Barry, 1990).

Researchers have also identified limitations and possible dangers of goal setting (Locke & Latham, 1990, 2009), including goals acting as a ceiling for performance, the effects of ignoring non-goal areas, and goal setting leading to inappropriate risk taking. Some researchers go even further, suggesting that goal setting has 'gone wild' and that goals are over prescribed. One group of researchers has proposed that goal setting has the potential to lead to unethical behaviour (Schweitzer, Ordonez, & Douma, 2004) and as such should be closely monitored and issued with a warning label (Ordonez et al., 2009). Locke and Latham (2009) dismissed these suggestions criticising the authors' use of emotive language and labeling the authors as reporters, using anecdotal evidence and personal biases to support their claims, rather than 'embracing good scholarship'.

Locke and Latham (1990) have readily acknowledged there are limitations to goal setting. Aspects of the limitations of goals and goal setting have been described with respect to the mediators of goal setting and the moderators of goal setting. According to Latham and Locke (2007), the mediators of goal setting are goal choice, effort, persistence and the strategy used to achieve the goal. A mediator accounts for the relationship between goals and

performance and as such can affect the actual attainment of the goal. Moderators, on the other hand, influence the strength of the relationship between goals and performance. For example, the moderators of goal setting could include ability, commitment to the goal, feedback in relation to the goal, complexity of the task and external influences that affect the situation in which an individual is operating, such as the provision of external resources (Latham & Locke, 2007). If ability is taken as an example, then an individual's ability would affect the type of goal chosen; an individual with less ability may choose a relatively easier goal than an individual with higher ability. An individual's ability does not preclude them from actually attaining the goal or performing at a particular level, however, what an individual's ability may do is affect the type and difficulty of the goal that the individual is aiming for.

There are two factors that affect the goal an individual might choose; these are the importance of the goal to the individual and feelings of self-efficacy (Latham & Locke, 2007). Perceived self-efficacy is described as the self-confidence or self-belief to, in this case, achieve the goal. Self-efficacy affects goal setting in a number of ways. When goals are set by an individual with high self-efficacy, they tend to be higher goals than the goals individuals with low self-efficacy might set. People with high self-efficacy have also been shown to be more committed to their goals (Locke & Latham, 1990, 2002; Seijts & Latham, 2001).

Goal setting theory identifies the existence of a relationship between having a goal and performance but it is social cognitive theory (Bandura, 1986) that provides us with an explanation as to why goals motivate us and hence improve our performance. Goals specify the requirement for personal success; they enable the individual to see a vision of where they want to be. Hence goals can map out a persons' response to their performance enabling them to clearly define the criteria for their success and how to achieve that success. The greater effort needed for challenging goals is associated with an increased sense of satisfaction and hence a higher sense of self-efficacy when the task is completed (Locke & Latham, 1990). Locke and Latham (2006) argued that the greater an individual's success in achieving a challenging goal the greater the individual's well-being in terms of pleasure, satisfaction and happiness. The increased feeling of satisfaction improves perceived self-efficacy and this then encourages an individual to continue with the pursuit of the goal until it is achieved, ultimately leading to the setting of more challenging goals.

To sum up, the psychological literature on goal setting suggests that it leads to greater performance by directing attention toward a task, by affecting the intensity of our actions, by affecting our persistence and by encouraging people to search for the appropriate strategies to

complete the task. This literature review will now consider how these conclusions apply to the area of education.

Goal Setting – in education

Goal setting has been applied in education although there have been fewer studies in this particular field of goal setting. However, there are some indications that goal setting can and does work in educational settings. Although few of the studies Locke and Latham completed in their 40 year study of goal-setting used school achievement as the outcome, the studies 'do indicate how critical goals are for enhancing performance' (Hattie, 2009, p. 164). In a meta-analysis of educational interventions, Hattie (2005) found that setting challenging goals was important in raising achievement in schools. In his paper, he used the results from a synthesis of over 500 meta-analyses to develop a scale in which educational interventions are placed. Hattie found that there were few interventions that were actually detrimental to student achievement. However, when interventions were compared with the average effect over all interventions (average effect size = 0.4 standard deviations), only a small selection of interventions were found to have statistically significant impact on student achievement. Setting challenging goals had an effect size of 0.59 standard deviations which was greater than the average and thus demonstrates that setting challenging goals is worthwhile in terms of improving achievement. The meta-analysis showed that giving feedback had the highest effect size (0.81 standard deviations), and this intersects with goal setting theory, since feedback is an important element in measuring the progress of an individual against a target. The relationship between goals, feedback and improved student achievement is discussed later in the review.

As with goal setting in the workplace, goal setting in schools and in the classroom has the potential to improve achievement by motivating students to reach their goals. Rutter (1979) noted that having, sharing and working toward a common goal was evidence of good morale and effective teaching in schools. There are some studies in education that have shown that teaching low-achieving students to set goals for themselves enhances academic achievement and students' intrinsic interest in the subject being studied (Bandura & Schunk, 1981). In the classroom, achievement is enhanced to the degree that students and teachers set challenging rather than 'do your best' goals relative to the students' present competencies (Hattie, 2009).

The goal mechanisms outlined in the previous section on goal setting theory (effort, focus, persistence and strategy use) apply to the educational context as well as the business environment. The central idea in goal setting theory, that the more difficult the goal is the more effort the individual will put in has also been shown to apply in educational studies about goals. For example, Schunk (1983) investigated the effects of goal difficulty on the performance of children who lacked division skills in mathematics. The results indicated that students with the more difficult goals tried harder and maintained their motivation for the task for longer periods of time, providing the goal was realisable for the student.

The idea that individuals may develop their own strategies in the educational context in response to a goal or a target is also supported by research conducted by Elliot and Dweck (1988). They demonstrated two types of goals that students pursue in achievement situations. The first is a performance goal where students seek to maintain positive judgments of their ability that focus on extrinsic factors such as grades, rewards, or approval from others (Pintrich & Schrauben, 1992). The second type of goal is a learning goal. In a learning goal, the motivation for success is intrinsic and, as such, individuals seek to increase their ability, improve learning or master new tasks by forming new strategies (Nicholls & Dweck, 1979), by persisting over time and by risking displaying mistakes to increase their competence (Elliott & Dweck, 1988). One of the skills that students have also been shown to develop as a response to target setting is error detection (Hattie & Timperley, 2007). Error detection skills allow students to provide their own feedback and therefore seek better strategies to complete the tasks required to achieve their goals.

Self-efficacy again plays an important part in the goal-performance relationship in education. Self-efficacy is a personal judgment about one's ability to perform certain tasks in order to achieve specific outcomes. In education, these outcomes refer to academic performance. Educators have long recognised that students' beliefs about their academic capabilities play an essential role in their motivation to achieve (Bandura, 1977; Zimmerman, 2000). The beliefs people have about themselves are a key mediator in achieving the goals they have set for themselves (Carroll & Garavalia, 2004). In the context of goal setting in education 'self-set goals, assigned goals, self-efficacy and ability are related to academic performance' (Klomegah, 2007).

In educational research on goals it has been shown that goals improve focus, that is, any effort that is directed towards an activity or task. This effort may vary in terms of intensity and/or duration. The more difficult a valued goal the more intense are efforts to achieve it. However, other researchers have found that goals in and of themselves do not

ensure successful academic performance (McKeachie, Pintrich, & Lin, 1985; Schutz & Lanehart, 1994). Goals need to be placed in the context of a long-term plan or life-goal and as a result the goal becomes much more powerful and meaningful to the individual (Meyer et al., 2006; Schutz, 1997). Placing a goal in the context of a long-term plan, for example gaining a degree in science, provides additional motivation to achieve goals in the classroom.

In education, goals can be developed for a whole school, for groups within a school and also for individual students. Regardless of the level of implementation, the underlying psychology and motivational principles remain the same. From the preceding paragraphs it can be concluded that having a goal can aid achievement providing it is selected wisely; the goal must be challenging yet not beyond the student's grasp. Further, the goal must be relevant to the long-term plans or life-goals of the student and measurable so that accurate feedback can be given as to what the student has achieved so far and what still needs to be done to reach it.

Goals and Feedback

There is a significant body of evidence that suggests that one aspect of teaching and learning that enhances student outcomes is feedback. 'Feedback is information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, meta-cognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies' (Winnie & Butler, 1994, p. 5740).

Individuals require feedback that provides information about their progress in relation to their goals. Feedback is a moderator of the goal-performance relationship in that the combination of having a goal and gaining feedback on progress toward the goal is more effective than goals alone in improving performance (Locke & Latham, 2002). For feedback to work efficiently, the students and the teachers must have a clear understanding of the standard or goal they are aiming for. It is difficult to measure progress towards a goal without feedback that indicates what has been achieved and what remains to be done. Feedback is required so that further effort can be exerted or a change in strategy implemented. Feedback can also offer reassurance that the goal or target is within reach and that progress towards the goal is being made. Black and Wiliam (1998a) found that in the classroom 'the provision of challenging assignments and extensive feedback leads to greater student engagement and higher achievement' (p. 13).

Hattie and Timperley (2007) also suggested that the most effective forms of feedback relate feedback to learning goals. Feedback is the mechanism by which students are able to

monitor where they are in relation to their goals and enables students to correct or readjust the strategies they are using. In addition, Crooks (1988) found that for assessment to improve learning, the feedback given to students in class needed to be specific, constructive and frequent. Feedback needs to be effective in relation to individual students' outcomes and not serve only social or classroom management purposes (Black & Wiliam, 1998b). To be effective, feedback needs to give useful advice on exactly how the student can improve.

Feedback is necessary not only at the individual level but also at the system or institutional level. As with individuals when organizations have goals then feedback towards the goals can enhance performance, inform the next steps as well as signal when to introduce, adapt or end strategies that will lift the achievement of the school as a whole (Easterby-Smith & Arauyo, 1999).

Hattie (2009) described feedback as an important correlate of student achievement, but advises caution about the type of feedback given because he is referring to a specific type of feedback when he refers to its impact on student achievement. It is the feedback to teachers about what students can and cannot do that provides the most powerful link to student achievement. Feedback is also required for teachers to see where they are in terms of the goals they have for their students allowing teachers to address any misconceptions they have about what students have or have not learned. Feedback from assessment tests should be used to discern students' learning needs and to adapt teaching practice accordingly. This type of feedback is just as important as the feedback to students themselves (Hattie, 2009), particularly as it may help to address any erroneous expectations that teachers may have made about their students.

Goals and Teacher Expectations

Another important aspect of teaching and learning that affects student achievement is teacher expectations. Good and Brophy (1997) defined teacher expectations as 'inferences that teachers make about the future behaviour or academic achievement of their students, based on what they know about these students now' (p. 79). Timperley and Phillips (2003) and Good and Brophy (2000) suggested that teachers' beliefs about students' expected achievement become their goals for the students. This idea is an important one because, if teachers' expectations become their goals for their students, which in turn shape their instructional practices, then low expectations could result in inappropriate goals and teaching might be pitched at the wrong level. Research does confirm that teacher expectations can and

do affect what takes place in the classroom, from teacher planning to the day-to-day instructional strategies of teachers.

Teachers' expectations of students have been shown to affect the academic performance and behaviour of students and as Tinto commented 'no student rises to low expectations' (Bamburg, 1994; Good, 1987; Good & Brophy, 1997; Tinto, 2008; Weinstein, 2002). Expectations can affect the classroom climate (Darley & Fazio, 1980; Rosenthal, 1974, 1991), from the feedback that is given to students (Rosenthal, 1974, 1991), to the quality and quantity of question and answer interactions in the classroom. In fact, Good and Brophy (2000) suggested that there is now sufficient evidence to show that teachers' expectations can be a self-fulfilling prophecy for student achievement.

Research in New Zealand indicates that there are problems around some teacher expectations (Bishop, 1989; Bishop, Berryman, Richardson, & Tiakiwai, 2003; Hillard III, 1991; McNaugton, Phillips, & MacDonald, 2000; Timperley, Robinson, & Bullard, 1999); teachers in New Zealand may have inappropriately low expectations of some students (Alton-Lee, 2003), with some expectations being 'nearer the floor than the ceiling' (Rubie, 2003, p. 37). There is also research evidence to suggest that teacher expectations for student achievement are affected by student ethnicity (Rubie-Davies, Hattie, & Hamilton, 2006), student gender and/or the socioeconomic status (SES) of students (Auwarter, 2008).

Teacher expectations are driven by teachers' beliefs (Good & Brophy, 1997; Timperley & Phillips, 2003). If a teacher believes student outcomes are affected by things they cannot change, for instance, student ethnicity, gender or SES, then they may perceive that their efforts in the classroom cannot change those outcomes (Diamond & Spillane, 2004). Therefore, this belief will affect teacher actions in the classroom such as planning, task selection and interactions with students, as well as feedback and marking. When teacher expectations of students are low, teachers are likely to provide non-challenging tasks and teach less to students rather than more (Delphit, 1995). These expectations are not explicitly shared with individual students. Rather they are more subtly enacted through teacher behaviours. Because teacher beliefs affect teacher behaviours, they therefore may not only affect individual students but whole classes of students as well. If an individual student or group of students accepts teachers' expectations for them, it can lead to a self-fulfilling mechanism whereby the students whose teachers have high expectations tend to fulfill these expectations, while the converse is also true (Good & Brophy, 2000).

Sammons, Hillman and Mortimore (1995) established in their review of school effectiveness research that, when schools and teachers have high expectations of their

students and engage them with challenging work, student outcomes are improved. These high expectations of students have been found to have a strong influence on what takes place in the classroom (Tizard, Blatchford, Burke, Farquhar, & Plewis, 1988) and it has also been found that more progress was made by students in classes that were stimulated and challenged (Mortimore, Sammons, Stoll, Lewis, & Ecob, 1988; Reyes, Scribner, & Schribner, 1999).

Bandura (1992) determined that when teachers display the conviction to students that their achievement can be raised, it enhances the self-esteem of students, and in this way high expectations can be translated into improved student outcomes. The balance between high expectations and expectations that are too high has to be carefully managed. Expectations that are too high can cause the student to exert less effort when they are perceived to be unattainable or may cause the students to give up (Locke & Latham, 1990).

The question of how a teacher draws conclusions about a student's ability and hence what to expect from them is an important one, particularly when it affects classroom practice. It is critically important then that teachers have a robust way of gaining information about students on which they can base high but realistic expectations. One source of useful information is the student's current achievement. Recent research has documented the large amount of data on students collected by schools that could be used for this purpose. The next section, therefore discusses the current uses of data in schools.

Goals and Data

This section of the literature review considers why assessment data is important to schools, educationalists and government. A brief examination of how data are used at each of these levels is conducted, beginning with formal accountability systems and what they intend to achieve and the outcomes that have arisen from these systems to date. Secondly data use in schools is explored and, finally, the use of student achievement data in the classroom is discussed. An explanation of why data and achievement data in particular can support schools in the preparation and monitoring of school and student goals is offered.

Data are information and information is important because it goes beyond personal observations and subjective impressions to contribute knowledge about situations and trends. In schools, achievement data are a particular type of knowledge that schools have always collected. Historically these data were used to sort students into academic groups for teaching purposes, for entry into the next level of study at school, for work, or as a stepping stone into further education institutions such as colleges or universities (Schmidt & Hunter, 1998).

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Over time as more and more data have been collected about student achievement, the existence and extent of a gap has been documented between the educational achievements of high socioeconomic, white and Asian students and their low socioeconomic, minority or non-white counterparts. These achievement gaps have been documented in most developed countries across the world including New Zealand (Alton-Lee, 2003; Bishop, Berryman, Richardson, & Tiakiwai, 2003; Jencks, 1971; Salmond et al., 2005; Timperley, Robinson, & Bullard, 1999).

As more and more knowledge has been collected and aggregated about student and school performance and disseminated into the public domain, there has been a raised consciousness about the performance of individual schools and the education system in general. The use of league tables in the UK is a particular example of this phenomenon. The availability of this information about schools and student achievement has put governments under increasing pressure to 'do something' about poor student outcomes and low achieving schools (Ravitch, 2002). In New Zealand, this has lead to the imminent introduction of National Standards in literacy and numeracy for all primary and intermediate schools (Ministry of Education, 2009).

In the context of the global economy, today's companies and businesses can invest anywhere in the world. To encourage companies to invest in their country, governments must ensure the skill levels of their existing and future workforces are good enough to compete with other countries; if the population's skills are not satisfactory, government must improve them or the country will be unable to compete effectively in the global economy. As a result of these influences and demands, policy makers in education are focusing on improving educational outcomes. This focus is directed at all students particularly as it is regarded as socially and economically counter-productive to have some sectors of the population failing to achieve educationally.

If these two ideas are considered together – being competitive in an increasingly global economy and attending to information that indicates there are sectors of the population that achieve poorly educationally – then the demand for governments to focus on improving achievement is critical. In the effective school improvement research, this is defined as the pressure to improve (Reezigt & Creemers, 2005).

Accountability in schools

The pressure to improve, to attend to the concerns related to standards and quality in education (Husen & Tuijnman, 1994) and to be competitive in the context of the global

economy, has instigated the introduction of a range of accountability practices in education systems across the globe. These accountability systems have allowed governments to focus on achievement for all, to monitor progress toward improvement and to provide evidence of improvement to the wider public.

Accountability measures provide information about what students have learned at school but being accountable is more than just being answerable for student performance. It also means having to continually improve student outcomes (Darling-Hammond, 2007). As such, schools in many countries including New Zealand are now required to set goals for student achievement and monitor their progress towards these goals. If the goals are not met then there is a requirement to explain why. This type of accountability has become 'the watchword of education, with data holding a central place in the wave of large-scale reform' (Earl, 2005).

Another justification for introducing an accountability system into education was to encourage teachers to adopt more effective practices and to motivate students to work harder. Hamilton, Stretcher and Klein (2002) go as far as to imply that external data and accountability systems drive changes in the daily interactions between teachers and students which then result in an increase in student achievement. Underlying the introduction of these accountability systems is 'the assumption that teachers will try harder and become more effective in meeting goals for student performance' (Newman, King, & Rigdon, 1997, p. 3). The claim that educational practices can be changed by implementing accountability policies was one of the policies underlying the *No Child Left Behind Act* in the USA (US Department of Education, 2004). In fact, this claim has been supported by many researchers but it can be argued that the changes may not always be for the better (Ingram, Seashore Lewis & Schroeder, 2004).

The question as to whether using data for accountability purposes affects student outcomes is an important one. One view is that data used in this way results in greater student achievement gains (Carnoy & Loeb, 2003); the other is that the cost of the accountability systems is too high (Seashore Louis, Febey, & Schroeder, 2005) and another is that schools are awash with data and yet barren in interpretation. This issue has been studied by several researchers. For example, Carnoy and Loeb (2003) found a positive relationship between the strength of accountability systems across American states and student performance, to the extent that those states that implemented strong accountability systems in the 1990s saw larger gains in student achievement. This relationship held true for White, Black and Hispanic students. On the other hand, Carnoy, Elmore and Siskin (2003) in their study into

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the effects of accountability systems, reported that schools made only slight to modest gains in state standardised tests and these gains were restricted to states with high-stakes testing policies. However, Horn (2003) found that the high stakes testing that resulted from tests being used for accountability purposes had an adverse impact on non-White and non-Asian students. In summary, many studies have been conducted on this theme but they have produced inconsistent findings on the effects of accountability policies on academic achievement (Amrein & Berliner, 2002; Grissmer & Flanagan, 2008; Raymond & Hanushek, 2006; Lee & Wong, 2004).

Assessment Data in Schools

Assessment data are also important within schools because they enable student performance to be monitored against school goals. Black and Wiliam (1998a) stated that data collected from assessments have three main uses at the school and classroom level; these can be broadly categorised as formative, to aid learning, and summative. Summative assessment can be further divided into two uses; summative – for review, transfer and certification – and summative – for accountability purposes.

Summative data collected after an assessment can be aggregated for different groups of students within a school. Killion and Bellamy (2000) found that 'school-based data analysis strengthens school improvement efforts'. In the 1980s, effective schools research revealed that successful schools used data to monitor students' progress. Fullan (2001) has urged schools to create the capacity to examine and make sense of student data, and make changes in teaching and learning based on this analysis. Hopkins and Reynolds (2001) also identified that collecting high quality data and feeding these data back into the school system is an essential part of school improvement. School improvement research also suggests that improved student outcomes result when goals are explicit in school development planning and progress towards them is monitored over time (Mortimore, 1998). This monitoring means it is possible to put in place remedial actions if things are not progressing according to the school development plan.

In terms of monitoring student performance, frequent and systematic monitoring of students, whilst not shown to have a direct impact on achievement itself, has however been shown to be an important ingredient in the work of an effective school (Sammons et al., 1995). This effectiveness occurs because monitoring student performance is a mechanism for seeing if the goals of the school are being realized, as well as focusing the attention of staff and students on these goals. To be able to monitor student achievement, there must be some

kind of expectations about what achievement is possible by students and the school. Another important element of an effective school as argued by Scheerens (1992) is proper evaluation measures at all levels of school, especially in the process of evaluating whole school performance against the schools goals. The incorporation of monitoring, evaluation and feedback of information into the decision making processes of a school ensure that information is used actively.

In addition to the use of data as an aid to raising student achievement, one of the side-effects of accountability measures and the pressure to improve has been an increased interest in understanding what has been proven to work in educational policy and practice. One approach, evidence-based practice, has been suggested as a way forward in improving student outcomes (Bailey, 2006). In the school improvement environment, there is a need to set goals and targets. It seems plausible to argue that, if you have no understanding of what is being aimed for in terms of academic achievement, then it will be difficult to reach these aims. Lai (2008) described target setting as being about 'using high quality evidence to develop a target that will help the school learn how effective it has been in raising student achievement' (p. 20). Only when you understand, clarify and define what you are striving for will you focus your energy and efforts on reaching your goals (Pring, 2004, p. 209).

Earl and Katz (2006) noted that educators, however, can be resistant to change when data create conflicts with information that teachers 'believe to be true'. In such circumstances policy makers and school personnel run the risk of making poor decisions when they ignore data or rely on inadequate data or data based on individuals' perceptions, opinions and/or limited observations rather than the evidence.

In the school effectiveness and school improvement literature many effective schools have been found to have well established routines and processes for monitoring the performance and progress of students, classes and the school as a whole (Sammons et al., 1995). In particular a focus on teaching and learning data has been shown to have an important role in raising expectations and improving performance, especially if the head teacher or principal of the school is engaged in the monitoring of student achievement and progress. Feldman and Tung (2001) suggest that, if teachers incorporate data analysis as a regular part of their professional activity, teachers become more reflective about their teaching practices.

Assessment Data in the Classroom

In the classroom, summative data are data that are usually collected after an assessment. These data provide the teacher and the student information about how well they did on the assessment. The information collected from this type of assessment does not affect what happens next in the classroom. Formative assessment on the other hand is used to inform and monitor the practices of the teacher and the student in the classroom. The following paragraphs discuss these two particular uses of data.

Many researchers including Black and Wiliam (1998a), Earl (2005), the Assessment Reform Group (ARG, 1999) and Sadler (1998) make the strong argument that by feeding achievement data on student achievement progress back to the teacher in the classroom, student achievement will be raised. When teachers are required to use data and evidence-based models to inform their teaching practices, then the achievement of students is improved (Hattie, 2009). Stiggins (2002) makes an important distinction between assessment of learning (summative) and assessment for learning (formative). In assessment for learning, tests help to identify students' strengths and/or weaknesses and provide information to ensure that students are on track to reach their goals. Educational research has long advocated assessment for learning by using test data to aid teaching and learning.

Flecknoe (2001) discussed the teacher's role in target setting and stated that 'knowing whether the target has been attained is crucial to the success of target setting and is squarely in the teacher's court' (p. 224). There is evidence however to suggest that teachers could use these data more efficiently, in the drive to raise academic achievement (Robinson, Timperley, & Phillips, 2002). In a study of 26 New Zealand primary schools, Robinson et al. (2002) found a substantial amount of test score data were collected about students' literacy skills throughout the course of one year but almost half of the data were not analysed in ways that were useful for teaching and learning. Furthermore, evaluations about teaching programmes at the schools in the study were frequently not data-based. Kirkup, Sizmur, Sturman and Lewis (2005) found that only two fifths of teachers in UK schools used data to track student progress and less than a quarter used assessment data to set targets for students.

In conclusion, the collection of achievement data can be used to set goals and targets for students and to improve student performance, when it is used to find and analyse problems, improve teaching and learning practices and respond to internal evaluation and accountability measures.

Goals and Leadership

Since the 1960s researchers have been investigating the factors that make some schools more effective than others (Mortimore, 1991, 1998; Reynolds, 1976; Rutter, 1979; Sammons et al., 1995). An effective school is defined as one 'in which students' progress further than might be expected from consideration of its intake' (Mortimore, 1991, p. 6). This definition implies that students from disadvantaged backgrounds are as likely to do as well as those students from advantaged backgrounds, provided students starting points are taken into consideration.

One factor that is prevalent in all these studies is the impact of leadership on student outcomes. Edmonds' (1979) research into effective schools in the USA identified five features of the effective school and one of these was strong leadership. In the UK, Sammonds, Hillman and Mortimore (1995) reviewed effective schools and identified a list of ten 'key determinants' that could be associated with effective schools. One of these was professional leadership. (As an aside, a second was having shared goals and vision). Gray (1990) has argued that 'the importance of the headteacher's leadership is one of the clearest messages from school effectiveness research'.

More recent research on leadership within schools has investigated the types of leadership that influence student outcomes (Robinson, Lloyd, & Rowe, 2008). In this paper, leadership types were broadly categorised into two main types; these were instructional leadership and transformational leadership. Using meta-analysis techniques, the authors identified five leadership dimensions that impacted on student outcomes. One of these dimensions was establishing goals and expectations for the school, including setting, communicating and monitoring the goals. The effect size of this dimension indicated that this had a 'moderately large and educationally statistically significant effect' on student outcomes (effect size, $d = 0.42$ standard deviations) (Robinson, Lloyd & Rowe, 2008). Research on leadership characteristics that impact positively on student outcomes also includes references to having goals that can be shared (Robertson, 2008). For example, Robinson, Hohepa and Lloyd (2009) identified the following concepts in school leadership as important: leaders establishing goals and expectations with a clear emphasis on academic learning goals; goals that are embedded in school routines and leaders ensuring staff systematically monitor student progress. Goal setting affects student outcomes because, when the principal and/or the leadership of a school articulate the vision and goals of the school and share this with the staff and the students, a unity of purpose is developed at the school (Sammons et al., 1995).

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This unity of purpose, particularly when combined with a positive attitude to learning directed towards students, is a powerful mechanism for raising student achievement because teachers in schools can work collaboratively towards that explicit common goal.

Summary

There is a common agreement within previous research that having goals is a characteristic of an effective school; these goals should be articulated clearly and shared and goals should exist as part of school development planning as explained in school improvement research (Sammons et al., 1995). It has also been found that effective school leaders typically have clear goals for the school that are shared with school staff (Roberston, 2008). For example Robinson, Hohepa and Lloyd (2009) identified the following aspects of school leadership as important; school leaders established goals and expectations with a clear emphasis on academic learning goals. Goals should be embedded in school routines and that school leaders ensure staff systematically monitor student progress. So clearly articulated school goals are indeed a key factor in the drive to raise educational outcomes for all students.

However, the problem identified in the research review, and addressed in this study, is that there is no explanation in the literature of the mechanism by which goals operate *within* a school, or how they are established, particularly with regard to academic achievement. In the studies mentioned previously, there is a consensus that data are a key factor in raising educational outcomes for students but the two mechanisms (the use of data and goal setting) are not explicitly linked together.

At the classroom level, research by many authors have suggested (Black & Wiliam, 1998a, 1998b; Clarke, Timperley, & Hattie, 2003) that teachers should use the data collected from assessments in a formative manner, as well as in a summative way. However, in the literature these suggestions are usually presented separately to any whole school action and are not linked together to form a coherent strategy to improve student outcomes. The academic achievement data pertaining to students do not flow around all the systems of the school. Achievement data are collected but not necessarily used to its best advantage to evaluate programs (Parr & Timperley, 2002) or to inform teaching practices.

This study attempted to address this problem and provided a structure through which academic achievement data were collected about students and flowed around school systems with a view to improving student outcomes by developing academic achievement targets. Academic data were used to develop individual achievement targets for students which were

then aggregated to form whole school goals. The targets were shared with the students and monitored via two mechanisms, academic counselling and in classrooms with subject teachers. The goals were shared with staff and were used in the school's strategic and annual planning documents, which were submitted to the Ministry of Education. These documents also provided the information upon which the statement of variance was prepared at the end of each academic year. In the classroom, the targets were used to assist with the formation of teacher expectations and to avoid teachers' expectations being based on students' personal characteristics. The targets included an element of challenge so it was hoped that students and teachers were continually looking to improve their performance.

Conceptual Models for Study

The aim of this study was to use the large quantities of academic achievement data collected about students in a positive and constructive way by developing targets in order to foster high expectations and to raise the achievement of students. These targets were developed for students at the individual level and then those individual targets were aggregated to form whole school targets for Year 9 and Year 11 students, thus forming some of the academic goals of the school for inclusion in the school charter.

The preceding paragraphs of this literature review have explored the theories that are important in the two models that were used to frame this study. The first model in the framework was a macro, whole school model. The second model was a micro model in that it concerned the use of achievement data within a classroom.

Macro Model

At New Zealand High School (NZHS) prior to the intervention described in this thesis, academic achievement data were used primarily for sorting purposes – for class composition in Years 9 and 10, then later for entry into the next level of a course or subject – and to satisfy legislative requirements as defined in National Administration Guideline (NAG) number 2. In New Zealand, The National Administration Guidelines (NAGs) for school administration set out a statement of desirable principles of conduct or administration for specified personnel or bodies (Ministry of Education, 2005b). Large quantities of data were collected about students' achievement but much of it was used in a limited way; in general the data were used to assess 'how well the school had done' to satisfy the legislative requirements of the government (via NAG number 2) to inform the (local) community of this and was in direct response to the pressure to improve (Reezigt & Creemers, 2005). The

achievement data could be regarded as static as it did not flow through all elements of the school structures.

The macro model proposed in this study is presented as a diagram in Figure 2. In the model, there are sets of arrows that represent information circulating through the school structures. The information flowing throughout the school is achievement data. Lai (2008) described target setting as using evidence to find out how effective the school has been in raising student achievement. This suggests that target setting is a continual cyclical process that involves using academic achievement data as a dynamic medium that flows around all elements of the school.

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Figure 2: Conceptual macro model to show the flow of data around a school.

Note: Arrows represent data flow around the school and out into the wider educational context.

Wider Educational Context (E.g. National Administration Goals (NAGs)/ National Educational Guidelines (NEGs))

The School

Senior Management Team Board of Trustees

Pastoral Teams

Departmental Teams

Students

Goals

Goals

Goals

Goals

Targets

Targets

Achievement Data

Academic Counselling Feedback & Monitoring

Subject Targets Feedback & Monitoring

Accountability

PRESSURE TO IMPROVE

KEY:

Data hub

Feedback and Monitoring

Data flow

Accountability

Pressure to improve

The first two sets of arrows discussed are those pertaining to accountability and the pressure to improve which, as described above, existed prior to the intervention researched in this thesis.

The second National Administration Guideline (NAG) details legislative requirements that relate to planning and reporting in schools. The NAG's require schools to give evidence about student achievement, set goals for improvement and report on progress made with reference to the goals (Ministry of Education, 2005b). In the macro model, the requirement of NAG number 2 is represented by the pressure to improve arrow coming from outside the school but exerting pressure on the school. These arrows also represent pressures from the local community.

The black arrows that project outwards from the Senior Management Team/Board of Trustees (SMT/BOT) box within the school represent the requirements for schools to report back to the Ministry of Education and accountability. An analysis of variance is the main constituent of the report required of schools in response to NAG number 2. The analysis of variance reflects the extent to which schools have met their goals and if the goals are not met then an explanation of this variance from the goals is required in the report. The black arrows also represent aggregated achievement data that the school might disseminate to its local community and other interested groups, such as school improvement initiatives that the school may be involved in.

The school structures referred to in the macro model in Figure 2 are groups of people within the school and are represented by the boxes labeled, Senior Management Team/Board of Trustees, Pastoral Teams, Departmental Teams and Students. The data in this macro model are more dynamic and data flow around the school structures informing planning and professional development of staff, and are used as a way of monitoring and improving student achievement.

In the new framework, achievement data from students were used to develop goals and targets for students which were then aggregated to form the whole school goals that fulfill the requirements of NAG number 2. This process of developing targets for the students which, when aggregated, form the school goals is represented by the solid arrows leading from the students to the data hub. At the centre of the model, represented by a black eight pointed polygon in Figure 2, is the data hub; it is here that data are collected, sorted and analysed, and then redistributed in a more coherent form as targets and goals for staff and students to digest. The targets and goals flow to the pastoral teams who then disseminate this information to the students in academic counselling sessions. The targets and goals for the

students also flow to departmental subject areas so that the subject teachers can use this information to help formulate positive expectations for students.

Having a shared vision and shared goals is a key element in school effectiveness (Sammons et al, 1995) and, when the school principal establishes and shares the goals and expectations for the school with staff and students, then student achievement is enhanced (Hattie, 2009). This study provided the data to develop goals that were shared with staff and students. In the macro model the concept of using student achievement data to develop the whole school's goals is represented by the solid arrows that lead outwards from the SMT/BOT box in the model shown in Figure 2 to two groups of people, the pastoral and departmental teams.

The targets and goals for the school and for individual students reach the students in two ways, via the pastoral teams in academic counselling and via subject teachers, who are part of the departmental teams. Dialogue between the pastoral and departmental teams and students is represented in the macro model in Figure 2 by the feedback and monitoring double headed arrows. Feedback and monitoring of student progress are important elements in goal setting theory (Locke & Latham, 1990, 2002, 2006) and school improvement theory (Teddlie, Kochan & Taylor, 2002); it is through these mechanisms that students and teachers can decide if they are on track to meet their goals or if any remedial action is required to meet them.

At the centre of the macro model is the data hub, where the main analysis and data management aspect of school data is located. Data flow into this hub and are formulated into the targets for the students and the whole school. The data hub also provides feedback on progress to the departmental teams, the pastoral teams and the SMT/BOT. Associated with the data hub is the position of a person or persons, who can manage, analyse and report on the achievement data.

Micro Model

Together, goal setting, high expectations for students and feedback are the key ingredients in the framework for the second theoretical model used in this study. In the classroom 'this would mean holding high expectations of students, monitoring the students' progress towards realizing those expectations and adjusting teaching methods when existing actions do not result in the desired outcomes' (Timperley & Phillips, 2003, p. 629).

High expectations are now accepted as a correlate of effective schooling (Teddlie & Reynolds, 2000). Teachers' expectations, high or low, result from their beliefs about student

academic performance and affect teacher behaviour in the classroom (Good & Brophy, 1997). Timperley and Phillips (2003), in their research about teacher expectations, state that teachers' beliefs about students' achievement become their goals for the students and as such shape the teachers' classroom practices.

Teacher beliefs are also linked to teacher efficacy – the idea that teachers can motivate and instruct students successfully. Teachers with high efficacy believe their students can achieve highly; conversely, teachers with low efficacy believe they are unable to change student outcomes because of the students' backgrounds or other characteristics.

The ideas discussed above form the theoretical framework for the micro model, which is represented in the diagram below, Figure 3.
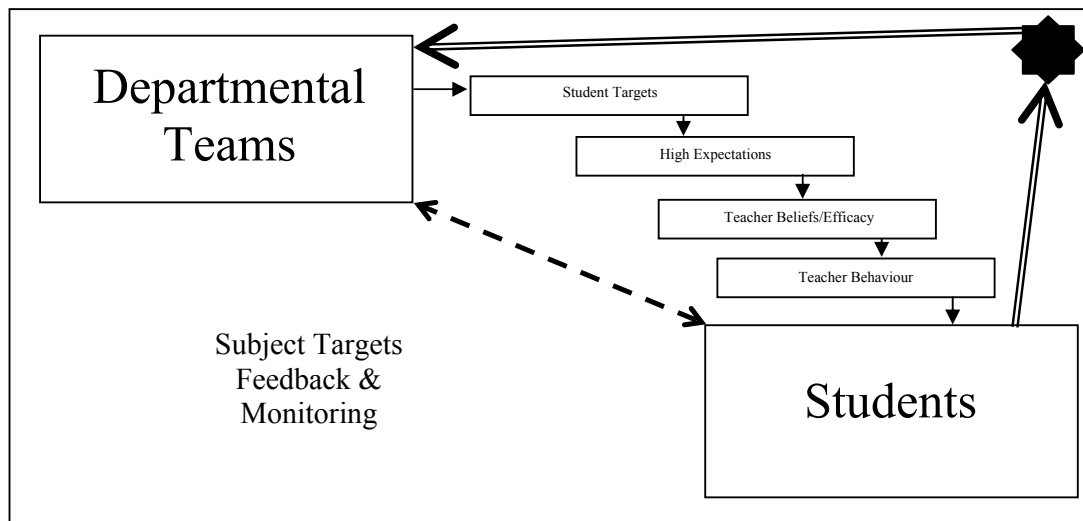
Figure 3. Conceptual micro model.

Figure 3 examines the link between the Departmental teams and the student groups, as portrayed in the macro model Figure 2. The information regarding student targets and the school goals comes from the data hub and the SMT/BOT and flows to the subject teachers who make up the departmental teams. The micro model describes the theoretical framework in which achievement data informs the students' targets, which then help teachers formulate positive high expectations of students; these high expectations impact on teacher beliefs and efficacy as described in previous sections of the literature review, and this in turn affects teacher behaviour in the classroom. The monitoring and feedback arrows from the macro model are still in place ensuring that students and teachers are on track to reach the student targets and goals.

Conclusion

The aim of this literature review was to identify the main elements of relevant educational theory that frame the research in this study. The framework developed in the study drew on aspects of schooling improvement theories relating to data use, such as monitoring and evaluation of achievement data, and then used the data to form student and school goals, thus linking it to theories in effective schooling research. The formation of the targets and goals from the student achievement data enabled information to be provided to teachers to aid the formation of positive and high expectations of students.

CHAPTER THREE

Methodology

This study sought to examine how the development of individual academic targets would impact on student achievement at a secondary school in New Zealand. The study employed a mixed methods methodology to answer the two research questions: 'To what extent does the development of individual student academic targets impact on student achievement?' and 'Does the development of individual academic targets impact differently on different sub-groups of students in the school?' A quantitative methodology was used, firstly, to determine the targets for individuals and then the whole school and, secondly to evaluate the success of the implementation. A small qualitative study was also undertaken to understand the implementation of the target setting to determine teacher's attitudes towards the use of the targets. The qualitative study was employed to answer the research question. 'What are teachers' experiences of target setting?' The methodology and results of the qualitative study are presented in Chapter Seven.

Design

The main purpose of experimental studies is to determine the possible influences that an intervention has on other factors. Experiments are the classic method of the science laboratory, and are sometimes claimed to be the most sophisticated and powerful method for discovering and developing an organised body of knowledge (Best & Kahn, 2003). Experimental research provides a systematic and logical way for answering the question 'if this is done under carefully controlled conditions, what will happen?' Experimental studies are often useful in addressing questions about the effectiveness and impact of programs (Gribbons & Herman, 1997). The final decision on the success of an intervention, in these types of studies, is frequently framed in the language of probability.

There are two main categories of experimental study design; these are true experimental design and quasi-experimental design. 'The controlled experiment is the desired model of science' (Kerlinger, 1986). A true experimental method in its purest from is only possible to effect in a laboratory that allows rigorous control of all external factors that might impact on the intervention. Although rare, true experimental designs have been applied in research into the social sciences and education where statistically significant factors and variables can be controlled to some degree. The main feature of this type of experimental

design is the creation of two groups of research subjects. The first is the experimental group to which the implementation is applied and the second is a control group to which the implementation is not applied. Each group is tested using a common assessment tool at the beginning and end of the research process. This type of design is frequently called the randomised pretest–posttest control group design.

The second feature of this type of design is the random assignment of the unit of investigation to the experimental group and the control group. Randomisation of the unit of investigation is important because this ensures greater apportioning of any factors or characteristics of the subjects which might affect the experimental variables in which the researcher is interested (Cohen & Manion, 1994). Randomisation allows the researcher to determine whether it was the intervention and not the difference in the groups that produced the outcome in the experiment. In effect, randomisation allows 'apples to be compared with apples'.

It is unfortunate that in educational research it is not always possible to undertake true experimental studies because it is impossible to rigorously control external factors that may impact on the research. In these instances researchers may be able to employ something approaching a true experimental design; these situations are called quasi-experimental. Kerlinger (1986) referred to quasi-experimental situations as 'compromise designs'. Quasi actually means likeness or resembling, so quasi-experiments share characteristics of true experiments which seek to evaluate interventions or treatments. In particular, a quasi-experimental design might be used when it is not feasible for a researcher to use random assignment of the unit of investigation to the experimental group and the control group, as in the case reported in this thesis.

There are different types of quasi-experimental designs but the specific type of quasi-experimental design employed in this study was a non-randomised control group pretest–posttest design. This is one of the most common quasi-experimental designs used in educational research and can be represented by the following diagram (Figure 4).

$$E \quad\text{----------}\quad O_1 \quad\text{----------}\quad X \quad\text{----------}\quad O_2$$
$$C \qquad\qquad O_3 \qquad\qquad\qquad\qquad O_4$$
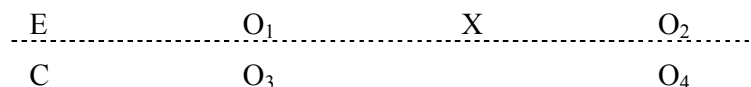
Figure 4. Pictorial representation of a quasi-experimental design.

The dashed line between the experimental group (E) and the control group (C) indicates that the groups have not been formed using randomisation.

This type of design involves two groups to which participants have not been randomly assigned and incorporates a measure of achievement before the intervention, in this case, target setting (O_1 and O_3) and after the intervention (O_2 and O_4). X represents the target setting intervention and is only applied to the experimental group. This type of design is used more often in educational research because random assignment of students to groups is not always possible but, without random assignment to groups, there is no guarantee that prior to the intervention the two groups were similar in every respect.

Validity

In all educational research there are two factors that need particular attention; these are internal and external validity. Internal validity means the ability to eliminate other explanations for the outcome, so that the researcher can be sure that it was the intervention that resulted in the outcome gained and not any other factor (Neuman, 2003). External validity on the other hand is the ability to generalise the conclusion found in the experiment to events and settings to the general population (Neuman, 2003). The amount of control an experimenter has over the conditions of the research is related to internal and external validity. Laboratory experiments tend to have greater internal validity but lower external validity, because the conditions of the research can be rigorously controlled yet are difficult to reproduce in the other situations. The reverse is true for field experiments like those of a quasi-experimental design, because the conditions of the research cannot be so easily controlled but are more reproducible in other situations outside the laboratory. Quasi-experimental designs are more difficult to control but are more reproducible in the 'real world', they may be more at risk from internal validity issues than true experimental designs conducted in the laboratory, but have greater external validity. The implications for this study and its quasi-experimental design were that the results would be indicative of the effect of target setting in NZHS, but it would also be prudent to acknowledge other factors that may have affected the outcomes. These factors are discussed in each study.

Since quasi-experimental designs are frequently used when randomisation is impossible and/or impractical, this means they have the advantage of being easier to organise, set up and conduct. As mentioned earlier with respect to validity, quasi-experimental designs are more easily reproduced in other settings and hence the conclusions generated from this type of experiment can be more generalisable to the whole population. The disadvantages of

quasi-experimental designs are the inability to rigorously control all factors that may influence the unit of investigation, as is possible in a laboratory conducted experiment. The failure to randomly assign the unit of measurement to a control group and an experimental group makes it harder to rule out confounding variables and introduces threats to the internal validity of the experiment; as a result, conclusions of a causal nature are difficult to determine (Neuman, 2003).

Participants

The participants involved in the target setting initiative being examined in this study were Year 9 and Year 11 students from the academic year 2007. The students were part of a large secondary school in Auckland where a new intervention called academic counselling and target setting had been introduced. These students were chosen as participants because they used two different types of assessments, asTTle (assessment Tools for Teaching and Learning) (Ministry of Education, 2005a) and NCEA, and the intervention required the development of an effective target setting practice for individual students and the whole school that would work with both of these types of data. In addition to the participants in the academic counselling and target setting initiative, student data were used from previous cohorts of students to establish the targets. The groups of students who were used as the control group were the students from the previous academic year. Specific details of each of the groups of participants and the control group used in this thesis are reported in each study.

Cohort

The rationale for designating students by cohort was to clearly distinguish between each group of students whose data were used in this study; this was particularly necessary because the study collected longitudinal data over a series of years. A cohort of students was described by the year they started at NZHS and the year they sat NCEA Level 1. For example, cohort 35 represented all those students who began at the intervention school in Year 9, 2003, and sat NCEA Level 1 external examinations in year 2005. Students in Cohort 46 started at NZHS in Year 9, 2004, and took NCEA examinations in 2006. Two groups of students were the main focus of this study and had academic targets set for them; these were students from Cohort 57 and Cohort 79. The following table, Table 2, provides a description of all the cohorts in the study.

Table 2.

Description and Labelling Convention for Students in the Study.

	Year 9	Year 11	Label
Calendar Year	2003	2005	Cohort 35
Calendar Year	2004	2006	Cohort 46
Calendar Year	2005	2007	Cohort 57*
Calendar Year	2006	2008	Cohort 68
Calendar Year	2007	2009	Cohort 79*

KEY: * represents those students who were part of the academic counselling and target setting in 2007

Instruments

The analyses used in this study utilised data collected by NZHS from the New Zealand national examination system, the National Certificate of Educational Achievement (NCEA); the Middle Years Information System (MidYIS) and the assessment for teaching and learning (asTTle) tests, as well as demographic data, such as gender and ethnicity. The following paragraphs provide definitions of the terms and measures used in this study, as well as the groups, contexts and institutions that form the focus of this work.

NCEA

The National Certificate of Educational Achievement (NCEA) is the main National examination system in New Zealand. Introduced in 2002, NCEA is a standards-based examination system, meaning that students are required to demonstrate they have achieved the criteria for the standard, rather than being ranked and compared to one another using a percentage or a score. Students study standards on various topics which are combined to form a subject and then combined again to form the main National Certificate of Educational Achievement.

Standards are assessed at three levels, Level 1, 2 and 3. Typically Year 11 students study Level 1 Standards, Year 12 study Level 2 Standards, and Year 13 study Level 3 standards. However, the relationship between year level and standard level is sufficiently flexible that students can study a combination of standards, at any level, depending on their prior achievement and school provision.

There are two types of standard, Unit Standards (US) and Achievement Standards (AS). Unit Standards are all assessed internally by the school or at an accredited examination centre. To satisfy the requirements to gain a Unit Standard, students need to perform a set of approved tasks to the prescribed standard and only a pass is possible. Achievement Standards can be assessed internally and externally and have four measures of attainment; these are Not Achieved, Achieved, Achieved with Merit and Achieved with Excellence. Both Unit Standards and Achievement Standards are worth credits. It is the collection of these credits that are accumulated to gain the Certificates at Level 1, 2 and 3.

To gain the NCEA at Level 1 students must satisfy three separate criteria. Students must gain eight credits that are defined as literacy credits and eight credits in numeracy. In addition to the literacy and numeracy requirements students must gain in total a minimum of 80 credits at Level 1 or above. These 80 credits must include those that satisfy the literacy and numeracy criteria.

This study focused on achievement at Level 1 of the NCEA and concern Year 11 students working at this level. At NZHS, the school at which the target setting intervention took place, Year 11 students study five subjects, for example, English, mathematics (both compulsory), a choice of a science subject plus two other choices from a range of different fields, such as the arts or the humanities. Therefore, on average each subject must contribute at least 16 credits towards the Level 1 Certificate. These credits can come from a combination of internal and externally assessed standards. Externally assessed standards are written by an external body and sat by students in a formal examination setting at the end of the year. The internally assessed achievement standards and unit standards can be written by the school or other bodies (for example, the New Zealand Association of Mathematics Teachers (NZAMT)) and can be taken at any time during the school year but are subject to moderation procedures. Internal standards may be repeated until the student achieves the standard and the number of opportunities to resit internal standards depends on the school policy.

MidYIS

MidYIS stands for the Middle Years Information System and is a value-added system that is administered by the Curriculum, Evaluation and Management Centre (CEM) at the University of Canterbury in New Zealand. This programme is optional and schools pay to be involved so the comparison data do not include all Year 9 students in the country. At the start of the academic year, Year 9 New Zealand students who are part of MidYIS take a test that is approximately one hour long and covers four domains: vocabulary, mathematics, non-verbal

and skills. The tests are strictly administered by a pre-recorded examiner on a tape to make sure that all students are exposed to the same instructions, explanations and examples, ensuring fair, high quality and reliable data. The tests are designed to measure, as far as possible, ability and aptitude for learning rather than achievement.

The vocabulary and mathematics sections of the tests measure what the student knows and is described in the MidYIS information provided to schools as basic 'curriculum readiness' skills. The non-verbal section claims to measure an innate rather than a teachable skill and tests visual processing and perception (CEM, 2008). This includes block-counting, 3-D shapes and mentally combining shapes. As with the non-verbal section of the test, the skills section purports to measure innate rather than teachable skills, testing speed and accuracy and an 'eye for detail'.

The MidYIS tests are marked by the Curriculum, Evaluation and Management Centre (CEM) and results are returned to school during March of the same year. The information from the test sat in Year 9 provides baseline data about the students at NZHS. The students' scores from all participants in the country are standardised so that the average is 100 and the standard deviation is 15. This means that 68% of all MidYIS students will have a MidYIS score of between 85 and 115 while 95% of the students who sat the test will have a score between 70 and 130. Scores below 70 and above 130 are considered to be statistically significantly less or statistically significantly greater, respectively, than the mean score of 100. Each student from all the students in New Zealand who sat the MidYIS test is placed into a band according to their MidYIS score, such that 25% of the students are placed into each band with A being the highest of the four bands.

The MidYIS total score, which is an average of the scores from the four domains, is used to produce "chances" graphs which indicate the performance of students in different subject areas of NCEA. The chances graphs in each of the four MidYIS bands, A, B, C and D, are based on the Year 11 grades achieved by candidates in the previous year. The graphs indicate the actual range and frequency of grades that were achieved and therefore provide a rough guide to what might reasonably be expected, as well as indicating the likely spread of results.

Once the Year 11 NCEA examination results have been produced and matched to the same cohort of students who sat the baseline MidYIS tests in Year 9, then a value-added measure is produced for each subject area. An overall school value-added measure is also produced at this time. It was beyond the scope of this study to explore the value-added measures used by the MidYIS assessments.

asTTle

asTTle stands for assessment Tools for Teaching and Learning. It is an educational resource for assessing Literacy and Numeracy which was developed by the University of Auckland and the Ministry of Education (Ministry of Education, 2005a). asTTle provides teachers with information about a student's level of achievement relative to the New Zealand National Curriculum achievement outcomes for levels 2 to 6 and national norms of performance. Each curriculum level is further divided into three sub-levels, called basic, proficient and advanced.

The test is created by the subject teacher according to curriculum foci that the subject teacher can select. In addition, the teacher can select the national curriculum levels that the test should cover. Once the test is made and sat by students then a standardised score is produced for each student, called an asTTle reading scale (aRs) score in reading literacy and an asTTle mathematics scale (aMs) score in mathematics. The curriculum levels are associated with a range of scores.

At NZHS students are given an asTTle reading literacy and an asTTle mathematics test at the start of Year 9, at the end of Year 9 and then again at the end of Year 10.

Missing Data

One issue that arose in the procedure to develop the targets for students in the intervention was the number of students who had missing data values in each of the instruments used in the analysis over various time points. Students could have data missing from all or some of the MidYIS, asTTle or NCEA Level 1 achievement data. Missing data on test scores in schools occurs for many reasons, such as, absences caused by illness, stand-downs and suspensions, truancy, family holidays or because students joined the school later than in Year 9 or left the school prior to the end of Year 11.

There are several methods for dealing with missing data including listwise deletion (that is, deletion of any case where one or more of the variables are missing) to methods of imputing data values that replace the missing value. Mean substitution, regression and expectation maximisation (EM) are all different methods of replacing a missing value (Tabachnick & Fidell, 2007). Mean substitution involves replacing the missing value with the variable's mean, or with the mean or median of nearby points, or via linear interpolation between prior and subsequent points. Imputation using regression substitutes the linear regression trend in place of the missing value. Expectation maximisation (ME) uses

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maximum likelihood estimation (MLE) as a method to impute values by making estimates based on maximising the probability (likelihood) that the values are drawn from a population assumed to be the same as that reflected in the coefficient estimates.

In this study, it was necessary to impute values into the dataset to be able to provide some basis on which to establish a target for the intervention group of Year 11 students. Listwise deletion was an inappropriate method to deal with the establishment of targets for students as it would have deleted the student when the main point of the exercise was to develop targets for all the students in the intervention. It would be inappropriate to have a student attend academic counselling sessions and find he or she had their data deleted for this reason. Mean substitution was also discarded as a method for replacing the missing value as it would be wrong to assume that all students who did not have a MidYIS score performed at the mean value of NCEA. The literature on mean value substitution as a way of replacing missing value reports that mean substitution reduces the variance of the variable which ultimately affects the beta weights of all variables. As a result, a method that was once the most popular missing data replacement method is no longer recommended (Garsen, 2008; Tabachnick & Fidell, 2007).

Regression based on a dichotomous dependent variable, satisfying the NCEA Level 1 criteria, was also an inappropriate method to replace missing data, partly due to the nature of the variable, but also because the students from this cohort (57) had not yet sat the examinations. The method of regression was used to replace missing data. The variable that was used in the regression was either information from a reading literacy asTTle assessment, the students had taken at approximately the same time of year as the MidYIS test, or from any subsequent asTTle assessment that students took as they joined the school. It was possible to conduct a regression analysis on students in Cohort 57 that had taken an asTTle assessment and the MidYIS test and, thereby, use asTTle to impute the MidYIS score and hence produce an associated MidYIS band. This was deemed possible by the high linear correlation coefficient that existed between the asTTle assessment in reading literacy and/or numeracy and the MidYIS test scores. Table 3 shows the correlation values and the significance of the correlations between MidYIS and the asTTle assessments.

Table 3.

Correlations between MidYIS and asTTle Assessments.

	Pearson's Correlation Coefficient
Term 1 aRs	0.71**
Term 4 aRs	0.58**
Term 1 aMs	0.76**
Term 4 aMs	0.72**
Term 8 aMs	0.72**

** Correlations statistically significant at the 0.01 level (2-tailed)

Ethics

Prior to undertaking this research a series of ethics applications were submitted to The University of Auckland Human Participants Ethics Committee. The ethical considerations guiding this project concerned the use of academic achievement and demographic data collected by secondary schools being used for research purposes. Most ethical concerns revolve around issues of harm, consent, deception, privacy and confidentiality of data. However in this particular series of studies, two main concerns were highlighted by the committee.

The issues related to the ownership of the data, that is, who owned the data and hence who could give permission for their use in a research project. The conclusion of the University of Auckland Human Participants Ethics Committee was that each school, namely the Board of Trustees of each school, owned the data collected at the school. To cater for these requirements, complete confidentiality and anonymity of information was assured by the researcher via the participant information sheet, that was submitted to each Principal of the schools involved.

The second issue related to the position of the researcher as an employee in the intervention school. Specifically, as an employee, methodological bias may be introduced into the qualitative evaluation of the project being researched. Interviews and focus group interviews were used to understand perceptions of teachers regarding this project. As someone who has ongoing professional relationships with staff and who is researching a programme in their place of employment, there is an ethical concern in terms of voluntary

participation of the stakeholders. The issues surrounding this specific ethical issue is discussed further in Chapter Seven.

Studies

The following four chapters describe a series of three separate target setting studies which share the same broad quantitative methodology, that of a quasi-experimental design, yet involved three different approaches to the establishment of the academic targets. The three approaches were required due to the nature of the data being employed, the year level of the participants, the form the targets took and also the methods by which a measure of the success of the target setting initiative could be made. The following sections will detail the methods used to develop the targets for individual students in Years 9 and 11. The first study was divided into three parts. The first part (1a) explains the procedures required to develop a target for individual Year 11 students. A target was calculated for students at NCEA Level 1. The first target took the form of a dichotomous outcome, either a Yes or No the students will or will not satisfy the criteria to gain the NCEA Level 1 Certificate, and a similar format was used for the literacy and numeracy requirements of Level 1. The second part (1b) describes how individual targets were developed for the external standards in English, and mathematics for students in Year 11. The third part (1c) illustrates the methods for developing targets in literacy and numeracy based on asTTle for Year 9 students at the intervention school. The specific issues and strategies for each case will be discussed in each part of the study. The results of the effect of the intervention of each target setting study will also be presented in these chapters.

CHAPTER FOUR

Study 1a: NCEA Level 1 Targets

In essence, this study looked back at previous academic achievement data for different cohorts of students, throughout their first three years at secondary school, and then used any trends evident in these data to set targets for an intervention group. The information for individual student targets in Year 11 was collected and aggregated to form the school targets for the whole year group. The targets that were set were those of gaining the NCEA Level 1 Certificate and satisfying the literacy and numeracy criteria at Level 1. As discussed previously, to gain the NCEA Level 1 Certificate, students must gain 80 or more credits at Level 1 or above. These 80 must include eight credits which satisfy specific literacy criteria and eight credits that satisfy specific numeracy criteria. Without the literacy and numeracy credits the Level 1 Certificate cannot be achieved.

Method

The following sections describe the datasets and participants used to establish the targets and the process by which the targets were developed and implemented in the intervention school. The types of analyses used to evaluate the intervention are also described in this section. In addition, information regarding the participants in the intervention and those participants in the control group are presented.

Datasets

The principal sets of data used in this section of the study were MidYIS scores and NCEA results. MidYIS and NCEA data for two cohorts of students were analysed for past trends and the results were used to establish individual targets for the intervention cohort. The MidYIS data were supplied to NZHS by the Canterbury Evaluation and Management Centre (CEM) project in the form of an Excel spreadsheet. The fields in this spreadsheet included Class (namely the student's form class), Surname, Forename, Sex and Ethnicity; in addition to these variables, there were variables that represented the standardised scores for Vocabulary, Mathematics, Non-verbal, Skills and an overall MidYIS score. Further variables included a Band mark A to D for each of the previous sections of scores, that is, a Vocabulary Band, a Mathematics Band, a Non-verbal Band, a Skills Band and, an overall MidYIS Band.

The NCEA data used in the study were downloaded from the NZQA website and the following variables were provided in the file: Sort Key (the form class of the student), Last Name, First Name, Name 2, Name 3, NSN (National Student Number, a unique ID specific to the student), MOE Year (the student year level), Gender and Ethnicity. Also included in this dataset were the student's results for NCEA Level 1, 2 and 3, the student's literacy and numeracy results, results for University Entrance (UE) literacy and numeracy and the total number of credits gained in the year as well as the total credits gained in the year at each of the Levels 1, 2 and 3.

The decision to use MidYIS as the data matched to NCEA Level 1 results for the purpose of developing academic achievement targets, as opposed to other achievement measures, was based on two factors. Firstly, the targets needed to be appropriate to the examination system being studied by the student; hence the requirement for NCEA data to be used. More importantly, the decision to use MidYIS data was made because of the findings from previous research conducted by the Starpath project (Shulruf, Tolley, & Tumen, 2005). This research found that non-curricular (MidYIS) scores as a baseline measure appeared to be a better predictor of overall student outcomes than other measures tested, such as the Progressive Achievement Tests (PATs).

The question of whether it was appropriate to compare students in this cross-sectional way, year to year, and expect the same type of performance from one cohort to the next was a valid one and needed to be considered. This was addressed by carrying out an ANOVA (Analysis of Variance) analysis on the three cohorts of students being considered in this study, that is, cohorts 35, 46 and 57 at NZHS. The ANOVA analysis was carried out on the NZHS students' Year 9 MidYIS data. The ANOVA analysis indicated that there was no statistically significant difference in MidYIS scores between cohorts 35, 46 and 57 and, as a result, it was acceptable to use the cross-sectional data in this way ($F = 2.570$, $df = 2$, $p = 0.077$).

Participants Used to Establish the Targets

The participants in Study 1a were three cohorts of students from NZHS. Each cohort of students had completed MidYIS assessments when they were in Year 9 and two of the three cohorts had completed NCEA examinations. The third cohort was the intervention cohort and had not, at the time of the intervention, completed NCEA examinations. The first two cohorts were selected by virtue of being the cohorts immediately preceding the intervention cohort, the third cohort.

Table 4 shows the demographic details of each of three cohorts of students, including the total number of students in each cohort. The demographic data from students in Cohort 35 and 46 who were used to establish the targets for the intervention group are shown in the upper part of the table. The demographic details of the intervention group, Cohort 57 are shown in the lower half of this table. Cohort 35 contained 330 students of which half were male. Cohort 46 had 404 students and Cohort 57 contained 544 students. Cohorts 46 and 57 contained the same proportion of male and female students (49% of each cohort was male and 51% female). There were small variations in the distribution in the percentage of each ethnicity across each cohort.

Table 4.

Percentage of Participants Involved in Establishing the Targets

Cohort	n	Male	Female	NZE	Maori	Pasifika	Asian	Other	FEE
35	330	50	50	43	17	16	12	7	4
46	404	49	51	50	19	14	12	2	2
Participants for whom the targets were established									
57	544	49	51	47	20	18	12	1	3

Key: NZE – New Zealand European Students. FEE – Fee paying students from overseas.

Overview

The following sections of this thesis give a brief overview of the target setting intervention and then a detailed explanation of how the targets were established is described. The process for establishing the academic targets is summarised in Figure 5. The initial stages of the process involved gathering data from previous cohorts of students and analysing these data to identify trends. This process is represented in the diagram by the evidential database box. The information from these cohorts of students was used to establish the targets for individual students in the intervention group; these individual targets were called grand targets, subsequently aggregated to form the whole school targets. These whole school targets are represented in the Figure by the grand target and whole school target boxes. An underlying goal of the target setting process was that the students and schools would strive to improve current performance; otherwise the target setting procedures would only replicate the previous achievements of other cohorts of students. With that aim in mind, an

understanding of the concepts of a target and a prediction as they relate to this study is required. Predictions attempt to forecast the achievement of a student, whereas the whole premise of target setting was one of trying to 'raise the bar' and improve student achievement. Hence a small but varied degree of challenge was introduced into each of the targets for the intervention group of students.

The shaded box represents the processes involved in the intervention which included consultation with subject teachers and an analysis of current achievement in the intervention year. Consultation with teachers was carried out and any adjustments to targets made from this consultation were noted. This is represented in Figure 5 by the box 'consultation with all subject teachers'. The achievement of the Year 11 students at the time of consultation with the teachers was amalgamated with the previous information to establish student profiles. The student profiles were given to the staff responsible for academic counselling and in that way shared with the students. Each stage of this process is explained more fully in the sections below and in particular the formulation of the targets is clarified.

Academic Counselling and Target Setting
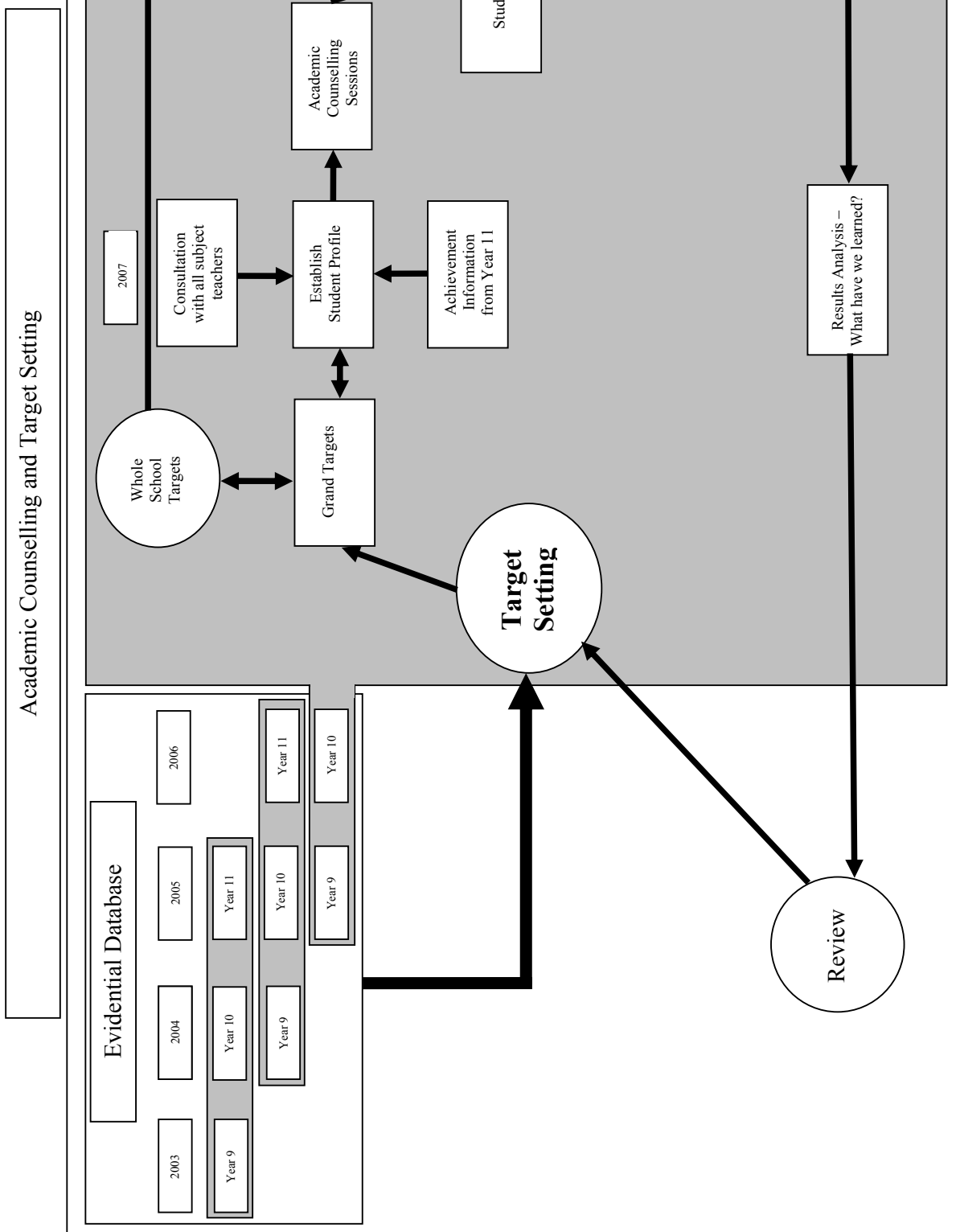
Figure 5. Diagram to show process for establishing targets and academic counselling.

Process

To develop the targets for students in Year 11 in Cohort 57, the intervention group, data from NZHS students (Cohorts 35 and 46) from the two most recent years of school results were analysed. Two sets of data were combined into one dataset: each student's overall MidYIS score and associated MidYIS Band (collected when they were in Year 9) and then the same student's NCEA Level 1 results. Specifically, details as to whether the students had gained the NCEA Level 1 Certificate and if the student had satisfied the literacy and/or the numeracy criteria, were included in these datasets.

As described earlier in Chapter 3, MidYIS scores from all students participating in the MidYIS tests were categorised into four bands, with the top 25% of students being placed in Band A, the next 25% of students placed in Band B and so on to Band D. The percentage of NZHS students from each MidYIS band who gained the Level 1 Certificate was calculated for each of the two cohorts and is shown in Table 5. This table shows that 92% of students from Band A in Cohort 35 and 83% of Band A students from Cohort 46 gained Level 1. In addition, 29% of Band D students from Cohort 35 and 21% of Band D students from Cohort 46 gained Level 1.

Table 5.

NCEA Level 1 Past Achievement by MidYIS Band.

MidYIS Band	Actual (%) passing NCEA Level 1	
	Cohort 35	Cohort 46
A	92	83
B	71	73
C	49	58
D	29	21
	n = 330	n = 404

A small element of challenge was incorporated into each target, for the intervention group, for each of the MidYIS Bands. This was to continually improve performance rather than replicate the performance of other cohorts of students.

The targets chosen for students in Cohort 57 in the first instance were specifically designed to maintain the highest proportion of success from the previous two years. A similar rationale was used to set the targets for each of the MidYIS bands for the intervention group. MidYIS Band A contained the most able students in NZHS and as such there was an expectation that all of these students should be capable of gaining the Level 1 Certificate in NCEA. The target for Band A, therefore, was for 100% of students to gain the NCEA Level 1 Certificate. Band B's target was chosen to repeat the rate of increase in success seen from Cohort 35 to Cohort 46. As such, the target for Band B students was set so that 75% of Band B students in the intervention group should gain NCEA Level 1. For students in Bands C and D, it was important that students achieve at least as well as the previous two Cohorts of students. Table 6 shows the targets for each Band of students in Cohort 57. The previous information from Cohorts 35 and 46 is also included in this table for comparison purposes.

Table 6.

NCEA Level 1 Past Achievement by MidYIS Band and Targets for Cohort 57.

	Actual %		Target %
MidYIS Band	Cohort 35	Cohort 46	Cohort 57
A	92	83	100
B	71	73	75
C	49	58	60
D	29	21	30
	n = 330	n = 404	n = 544

Once the proportion of students in each Band of the intervention group expected to gain NCEA Level 1 was established from data collected from the previous cohorts, identification of individual students making up that proportion from the intervention group was undertaken. Subsequent to the imputation of MidYIS scores into the dataset for those students with missing MidYIS scores, each student was placed in the equivalent MidYIS Band. Initially, the process of identifying individual student performance was completed by ranking students in order of their MidYIS score. So, for example, the top 75% of students in Band B would be given a target of gaining NCEA Level 1 as this was the target for Band B

students. The ranking of students according to their MidYIS score was repeated within each Band, thus identifying the students more likely to gain the NCEA Level 1 Certificate.

Once this procedure had been completed and each student was assigned a target, all the targets were aggregated and a whole school target of 64% of NZHS students gaining the NCEA Level 1 certificate was produced. Identical procedures were used to produce targets for the literacy and numeracy criteria, yielding targets of 80% of NZHS students gaining Literacy and 95% of students gaining Numeracy.

One early criticism of target setting in the United Kingdom (UK) discussed by Blanchard (2002) was that targets have been set without input from students and/or teachers. To address this criticism, a two part consultation process was undertaken in 2007 to include the intervention group's teachers in the target setting process. In addition, a review of the students' current achievements in NCEA in English, mathematics and three other subject areas was conducted; the information from this review was then cross checked against the targets. The exact nature of this process is described below. The targets were then given to the teachers responsible for academic counselling to discuss with the students.

Consultation

The first part of the consultation process involved the teachers of English and mathematics confirming the target set for each student regarding the literacy and numeracy criteria required for NCEA Level 1. The second part of the consultation process involved all the students' subject teachers and required them to contribute to establishing an academic profile for each student. One of the features of this profile was a traffic light system which was used to indicate whether the student would gain 16 or more Level 1 credits in each subject area.

The traffic light system was used as a metaphor for the measurement of three broad stages of progress towards gaining credits in each of the student's subject areas; it was a useful tool as it demonstrated a simple and graphic picture of how the student was likely to perform in each subject area, in comparison to the benchmark of 16 credits, from a typical course total of 24 credits. Three colours were used, just like a set of traffic lights; the colours were green, amber and red. Green was used to show that, in a particular subject area, everything was on track to gain 16 or more Level 1 credits at the time of survey, amber showed that the student was borderline and, finally, red showed that, based on work completed by the student so far, he or she would not gain 16 or more Level 1 credits if he/she continued at the present rate of achievement. The benchmark of 16 credits was chosen as a

reference point because, to gain NCEA Level 1, each student is required to gain 80 Level 1 credits. Each student studies five subjects at NZHS and 80 credits divided by five results in 16 credits per subject. Therefore, if each subject contributed equally to the achievement of the NCEA Level 1 criteria, each subject would contribute 16 credits.

Teachers were asked to indicate if a student would achieve 16 or more credits in their subject area and to generate the student's profile. The rationale for consulting teachers in this way was because teachers can report quite confidently on the achievement of students they teach but would not be able to comment as accurately on the question of whether the student would gain the overall NCEA Level 1 – as this award comes from the aggregation of different subject credits.

In Figure 6, an example of the academic profile of several students is shown. Each row in the figure represents a student and each of the highlighted columns represents one of the five subject areas being studied by each student in the intervention group. Each subject was highlighted in green if the subject teachers expected the student to gain 16 or more credits in their subject area.

ID Number	Subject 1	Subject 2	Subject 3	Subject 4	Subject 4	Target from MidYIS
1	GEO	GRA	ADP	ENG	MAT	1
2	MAT	TFO	ENG	HOR	HOS	0
3	HOS	SCI	HIS	ENG	MAT	0
4	MAT	SCI	TMF	ENG	ADP	1
5	HOS	MAT	SCI	ENG	WSK	1
6	ENG	SCI	ACC	ECO	MAT	0
7	GEO	ENG	HIS	GER	MAT	1
8	CHE	COM	HBI	ENG	MAT	1
9	PED	MAT	SCI	GRA	ENG	1
10	MAT	HOS	ENG	DRA	HEA	0
11	GEO	GRA	ART	ENG	MAT	1
12	ENG	MAT	MET	HOR	IMD	0

Key	RED	AMBER	GREEN

Figure 6. An example of a student's academic profile

Red areas represented an instance where the subject teacher did not think the student would gain the 16 or more Level 1 credits at Level 1 in their subject. A white box indicated the teacher did not provide a response to the data request. Amber showed the teacher was unsure whether the student would gain gaining 16 credits or more in a particular subject. The last column represents the target that had been generated from the MidYIS scores. The data presented in Figure 6 allowed a comparison to be made between the data supplied from the MidYIS scores and data collected from teachers. Any differences in the two outcomes could indicate the requirement for support and guidance for students.

Students 1, 5, 8 and 11 in Figure 6 had five cells highlighted green which indicated that all five subject teachers thought the students would gain 16 or more Level 1 credits in their subject area and the students were on track to gain the NCEA Level 1 Certificate. This conclusion, made from the student profile, agreed with the target that was deduced from the MidYIS data, as shown in the column titled 'Target from MidYIS' where 1 indicates that the student was expected to gain NCEA Level 1 and, 0 if not.

Students 4 and 9 had four cells highlighted green. This indicated the students were likely to gain the Level 1 Certificate, as one red cell does not mean the students will achieve no credits at all in that subject but rather that the student may gain fewer than 16 credits. In this example, it was assumed that the student was on track to achieve the NCEA Level 1 Certificate. This information also agreed with the target deduced from the MidYIS data.

Students 3 and 12 had four red cells highlighted, which indicated that in the current academic year gaining 80 Level 1 credits toward the Level 1 Certificate was unlikely. Therefore, indicating that NCEA Level 1 would be more appropriate as a target for the next academic year. The feedback from the teachers in the case of Students 3 and 12 also agreed with the target calculated from the MidYIS information.

Students 2, 6, 7 and 10 were more complicated. The feedback from the consultation with staff contradicted the information from the analysis of the MidYIS data and the evident trends. Student 2 had three green highlighted cells indicating that three of this student's teachers thought he or she would gain 16 or more Level 1 credits. One teacher highlighted a red cell and the remaining teacher indicated an amber cell. The target calculated from the MidYIS data read 0 indicating that this student would not gain the Level 1 Certificate. This was a situation where a student could be classified as borderline as the feedback from the teachers suggested that the student was achieving better than the target calculated from the MidYIS data may have suggested. This was an instance where additional support from

subject teachers and monitoring by the academic counsellors was recommended to help the student achieve the Level 1 Certificate.

In contrast to Student 2, Students 7 and 10 appeared to be under-achieving compared to the target suggested by the MidYIS data. Again, close monitoring and support from subject teachers and the academic counsellors may help the student achieve to their potential.

Using these three pieces of information, the subject profile and the feedback on literacy and numeracy, the whole school targets were cross-checked and adjusted if necessary. As a result whole school targets of 62% of the intervention group gaining the Level 1 Certificate in 2007, 80% gaining literacy and 95-100% gaining numeracy were produced. The completed academic profiles containing the traffic light indicators, credits to date and the student's target were shared with the students during academic counselling sessions at NZHS.

Academic Counselling

The intervention called academic counselling was introduced at NZHS in 2007, of which target setting for student achievement was an integral part. This intervention involved using past and present academic achievement data about students to develop achievement targets for the Year 11 students in the NCEA Level 1 examinations (the intervention group). These targets were disseminated to students via academic counselling sessions, where academic achievement was discussed with students in conjunction with their aspirations for their future career pathways.

Participants

The participants involved in the analysis were not the same as those used to establish the academic targets. The participants in the intervention and evaluation were all students who were in Year 11 in the intervention year and had had a target established for them, (Cohort 57). The students used as a comparison group were Year 11 students from the previous academic year (Cohort 46). Using the previous group of students from the same school as a comparison group was an important feature of the evaluation of the intervention. This was because conditions at the school had not changed significantly since the previous year, the New Zealand Curriculum had not changed and practices pertaining to MidYIS and NCEA assessments had remained the same. The only differences were the students themselves and the introduction of the intervention. There were, however, two other interventions at the school which the intervention students had been involved with, the

communication skills programme and the Te Kotahitanga Programme. The way the evaluation controlled for these aspects is discussed later in the results. The demographic details of the intervention cohort (57) and the control group (Cohort 46) are shown in Table 7.

Table 7.

Year 11 Demographic Details of Each Cohort as of 1ˢᵗ July Roll Included in Analysis (%).

Cohort	n	Male	Female	NZE	Maori	Pasifika	Asian	Other	FEE
46	564	49	51	54	21	10	13	2	N/A
57	542	49	51	46	20	18	15	1	N/A

Key: NZE – New Zealand European Students. FEE – Fee paying students from overseas.

Analyses

The analyses presented in the following sections explore seven themes. The first analysis is a two-step model that explored the main predictors on the dependent variable of achieving the NCEA Level 1 Certificate. The second step of this analysis explored all the sub-group interactions to identify any changes that had occurred between the sub-groups of students across the cohorts. The second stages of this analysis investigated the sub-group differences before and after the intervention. The third analysis explored the performance of students at NCEA Level 1 in each of the four MidYIS bands by comparing the performance of students from the intervention group with students in the same MidYIS bands from the previous academic year. The fourth analysis investigated the differences in performance across the 'schools within the school'[1] that exist at NZHS to check for consistency of outcomes across the schools. The fifth analysis explored the total number of credits gained by Year 11 students and the effect of the intervention on this number. The sixth analysis explored the threats to the internal validity of the intervention by discussing and analysing two other programmes that existed at NZHS prior to and during the intervention documented in this thesis. The seventh and final analysis explored the performance of NZHS in 2007 with the performance of students nationally and at decile six.

To explore the research questions regarding NCEA Level 1, logistic regression was used to analyse the effect of the intervention on student performance, when the dependent

[1] NZHS is divided into five schools within the body of the main school for pastoral care and the academic counselling sessions.

variable had a dichotomous outcome. In these situations the following generalised equation (Equation 1) models the hypothesis being investigated. In this equation, Y represents the probability of the dependent variable occurring and, X represents the predictor variable in the model.

$$\text{Logit } (Y) = \text{In } (\pi/(1-\pi)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_{n-1} X_{n-1} + \beta_n X_n \tag{1}$$

Therefore, the probability of gaining Y is determined using Equation 2.

$$\text{Probability of gaining NCEA Level 1} = \frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_{n-1} X_{n-1} + \beta_n X_n}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_{n-1} X_{n-1} + \beta_n X_n}} \tag{2}$$

The null hypothesis underlying the overall model states that all βs equal zero. A rejection of this null hypothesis implies that at least one of the β values does not equal zero in the population, which means that the logistic regression equation predicts the probability of the outcome better than the mean of the dependent variable, Y.

The first analyses describes the equation used in the model in full, thereafter the equation will be omitted. In each analysis the predictor variables will be described, a table of results will be produced and a discussion regarding the findings will be presented.

Results

The following describes findings from an analysis used to evaluate the effect of the intervention that took place at the school in 2007, by comparing the achievement of students (in NCEA Level 1) in the intervention group and the comparison group. The cohort of students used as a comparison group included all students in Year 11 from the previous academic year.

NCEA Level 1 Certificate

A two-step model was used to explore the effect of the intervention on achieving NCEA Level 1; the first model was used to explore the main predictors and the second to explore the effects of any interactions on the dependent variable. An analysis involving logistic regression was necessary as the dependent variable was gaining NCEA Level 1 or not. The analysis investigated the likelihood of a student gaining NCEA Level 1 Certificate

being related to the target setting and academic counselling intervention, the student's prior achievement, gender and ethnicity. This hypothesis is modelled in Equation 3, where y is the probability of gaining NCEA Level 1

$$\text{Logit } (y) = \text{In } (\pi/(1-\pi)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \tag{3}$$

Therefore, the probability of gaining y, NCEA Level 1, is shown in Equation 4

$$\text{Probability of gaining NCEA Level 1} = \frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4}} \tag{4}$$

Where X_1 is the continuous variable MidYIS Score,

X_2 is a categorical variable intervention,

X_3 is a dichotomous variable gender,

X_4 is a categorical variable ethnicity.

A four-predictor logistic model was fitted to the data to investigate whether the likelihood of gaining the NCEA Level 1 was related to the predictor variables. Data are entered into the analysis as a 0 or 1 coding for the dichotomous outcome, continuous values for continuous predictors, and dummy codings (e.g., 0 or 1) for categorical predictors. In the analysis, the reference group for gender was male students coded 0; dummy variables were used for ethnicity (the reference group was New Zealand European students). The reference group for the intervention was the group of students not involved in the intervention, coded 0 in the analysis (Cohort 46). The MidYIS score was a continuous variable. The results from the analysis are shown in Table 8.

Table 8.

Logistic Regression Analysis of NCEA Level 1 Results (N = 1141).

Variable	β	β (SE)	Walds χ²	df	p	$e^β$	95% CI for $e^β$
Constant	-8.44	0.79	115.10	1	<.001		
INTRVNTN	.65	0.16	16.05	1	<.001	1.91	1.39 to 2.63
MidYIS	.09	0.01	131.29	1	<.001	1.09	1.08 to 1.11
Female	.46	.16	8.44	1	.004	1.58	1.16 to 2.14
Maori	-.75	0.20	14.12	1	<.001	.47	.32 to .70
Pasifika	-.33	0.23	2.02	1	.155	.72	.45 to 1.13
Asian	.32	0.27	1.47	1	.225	1.38	.82 to 2.33
Test			χ²	df	p		
Overall model evaluation							
Likelihood ratio test			242.55	6	<.001		
Goodness-of-fit test							
Hosmer & Lemeshow			5.98	8	.65		

Note. Cox & Snell R² = .23 Nagelkerke R² =.31.

According to the model, the log of the odds of a student gaining NCEA Level 1 was positively related to the MidYIS score (the measure of prior achievement) ($p <.001$). In other words, the higher the MidYIS score the more likely it was that the student would gain NCEA Level 1. The log odds of a student gaining NCEA Level 1 was also positively related to the intervention ($p <.001$) meaning that, for a male New Zealand European student with the same prior achievement score, being in the intervention increased the probability of gaining NCEA Level 1. The odds of those in the intervention gaining the NCEA Level 1 Certificate were 1.91 ($e^{0.65}$) times greater than the odds for those not being in the intervention.

Two other predictor variables were related to the likelihood of gaining NCEA Level 1 – gender and ethnicity. Gender was positively related to gaining NCEA Level 1 ($p =.004$) and being Maori was negatively related to gaining NCEA Level 1 ($p <.001$). In other words,

controlling for the intervention, prior achievement and ethnicity, female students were more likely than male students to gain the NCEA Level 1 Certificate. Controlling for the intervention, prior achievement and gender, Maori students were less likely than New Zealand European students to gain NCEA Level 1.

The overall model evaluation likelihood ratio test indicated that the null hypothesis was rejected and implied that the β values were not zero. This means the logistic regression equation predicted the probability of the outcome better than the mean of the dependent variable, y, and there was a statistically significant relationship between the predictors and gaining NCEA Level 1. The Cox and Schnell and Nagelkerke R² values indicated that approximately 23% to 31% of the variation in gaining the NCEA Level 1 Certificate was explained by the predictors in the model. The overall evaluation of the model tests suggested that the model fitted the data well, as the inferential Homer-Lemeshow (H-L) tests yielded a $\chi^2(8)$ of 5.983 and was not statistically significant ($p > .05$).

Figure 7 demonstrates the predicted probabilities of the intervention cohort versus the comparison group, panelled by ethnicity and gender. The mean predicted probability of achieving NCEA Level 1 is larger for the intervention group (represented by the continuous line) than the control group (dotted line). This feature occurs for each group, for example, female, New Zealand European shown in the bottom left panel of Figure 7. This figure clearly indicates the higher the MidYIS score the greater the probability of achieving the NCEA Level 1 Certificate and that being in the intervention established a higher likelihood of students gaining NCEA Level 1 Certificate than being in the control group.
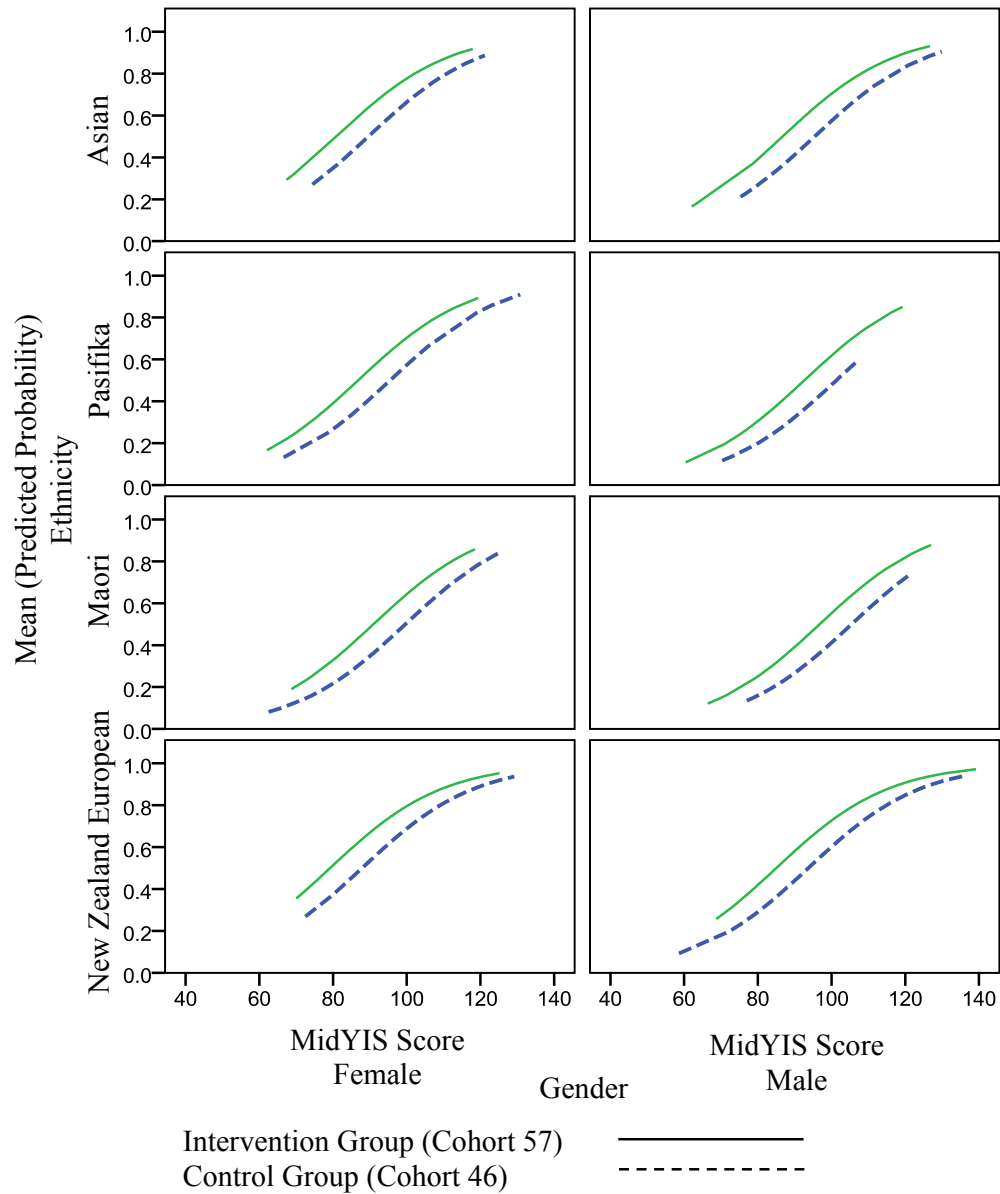
Figure 7. Graph showing the mean predicted probability of gaining NCEA Level 1 for each cohort, panelled by gender and ethnicity.

Two-Way Interactions

In the next step of the analysis, all two-way categorical interaction terms were included in the model. The aim of this analysis was to identify what had happened to the performance of students in NCEA Level 1 for different ethnic and gender groups across the cohorts (Table 9).

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Table 9.

Logistic Regression Analysis of NCEA Level 1 Results with Main Effects and Interactions (N = 1141).

Variable	β	β (SE)	Walds χ²	df	p	e^β	95% CI for e^β
Constant	-8.51	.81	110.95	1	<.001		
INTRVNTN	.60	.27	4.76	1	.029	1.81	1.06 to 3.09
MidYIS	.09	.01	129.75	1	<.001	1.10	1.08 to 1.11
Female	.69	.26	7.20	1	.007	2.00	1.21 to 3.33
Maori	-.75	.33	5.10	1	.024	.47	.32 to .70
Pasifika	-.91	.45	4.03	1	.045	.40	.18 to 0.98
Asian	.09	.43	.05	1	.833	1.10	.47 to 2.53
INTRVNTN by Female	-.38	.32	1.36	1	.244	.69	.37 to 1.29
INTRVNTN by Maori	.21	.40	.26	1	.612	1.23	.56 to 2.70
INTRVNTN by Pasifika	1.33	.49	7.3	1	.007	3.80	1.45 to 9.96
INTRVNTN by Asian	.02	.55	.002	1	.965	1.02	.35 to 2.99
Female by Maori	-0.19	.40	.22	1	.642	.83	.38 to 1.82
Female by Pasifika	-0.53	.47	1.26	1	.262	.59	.24 to 1.48
Female by Asian	.55	.55	.99	1	.319	1.73	.59 to 5.08

Test	χ²	df	p
Overall model evaluation			
Likelihood ratio test	255.20	13	<.001
Goodness-of-fit test			
Hosmer & Lemeshow	8.32	8	.402

Note. Cox & Snell R² = .24, Nagelkerke R² =.33.

In this analysis, only one of the seven two-way interactions was significant and the inclusion of all the categorical two-way interactions has not improved the fit of the model as indicated by the reduction in the Hosmer & Lemeshow χ^2 value ($p < 0.402$). One key result indicated in this analysis was the change in the performance of Pasifika students compared to New Zealand European students across the cohorts. There was evidence that the gap in achievement of NCEA Level 1 between Pasifika and New Zealand European students had narrowed statistically significantly.

Group Analysis

One of the main research questions in this study asked 'Does the development of academic targets impact differently on different sub-groups of students in the school?' The following analysis, which was the second stage of the analyses, specifically investigated this issue. To examine this issue, the relationship between the independent variables, prior achievement, ethnicity and gender, and the dependent variable, achieving the NCEA Level 1 Certificate before the intervention was put into place at NZHS, was explored. Then this same relationship between the same independent variables and dependent variable was explored after the intervention had been initiated and a comparison was made.

A three-predictor logistic model was fitted to the data both before the intervention and then subsequent to the intervention. Data were entered into the analysis as a 0 or 1 coding for the dichotomous independent variable, continuous variables for the continuous values and dummy codings for the categorical predictors. The reference group for gender was male and, for ethnicity, it was New Zealand European.

Before the Intervention

Analysis indicated that before the intervention there was a statistically significant positive association between prior achievement and gaining NCEA Level 1 (Table 10), indicating that, providing ethnicity and gender were controlled in the analysis, the higher the student's MidYIS score the greater the likelihood of the student gaining the Level 1 Certificate.

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Table 10.

Logistic Regression Analysis of NCEA Level 1 Results Before the Intervention (N = 514)

Variable	β	β (SE)	Walds χ^2	df	p	e^{β}	95% CI for e^{β}
Constant	-8.83	1.12	61.88	1	<.001		
MidYIS	.09	.01	70.20	1	<.001	1.10	1.08 to 1.12
Female	.67	.22	9.27	1	.002	1.95	1.27 to 2.99
Maori	-.84	.27	9.73	1	.002	.43	.25 to .73
Pasifika	-1.15	.40	8.31	1	.004	.32	.14 to .69
Asian	.34	.36	.88	1	.348	1.40	.69 to 2.85
Test			χ^2	df	p		
Overall model evaluation							
Likelihood ratio test			154.90	5	<.001		
Goodness-of-fit test							
Hosmer & Lemeshow			6.81	8	.557		

Note. Cox & Snell R^2 = .27, Nagelkerke R^2 =.37.

The results also showed there was a statistically significant positive association between gender and the independent variable, such that female students were more likely to gain the Certificate than male students. The odds of female students gaining NCEA Level 1 was 1.95 times the odds of male students gaining NCEA Level 1, when all other variables had been controlled. There was a statistically significant negative association between Maori, Pasifika and New Zealand European students gaining NCEA Level 1, with the odds of Maori students gaining NCEA Level 1 being 2.3 times <u>less</u> than the odds of New Zealand European students gaining NCEA Level 1. The odds of Pasifika students gaining NCEA Level 1 were 3.2 times <u>less</u> than the odds of New Zealand European students gaining NCEA Level 1. There was not a statistically significant difference between the odds of Asian students and New Zealand European students gaining NCEA Level 1.

After the Intervention

After the intervention, there were no longer statistically significant differences between males and females in gaining the NCEA Level 1 Certificate. This finding was also true for Pasifika and New Zealand European students. There was evidence to indicate that the only statistically significant contributors to gaining NCEA Level 1 was prior achievement and being a Maori student compared to being New Zealand European. The results from this analysis are shown in Table 11.

Table 11.

Logistic Regression Analysis of NCEA Level 1 Results after the intervention (N =514).

Variable	β	β (SE)	Walds χ^2	df	p	e^β	95% CI for e^β
Constant	-7.58	1.08	49.20	1	<.001		
MidYIS	.09	.01	60.14	1	<.001	1.09	1.07 to 1.12
Female	.22	.23	.93	1	.336	1.25	.80 to 1.95
Maori	-.64	.23	4.50	1	.034	.53	.30 to .95
Pasifika	.14	.31	.22	1	.641	1.15	.63 to 2.10
Asian	.33	.40	.70	1	.404	1.39	.64 to 3.02
Test			χ^2	df	p		
Overall model evaluation							
Likelihood ratio test			92.80	5	<.001		
Goodness-of-fit test							
Hosmer & Lemeshow			4.65	8	.794		

Note. Cox & Snell R^2 = .19, Nagelkerke R^2 =.27.

In comparing each of the variables in the analysis before and after the intervention, it was possible to see that the intervention reduced some of the disparities that were previously evident, for example, between female and male students, and some of the ethnicity disparities. Again the remaining statistically significant contributors to gaining NCEA Level

1 were prior achievement and being Maori compared to being New Zealand European, as was the case before the intervention.

The findings from the analysis of all two-way interactions on achieving the NCEA Level 1 Certificate (shown in Table 9) were compared to the separate analyses of the relationship between these variables prior to and after the intervention. In the two tables, (Tables 10 and 11), there was evidence that before the intervention there was a statistically significant gender difference in gaining NCEA Level 1. After the intervention, however, the significance of the gender difference was no longer present. On inspection of the β value of the interaction between 'Intervention by gender' term and the statistical significance value (Table 9), there was evidence of change in the male to female difference between the cohorts, although it was not statistically significant.

Following the comparison of the two types of analyses it can be concluded that the intervention narrowed the differences between the achievement of male and female students across the cohorts but not statistically significantly. Together, this means that although the differences between the genders across the cohorts may not have changed statistically significantly (Table 9), there was enough of a change to remove the significance of the gender difference after the intervention.

Performance of Students by MidYIS Band

In the next stage of the analysis the performance of students in each of the MidYIS Bands was explored. The performance of students was represented by a MidYIS score which was standardised to a mean of 100 and a standard deviation of 15. The MidYIS scores were derived from the assessments students sat at the beginning of Year 9 and correspond to one of four bands. The four bands are labelled A to D, with A being the highest band. The national data set of MidYIS results distributed these scores equally over the four bands, with 25% of the population being put into each band. At NZHS, the students may not be distributed evenly across each of the bands in the same way as the national data.

The figure below, Figure 8, shows the distribution of MidYIS band in Year 9 for both Cohort 46 and Cohort 57 students.
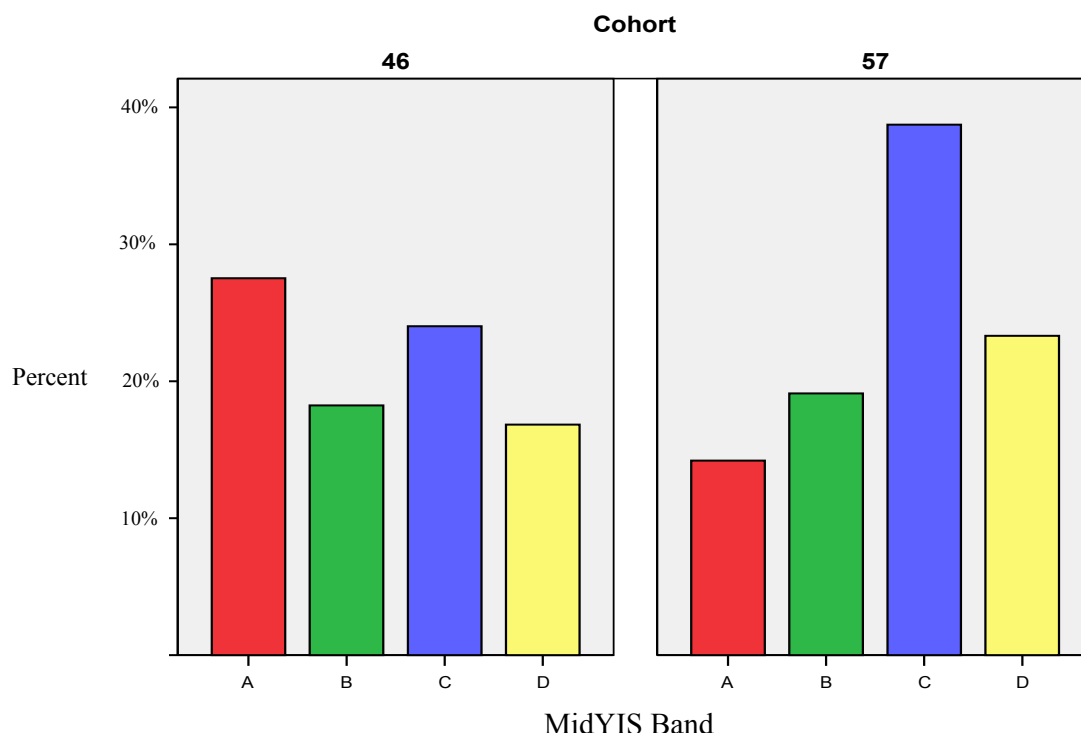
Figure 8. A bar chart to show the different distributions of MidYIS bands for cohorts 46 and 57

Figure 8 shows that the students were not distributed evenly across the four bands in either Cohort 46 or Cohort 57. In Cohort 46, there was a smaller variation in the distribution across the bands than in Cohort 57. An independent sample t-test for the difference in the MidYIS scores showed that Cohort 46 had a statistically significantly higher average MidYIS score than Cohort 57 (t = 3.240, *df* = 934, *p* = 0.001). In other words, on average, Cohort 46 students scored a statistically significantly higher score on MidYIS than Cohort 57 students.

The next stage of the analysis attempted to answer the question of whether students performed equally well in each of the MidYIS Bands between years. That is, did Band B students perform better in achieving the NCEA Level 1 Certificate in Cohort 46 or Cohort 57? The findings from a logistic regression analysis used to explore this question are shown in Table 12.

Table 12.

Logistic Regression Analysis of NCEA Level 1 Results Across the MidYIS Bands (N = 1141).

Variable	β	β (SE)	Walds χ^2	df	p	e^β	95% CI for e^β
Constant	-8.93	1.02	77.02	1	<.001	.00	1.16 to 2.14
MidYIS	.10	.01	85.74	1	<.001	1.10	1.08 to 1.12
Female	.46	.16	8.43	1	.004	1.58	1.16 to 2.14
Maori	-.73	.20	13.41	1	<.001	.48	.32 to .71
Pasifika	-.34	.24	2.11	1	.146	.71	.45 to 1.13
Asian	.34	.27	1.61	1	.204	1.41	.83 to 2.38
Cohort x Band A	.42	.45	.87	1	.352	1.52	.63 to 3.68
Cohort x Band B	.50	.29	3.03	1	.082	1.65	.94 to 2.91
Cohort x Band C	.71	.21	11.15	1	.001	2.02	1.34 to 3.06
Cohort x Band D	.79	.29	7.59	1	.006	2.21	1.26 to 3.88

Test			χ^2	df	p		
Overall model evaluation							
Likelihood ratio test			243.25	9	<.001		
Goodness-of-fit test							
Hosmer & Lemeshow			9.98	8	.266		

Note. Cox & Snell R² = .23, Nagelkerke R² =.32.

Band A students performed better in Cohort 57 than Cohort 46, but there was not a statistically significant difference between the Cohorts' performance in gaining NCEA Level 1 when prior achievement (as measured by the variable MidYIS Score), gender and ethnicity were all held constant. The same was true for Band B students. Cohort 57 students in Band B performed better in gaining NCEA Level 1 than those in Cohort 46, but this was not statistically significant.

It was the lower Bands C and D where statistically significant differences in the performances of students in Cohort 46 and 57 were evident. Students in Band C and D in Cohort 57 performed statistically significantly better than students from Cohort 46 in Band C and D when holding ethnicity, gender and prior achievement constant. The odds of students from Cohort 57 in Band C gaining NCEA Level 1 were 2.0 times the odds of students from Cohort 46 in Band C gaining Level One. The odds of students from Cohort 57 in Band D gaining NCEA Level 1 were 2.2 times the odds of students from Cohort 46 in Band D gaining NCEA Level 1.

In summary the analyses above have demonstrated that the intervention was particularly successful for the lower half of the cohort and addressed some of the disparities between male and female students and between Pasifika and New Zealand European students.

Differences across the school

The next stage of the analysis considered the consistency of performance across the schools within NZHS. The students at NZHS were divided into five schools within the body of the larger school for pastoral care and for the academic counselling sessions. Each school was managed by two Deans. The main forum for discussion with students about their goals and targets was at an academic counselling session; these sessions were facilitated by the Deans of NZHS. This analysis investigated the difference in the performance of the students in gaining NCEA Level 1 between each of the schools. The five schools are labelled 'A-school', 'B-school', 'C-school', 'D-school' and 'E-school' for the purposes of analysis. The dependent variable for this analysis was gaining NCEA Level 1. In the model, MidYIS was used to represent prior achievement; this was a particularly important variable as each school takes turn to have the Gifted and Talented class[2] at NZHS. In Cohort 57, 'C-school' was allocated this class. Gender and ethnicity were also included as variables in the model with the reference groups for the analysis being male for gender and New Zealand European for ethnicity. 'A-school' was used as the reference school in the analysis to compare the performance of students in each of the schools. Table 13 below shows the results of the analysis.

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[2] Each academic year there was a class designated the gifted and talented class. Students in this class were very high achievers. Each year this class was designated to a different school within NZHS. In 2007 C-school had this class, and in 2006 it was A-school.

Table 13.

Logistic Regression Analysis NCEA Level 1 Results for Different Schools (N = 1141).

Variable	β	β (SE)	Walds χ^2	df	p	e^{β}	95% CI for e^{β}
Constant	-7.99	1.12	48.62	1	<.001		
MidYIS	.09	.01	59.64	1	<.001	1.09	1.07 to 1.12
Female	.22	.23	.90	1	.342	1.24	.79 to 1.95
Maori	-.67	.31	4.84	1	.028	.51	.28 to .93
Pasifika	.15	.31	.23	1	.632	1.16	.63 to 2.12
Asian	.35	.40	.77	1	.380	1.38	.65 to 3.12
'B-School'	-.05	.34	.02	1	.878	.95	.49 to 1.84
'C-School'	.33	.35	.86	1	.353	1.39	.70 to 2.77
'D-School'	.50	.38	1.72	1	.190	1.65	.78 to 3.51
'E-School'	.39	.37	1.11	1	.292	1.47	.72 to 3.01

Test	χ^2	df	p
Overall model evaluation			
Likelihood ratio test	96.40	9	<.001
Goodness-of-fit test			
Hosmer & Lemeshow	11.13	8	.195

Note. Cox & Snell R^2 = .20, Nagelkerke R^2 = .28.

The analysis in Table 13 shows that, when controlling for prior achievement, ethnicity and gender, there is no statistically significant differences between the performances of students in gaining NCEA Level 1 between the different schools. This was an important finding because it justified the use of the Deans as the academic counsellors. In the planning of the academic counselling, there was some discussion about who should be the academic counsellors, the choice being between the form teachers and the Deans. The Deans were chosen to carry out the academic counselling sessions. This finding from this analysis

supported the choice of Deans as academic counsellors and also the consistency of the implementation as, even though different Deans co-constructed the academic counselling sessions, there were similar effects achieved in each school.

The same analysis was conducted on data collected from the control group (Cohort 46). In this analysis there was a statistically significant difference between the performance of students in 'C-school' compared to that of 'A-school', when prior achievement, gender and ethnicity were controlled, such that the odds of students from 'A-school' gaining NCEA Level 1 was 2.5 times the odds of students from 'C-school' school gaining NCEA Level 1. After the intervention, as the results in Table 13 indicate, academic counselling and target setting enhanced student performance in achieving the NCEA Level 1 Certificate no matter which school within the larger NZHS the students came from.

Number of Credits Gained by Year 11 Students at Level One

The next stage of the analysis explored the total number of credits gained by Year 11 students during the academic year, for students in Year 11 before the intervention, and then for Year 11 students involved in the intervention. The dependent variable, y, was the total number of credits gained in both external and external Level 1 NCEA assessments and the analysis included variables for gender, ethnicity and prior achievement. The hypothesis that the intervention improved the performance of students can be represented by Equation 5.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \tag{5}$$

where x_1 is the categorical variable intervention,

x_2 is the continuous variable MidYIS score,

x_3 is the dichotomous variable gender,

x_4 is the categorical variable ethnicity,

e is an error term with mean 0 and a standard deviation of 1.

The results of the analysis are presented in Table 14 below.

Table 14.

Summary of Multiple Regression Analysis for Variables Predicting Total Number of Credits Achieved in NCEA Level 1 (N = 1096).

Variable	B	SE B	β
Constant	-40.47	8.38	
MidYIS	1.30	.08	.43***
INTRVNTN	10.17	2.05	.13***
Female	4.24	2.02	.05*
Maori	-16.82	2.67	-.17***
Pasifika	-13.45	3.18	-.12**
Asian	3.76	3.06	.03

Note. R^2 = 0.37. *p < .05. **p < .01. ***p < .001.

Conclusions drawn from this table show the students in the intervention gained statistically significantly more credits than those students not in the intervention, when prior achievement, gender and ethnicity were controlled. A student with an average MidYIS score of 100 from the intervention group gained 99 credits in NCEA at Level 1, compared to a similar student not in the intervention group who gained 89 credits with the same MidYIS score. For each 1 point increase in MidYIS score, a student from the intervention group gained 10 more credits than a student not in the intervention, when prior achievement, gender and ethnicity had been controlled.

To gain Level 1, students need to gain 80 credits; the above analysis showed that to achieve a total of 80 credits, the student who had a MidYIS score of 85 or more would achieve Level 1 (i.e. the 80 credits) if they were from the intervention group of students. However, students not in the intervention would only achieve 70 credits if they had a similar MidYIS score on entry to the school. Prior to the intervention, students would need a MidYIS score of 93 or more to achieve the NCEA Level 1 Certificate. In conclusion, the intervention has supported students with lower MidYIS scores to achieve 80 or more credits and hence to achieve NCEA Level 1.

Internal Validity

The issue of internal validity that needed to be addressed in this study was the possible effects of other interventions on the outcome of the academic counselling and target setting initiative. There were two other large interventions that may have had an effect on the outcome of the initiative being investigated here. One, a reading programme called the communication skills programme, which the participants of the intervention being investigated here, took part in two years prior to the academic counselling and target setting initiative. The second initiative was the Te Kotahitanga Project which the whole school had been involved in since 2004. As Te Kotahitanga had been implemented since 2004, this meant both students in the control group and the intervention group were part of Te Kotahitanga and therefore the effect of this programme was controlled in the models used in the analysis. It is acknowledged that both these programme may have contributed to the improved achievement in 2007. In the case of the communications skills programme, the control group of students did not have access to the support provided by this programme. The effects of the communication skills programme are discussed further in the paragraphs below.

Communication Skills Programme

The communication skills programme affected all Year 9 students who were attending NZHS in 2005, Cohort 57. However, any student, who joined NZHS at the end of Year 9, after Term 3 of 2005, was not part of the communication skills programme but would be part of the academic counselling and target setting intervention. If an analysis was conducted on these late arrivals to NZHS, the effect of the academic counselling and target setting intervention would be attained without the effect of the communications skills programme.

Participants

The participants in this analysis were all students who joined NZHS after Term 3 of the Year in which they were in Year 9 for the intervention Cohort (57) and the control group Cohort (46). In Cohort 46 there were 110 students, of which 49% were male. In Cohort 57, the intervention cohort, there were 118 students of which 47% of students were male. The ethnicities of the cohorts varied and are presented in Table 15.

Table 15.

Year 11 Demographic Details of Each Cohort on the 1st July Roll (Percentages) Included in Analysis.

Cohort	n	Male	Female	NZE	Maori	Pasifika	Asian	Other	FEE
46	110	49	51	35	17	10	33	5	N/A
57	118	47	53	30	22	17	29	3	N/A

Key: NZE – New Zealand European Students. FEE – Fee paying students from overseas.

As with all the students in Cohort 57 and Cohort 46, a four-predictor logistic model was fitted to the data to investigate the likelihood of gaining NCEA Level 1. The dependent variable was gaining the Level 1 Certificate and the independent variables were being in the intervention, a prior achievement score, gender and ethnicity. It was necessary to impute a MidYIS score for all the students who joined NZHS in the latter part of 2006 and 2007, regression analysis was used from asTTle scores that had been collected from the students. The results from the analysis are shown in Table 16.

The overall model evaluation suggested that the β values may be zero and that the mean of the dependent variable predicted the probability of the outcome better than the logistic regression equation. However, other indicators (Hosmer & Lemeshow test yielded a χ^2 (8) of 0.307 and was not statistically significant ($p > .05$)) suggested that the model fitted the data and that the intervention students had a higher probability of gaining Level 1 than the students not in the intervention, once prior achievement, gender and ethnicity were controlled. This finding indicated that it was the intervention that affected the achievement of the students rather than the communication skills programme.

Table 16.

Logistic Regression Analysis of NCEA Level 1 Results for Students Not in the Communication Skills Programme (N = 228).

Variable	β	β (SE)	Walds χ^2	df	p	e^β	95% CI for e^β
Constant	-1.58	1.09	2.07	1	.150	.21	
INTRVNTN	.88	.28	9.83	1	.002	2.41	1.39 to 4.17
MidYIS	.01	.01	.74	1	.391	1.01	0.99 to 1.03
Female	.14	.28	.24	1	.625	1.15	0.66 to 1.98
Maori	-.54	.40	1.83	1	.176	.59	0.27 to 1.27
Pasifika	-.26	.44	.34	1	.559	.77	0.33 to 1.83
Asian	.01	.34	.001	1	.971	1.01	0.52 to 1.96

Test			χ^2	df	p		
Overall model evaluation							
Likelihood ratio test			12.49	6	.052		
Goodness-of-fit test							
Hosmer & Lemeshow			9.44	8	.307		

Note. Cox & Snell R^2 = .05, Nagelkerke R^2 = .07.

National Results

The last stage of the analysis considers the effects of the intervention on the intervention group by conducting a confidence interval analysis on the performance of the students at NZHS, compared to the performance of all students in Year 11 nationally. This analysis compared the proportion of students gaining the NCEA Level 1 Certificate. When comparing the NZHS results at NCEA Level 1 for Year 11 students with the entire national student body at Year 11, there was a statistically significant difference for male students ($p = 0.02$) and for Pasifika students ($p = 0.04$), but not the school as a whole. When

comparing NZHS with the national decile 6, student body there was a statistically significant overall difference for all students ($p = 0.007$) and for male students ($p = 0.01$).

Conclusion

Study 1a investigated the development and subsequent effectiveness of using academic achievement data to produce academic achievement targets for Year 11 students. The study provided sufficient evidence to suggest that this intervention did contribute to the improved achievement of students in the NCEA Level 1 Certificate. The study demonstrated that students with a lower MidYIS score on intake can satisfy the requirement to attain the Certificate. The analysis also showed that the intervention allowed a statistically significant increase in credits earned by students than prior to the intervention. The analysis also produced evidence to show there was a statistically significant reduction in the gap between Pasifika students and New Zealand European students, when other variables were controlled in the analysis. There was also evidence, though it was not statistically significant, to show that the achievement gap between female and male students had been narrowed with the introduction of the intervention. The analysis also demonstrated that there was a consistent approach to the delivery of the academic counselling programme as there was no significant difference in the achievement of the students in each school, when prior achievement, gender and ethnicity were held constant in the model.

CHAPTER FIVE

Study 1b: Subject Targets for Year 11

Study 1b explored the development of individual targets for each student, for each of the external standards, in English and mathematics at Level 1 of the National Certificate of Educational Achievement (NCEA). As with Study 1a, a key aspect in the development of the targets was to look back at prior trends of achievement, in the external standards, for previous cohorts of students at the school and develop targets from these. Subsequent to an analysis of these trends, targets were formulated for an intervention group of students at NZHS. The process used to generate the academic targets was based on Data Envelopment Analysis (DEA). DEA is commonly used in economics to measure efficiency and to set targets for businesses. However, DEA can also be used to identify lighthouse students. A lighthouse student is one who 'punches above their weight' and would be especially suitable as a model for raising the achievement of weaker students (Thanassoulis, 1999).

Method

The following sections of this chapter firstly provide a description of the datasets and participants used in this analysis and, secondly, give a brief overview of the target setting intervention and how it operated in the English and mathematics departments.

Datasets

The principal sets of data used in Study 1b were MidYIS scores, asTTle scores and NCEA external standard results provided by the New Zealand Qualifications Authority (NZQA). The variables supplied in the MidYIS data from the Canterbury Evaluation and Management Centre (CEM) were the same as those for Study 1a. The asTTle data used in Study 1b (reading literacy and numeracy) were collected from students at the beginning and end of Year 9 and again at the end of Year 10. The dataset contained the variables: Last Name, First Name, Gender, and Ethnicity (of which asTTle uses four categories; New Zealand European, Maori, Pasifika and Asian). Also included in the dataset were variables for a total score on the asTTle scale and the variable, asTTle Level. The variable asTTle Level represented the associated Level of the National Curriculum for each of the asTTle scale scores from the assessments in reading literacy and mathematics.

The datasets supplied by NZQA for NCEA data contained data regarding the achievement of students in each of a set of external standards. The standards for which targets

were set were external standards in English and mathematics. External standards were chosen as targets rather than internal standards as the assessment system for external standards is more robust and less open to subjective interpretation than the system in place to mark internal assessments. A further reason for choosing the subjects of English and mathematics to set targets was that every student in Year 11 in the intervention school was required to study English and mathematics at NCEA Level 1, though not necessarily to be entered for the external standards at this level.

There were five standards at Level 1 in English for which targets were produced and six in Level 1 mathematics. The details of the achievement standards are shown in Table 17.

Table 17.

External Standards used in Study 1b.

	Number	AS	Credits	Short Name
English Level 1 Standards				
	1.2	90053	3	Formal Writing
	1.3	90054	2	Extended Text
	1.4	90055	2	Short Text
	1.5	90056	2	Visual Oral
	1.6	90057	3	Unfamiliar Text
Mathematics Level 1 Standards				
	1.1	90147	4	Algebra
	1.2	90148	3	Graphs
	1.6	90191	2	Probability
	1.7	90151	3	Number
	1.8	90152	2	Right Angled Triangles
	1.9	90153	2	Geometry

This table shows the standard number and the number of credits each standard is worth and a brief description of the topic matter covered is also provided.

The results file from NZQA contained the following results for each student for each of the external standards; NA – not achieved, A – achieved, M – achieved with merit, E – achieved with excellence, SNA – student not attempted, ABS – student absent, as well as demographic details of the students including an NSN (National Student Number).

Participants Used to Establish the Targets

There were two types of participants in this study. The first type of participant was used to establish the targets and the second type of participant received academic targets to work towards; this second type of participant formed the intervention group. The first type of participant consisted of those students who had a MidYIS score and/or asTTle scores and had a matched result on one or more of the NCEA external achievement standards.

The data set used to establish the targets included 582 students, of which 49% were male and 51% were female. The student ethnicities were distributed as shown in Table 18.

Table 18.

Percentage of Ethnicity for the Participants
used to Establish the Targets (N = 582).

Ethnicity of Students	Cohort 46
New Zealand European	53%
Maori	21%
Pasifika	10%
Asian	14%
Other	2%

Overview

In Figure 9, the academic counselling and target setting model is displayed with the process for the target setting for students in the individual subject areas of English and mathematics at Leve1 1 of NCEA. As with Study 1a, the data from previous cohorts of students was collected and used to form an evidential database, represented in Figure 9 by the large box on the top left hand side of the figure. The evidential database was used to establish individual student academic targets for external standards in English and mathematics for the

intervention group of students. This process is represented in Figure 9 by the circle labeled 'Target Setting'.
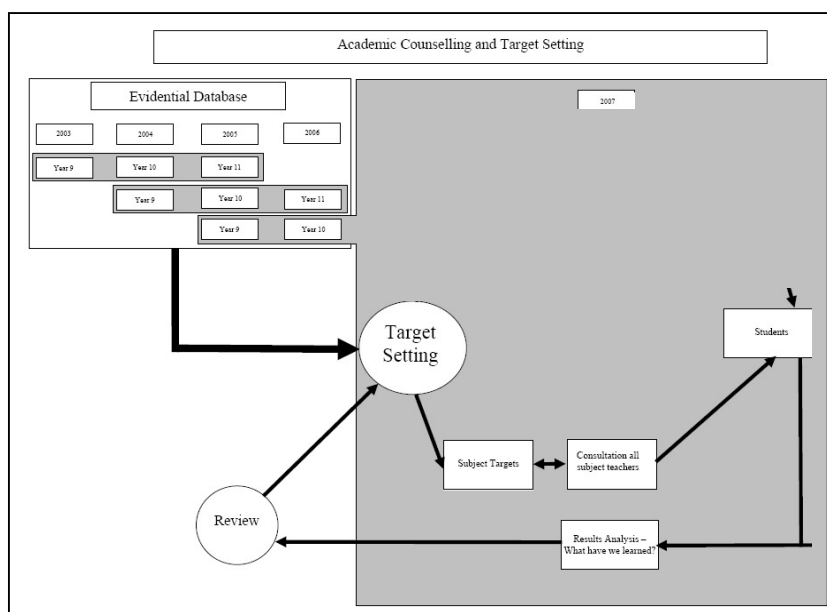
Figure 9.   Diagram to show academic counselling and target setting model for subject targets.

Once the targets were established, they were collated into subject targets and given to teachers. 'Consultation – all subject teachers' in Figure 9 represented the stage in the process where subject teachers were given the opportunity to review and change the individual targets for students. An important aspect of the target setting intervention was that students and teachers were to strive for the highest levels of achievement. To incorporate this concept into the model, any changes made to the targets were only allowed to be upwards. Once any changes had been made and recorded, teachers were asked to discuss this information with students in their subject classes. The full details of the process involved in establishing the academic targets for subjects in the external standards is outlined in detail in the following sections. Each target for the external standards in English and mathematics took the form of an NCEA grade of achieved, merit or excellence. As this study was about targets and not predictions, 'not achieved' was not used as a target.

Process

The technique used to establish the targets for students in the external standards in English and mathematics was based on Data Envelopment Analysis (DEA). DEA is a

methodology that considers the edges of a distribution of data rather than those data in the middle of a distribution. Instead of fitting regression lines through the centre of the data, as is the case for regression analysis, a piecewise linear surface is rested on top of the distribution of data and this is shown in Figure 10. The dotted line in the figure shows a regression line drawn through data points, and the solid line in the figure represents the piecewise linear function drawn on the edges of the distribution of the same dataset.

The weakness of regression as a technique for target setting is the outcome variable being calculated is an average value. As discussed earlier in this study, the aim of the target setting was to raise achievement for individual students so the concept of setting targets at the average value did not fit with the rationale behind the study or the theories of goal setting. The implications of using regression would result in a target being set that was too low for some students; fifty percent of students would have a target that was too low if regression techniques had been used to establish the targets.
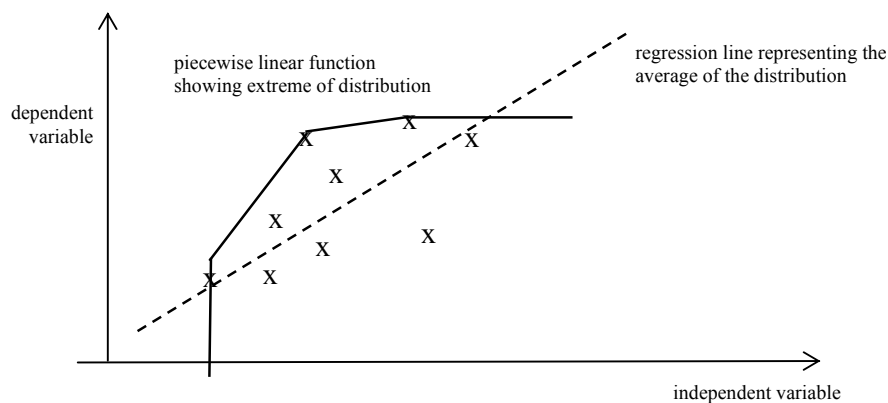
Figure 10. Diagram demonstrating data envelopment techniques.

Hence targets can be generated by identifying those students at the upper edge or the envelope of the data distribution; that is, those students who have achieved highly compared to other students with the same prior achievement score.

To develop a target for each external achievement standard, the following sets of data were required for each student; the MidYIS score at the start of Year 9, asTTle score at the end of Year 9 and the asTTle score at the end of Year 10.

The grades given in NCEA Achievement Standards are categorical with no linear relationship between the grades and, as such, the use of a DEA analysis was problematic. However the model that DEA uses of plotting MidYIS scores on the x-axis and the grade for NCEA on the y-axis was a good first stage in the analysis of the previous cohorts of students

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from NZHS. Cohort 46 NCEA results and MidYIS results were examined in this way. Figure 11 shows the performance of those students from NZHS from Cohort 46 who took AS90053 an English Achievement Standard in 2006 and their corresponding MidYIS score.

   In Figure 11, it was impossible to use linear regression techniques to determine a relationship between the NCEA grade and the MidYIS score as the values on the y-axis were not scale scores but rather categorical values that were the results possible for achievement standards (i.e. achieved, merit and excellence grades). NA represents the not achieved grade and indicated that the students did not satisfy the requirements of this standard. However, information analysed in this way allowed some important features of the distribution of the data to be observed and that was helpful in the next stages of the analysis. Generally the students with the highest MidYIS scores achieved excellence grades and the students with the lower MidYIS scores gained achieved grades. It was also possible to see the areas of the graph where students have overachieved (top left of Figure 11), and underachieved, (bottom right of the Figure 11). Unfortunately, the large overlap between the achieved and merit grades made it problematic to identify a breakpoint for the target setting analysis. This overlap is perhaps indicative of the lack in differentiation between achieved and merit grades, a common criticism of NCEA.
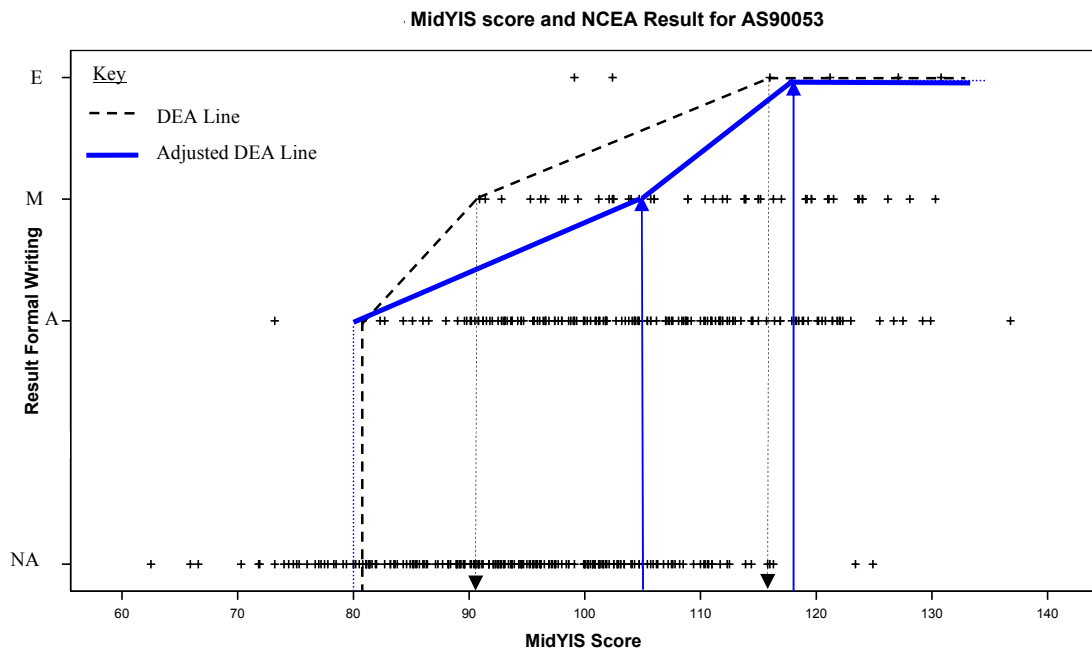
Figure 11. Analysis of Cohort 46 MidYIS scores using data envelopment analysis

Data envelopment analysis would have the upper boundary through the data in Figure 11 producing the dotted line as shown.

Table 19 synthesizes all the information that was used to aid the development of realistic breakpoints between gaining the different grades of NCEA on English achievement standard 90053, in order to develop a realistic target for students in the intervention group on this standard. Column (a) represents the possible grades awarded for this English achievement standard. Column (b) shows the spread of results for those students who passed the achievement standard from Cohort 46, the students at NZHS in the year prior to the intervention. The figures in Column (c) give the national picture. It shows the percentage of all New Zealand students with a pass result at the three grades in 2006. For example, 3% of students at NZHS that passed the assessment in 2006 gained an excellent grade compared to the National figure at the time of 7%. The figures in column (d) represent the targets for each grade based on calculations using the DEA model.

Table 19.

Percentage of Students Passing AS90053 Both at NZHS and Nationally.

AS90053	Percentage of Candidates with a Pass Result		
(a)	(b)	(c)	(d)
NCEA grade	NZHS Results 2006	National Results 2006	Target based on DEA upper boundary
E	3	7	8
M	22	27	65
A	75	66	27
NA	-	-	-

One foreseeable problem with the DEA model was that the targets it produced for students were extremely high. To have suggested to teachers that they increase the percentage of students passing at the merit grade from 22% of students to 65% would have been perceived as unrealistic; teachers would almost certainly have questioned the validity of the target setting process. A necessary condition of goal-setting theory (Locke & Latham, 2006) was that the student has the requisite ability to attain the goals set. As a result of the high

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proportion of merit grades produced by the full DEA method, an adaptation was made so that targets could be provided to teachers that were realistic and achievable. Hence an adapted-DEA model was developed for this study.

The adapted-DEA model involved deciding where the breakpoints for the achieved, merit and excellence grades would be placed. Rationales were developed to determine the breakpoints for the targets that were based on previous students' past performance in the NCEA external achievement standards, with a small element of challenge incorporated into the model. In this way, the adapted-DEA model would produce targets that were more realistic and achievable for the school, for the teachers at the school and for the students. The process involved in the adapted-DEA model is outlined in the sections below.

The NZQA website showed that the intervention school had not reached the same pass rate as the national student cohort in the external English achievement standard, AS90053, nor in fact in any of the other external standards in English. In Table 20, Row (b) shows NZHS's 2006 results by percentage of students who passed at each of the achieved, merit and excellence grades. Row (c) shows the national results. The results by percentage of candidates entering the external examinations for NZHS and national students for achievement standard AS90053 are also shown in Rows (e) and (f).

Table 20.

NCEA Result Information Guiding the Cut-off Grade Boundaries for the Targets for Achievement Standard AS90053 (Formal Writing).

	(a) NCEA Grades			
	E	M	A	NA
Percentage of students with a results pass				
(b) NZHS results 2006 (Cohort 46)	3	22	75	
(c) National results 2006	7	27	66	
(d) Target based on DEA upper boundary	8	65	27	
Percentage of candidates with a result				
(e) NZHS results (n =468)	2	12	40	46
(f) National results	4	17	42	37
Target for intervention group (Cohort 57)				
(g) NZHS	7	27	66	

Note: E represents the achieved with excellence grade, M achieved with merit grade, A achieved grade and NA represents the not achieved grade.

Again there is evidence to show that NZHS students were not achieving to the same level as the national cohort of students in this standard. For example, in 2006, 2% of NZHS students attempting achievement standard AS90053 gained the excellence grade, compared to 4% nationally. Therefore, in the first instance, a more realistic target for students at the intervention school was to reach at least the same level of achievement as the national cohort of students. Targets based on national student figures would also be easier to justify to staff at the intervention school as realistic, than the targets generated from the full DEA model. The data in Row (g) of Table 20 below show the targets that were used for the intervention students for the English external achievement standard AS90053.

Once the breakpoints for the adapted-DEA model had been decided, they were applied to the MidYIS and asTTle scores providing each student in the intervention cohort with a profile of three grades for the same standard, in this case the English achievement standard AS90053. The table below, Table 21, shows a typical profile for a group of students from Cohort 57. The adapted-DEA model produced slightly different targets for each independent variable used in the analysis; an example of how each final target was produced is shown in Table 21.

Student 1 in Table 21 had a target for the external English achievement standard of merit for each DEA analysis and hence the final target established for this student was a merit grade. Table 21 shows all three targets and the resulting final target.

Table 21.

NCEA Target Grades Produced for Students Using the Adapted-DEA Model.

	MidYIS	asTTle (Year 9)	asTTle (Year 10)	Final Target
Student 1	M	M	M	M
Student 2	M	M	E	M
Student 3	E	E	M	E
Student 4	A	M	E	M
Student 5	A	A	A	A

Note: E represents the achieved with excellence grade, M achieved with merit grade, A achieved grade and NA represents the not achieved grade.

The final target was chosen by selecting the most common highest target of the three targets generated from the analysis. The whole procedure was repeated for each external standard in English and mathematics. Once the final targets had been compiled they were presented to teachers who were asked to examine them, change them if they were inappropriate (upwards only) and then share with their students in a subject teacher session of academic counselling.

Analyses

In this section of the chapter, the success of the target setting intervention for the external standards in English and mathematics was investigated. The measures used to determine whether the target setting was successful in each of the subjects of English and mathematics were the total number of credits achieved by each candidate and a grade point score (GPS) for each candidate. Only external achievement standards were used in this measure of GPS as the test conditions and physical papers sat were the same for all candidates, giving more consistency to the measure. The GPS was calculated by multiplying each of the achievement standards' credit value by a factor of two if the standard was awarded at the achieved grade, by a factor of three if the standard was awarded at the merit grade and by a factor of four if the standard was awarded at the excellence grade. The sum of all the standards gained was multiplied by the award value and then added together. For example, a student gaining the following results in English as shown in Table 22 had a GPS of 29. The GPS used in this thesis is not the same as the typical 'grade point average' reported by NZQA.

Table 22.

Example Results for the External Achievement Standards in English.

Achievement Standard	Credits	Grade
90053	3	A
90054	2	A
90055	2	M
90056	2	A
90057	3	M

Note: E represents the achieved with excellence grade, M achieved with merit grade, A achieved grade and NA represents the not achieved grade.

The calculation used to calculate the GPS is shown in Figure 12, below.

$$GPS = \quad (3*2 + 2*2 + 2*3 + 2*2 + 3*3) \quad = 29$$

Figure 12. Demonstration calculation of grade point score (GPS) for English

English Results

The following analysis sets out to evaluate the impact of the target setting initiative in English by comparing the intervention students' achievement with a control group. The measures used to evaluate the success of the intervention were one of quantity and quality. The measure of quantity was provided by the total number of external standards credits gained and the measure of quality was gained from the grade point score (GPS). The control group consisted of students who gained the English achievement standards in the previous academic year and were not part of the target setting intervention.

Participants

The participants in this analysis consisted of those students who attended the external examinations in English. These participants differed from the number of students in the cohorts. Cohort 46 consisted of 582 students, of which 468 (80%) were entered and attended the external English examination on 21 November 2006. Cohort 57 had 559 students, of which 355 (64%) entered and attended the external English examinations on 22 November 2007.

Not every student was entered for the English external standards because there were different types of English course on offer at NZHS. Each course comprised of different combinations of unit standards and achievement standards, for example, one of the English courses at NZHS did not contain any external standards. Of the 468 students in Cohort 46, 48% were male and 52% female. 45% male and 55% female students were in Cohort 57. Table 23 (below) shows the distribution of ethnicities across those students who were entered and attended the external English examinations.

Table 23.

Ethnicity Composition for Each Cohort of Students

Entering the External English examinations.

Percentage	Cohort 46	Cohort 57
New Zealand European	60	54
Maori	18	18
Pasifika	9	15
Asian	11	13
Other	2	0

The first noticeable feature in the two cohorts was that fewer students in Cohort 57 were entered for the external achievement standards than those who entered the external achievement standards from Cohort 46. The percentage entered varied from standard to standard but was at most 87% from Cohort 46 and 71% from Cohort 57.

In 2007, a statistically significantly smaller proportion of students entered and attended the external examinations than in 2006. Cohort 46 entered 508 students for each of four English standards in 2006 and Cohort 57 entered 399 students for each of four external English standards. Both cohorts entered a reduced number of students for the 5th external standard; 85 from Cohort 46 and 74 from Cohort 57. This was not the case for Pasifika students, with statistically significantly more entering the external examinations, than previously.

In the external examination, students were graded with one of the following six results: SNA – student not attempted; ABS – student absent; A – achieved; M – merit; E – Excellence; and N – not achieved. In Table 24 below, the percentages of grades for those students who attempted the standard and the number of students considered are shown for each cohort. A reduction of candidate entries to the external examination results was a deliberate action by the English department to reduce the failure rate in the external examinations and to replace these standards with other standards that the students would be able to achieve. The reduction of entries to the external English examinations can be seen in the data presented above as well as its effect on the N – not achieved grade, which decreased

over the two cohorts in every standard. The students not entered for the external achievement standards took a course that involved unit standards and internal achievement standards.

Table 24.

Percentage of Students from each Cohort Gaining NCEA Grades in Each of Five English External Standards (SNA and ABS not included).

	Standards by cohort									
	90053		90054		90055		90056		90057	
Grade	46	57	46	57	46	57	46	57	46	57
A	44	48	52	59	38	59	43	56	32	37
M	13	16	7	11	16	21	11	12	20	27
E	2	3	2	0	12	7	3	3	3	2
N	41	33	40	31	34	12	43	29	46	34
n	427	321	371	300	85	74	383	307	444	339

The analyses undertaken in this research only involved students who were entered for the external examinations as they were the students for which a target was prepared. There were 508 students entered for the external examinations in Cohort 46 and 399 students in Cohort 57.

The analyses in the next section explored the difference in total credits gained for both cohorts when controlling for ethnicity, gender and a measure of prior achievement in this instance, the students' MidYIS score.

Analysis

An analysis involving regression examined whether the intervention had an impact on the achievement of the intervention group of students by using the total number of credits gained (quantity) and the quality of the credits gained (as measured by the GPS) in the external achievement standards in English.

Total Credits Gained in the English External Standards

The hypothesis that the intervention students achieved more than the control cohort of students, as measured by total number of external credits gained, was modelled by using

Equation 6, where *y,* the dependent variable, represented the total number of credits gained in English.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \tag{6}$$

where x_1 is the categorical variable intervention,

x_2 is the continuous variable MidYIS score,

x_3 is the dichotomous variable gender,

x_4 is the categorical variable ethnicity,

β_0 is the intercept term,

e is an error term (mean = 0 and standard deviation = 1).

A four-predictor regression model was fitted to the data to investigate the relationship between the dependent variables, prior achievement, the intervention, gender and ethnicity and the dependent variable, the total number of external credits achieved in English. Data were entered into the analysis as a value for the total number of credits gained in English, as continuous values for continuous predictors and dummy coding for categorical predictors. In the analysis the reference group for gender was male students, coded 0, the reference group for the intervention was Cohort 46 (the control group), coded 0, and the reference group for ethnicity was New Zealand European students. The β values and predictor variables are presented in Table 25.

Table 25.

Summary of Regression Analysis for Variables Predicting the Total Credits Gained in the English Externals (N = 648).

Variable	*B*	*SE B*	β
Intercept	-13.17	1.49	
INTRVNTN	0.11	.02	.16***
MidYIS Score	.18	.01	.54***
Female	1.67	.23	.21***
Maori	-.68	.31	-.07*
Pasifika	-.27	.39	-.02
Asian	-.04	.39	-.003

Note: R^2 = .37. *$p < .05$. **$p < .01$. ***$p < .001$.

The model summary information from the analysis indicated that the model accounted for approximately 37% of the variance in the total number of external credits gained in the external English achievement standards. According to the model, students in Cohort 57 gained statistically significantly more external English credits than students from Cohort 46, when prior achievement, gender and ethnicity were controlled. Although the difference was statistically significant, the numerical difference was small as, on average, students from Cohort 57 gained 1.2 more credits than students from Cohort 46. A difference of one credit was a theoretical impossibility in terms of gaining an additional standard in English as there are no standards worth one credit. However, this finding could mean the difference between gaining a 2 credit standard and a 3 credit standard. One credit also represents 10 hours of teaching, learning, homework and assessment time for an average student operating at the correct curriculum level (NZQA, 2009).

Group Analysis

The second research question being explored relates to the effect of target setting on different groups within the intervention school; to accomplish this analysis, cohort by ethnicity and cohort by gender interaction terms were entered into the model. The results of this analysis show that, when these interaction terms were entered into the model, there was no statistically significant closing of the gap in the total number of external English credits gained between the genders or ethnicities across the two cohorts. Although not statistically significance, the difference in the total number of credits gained in English by Maori students compared to New Zealand European students across the cohorts should be noted. The gap between these two groups widened. The results from these findings are presented in Table 26.

Table 26.

Summary of Regression Analysis for Variables Predicting Total Number of Credits Gained in the English External Examinations (N = 781).

Variable	B	SE B	β
Intercept	-12.906	1.052	
INTRVNTN	.990	.397	.125**
MidYIS Score	.176	.010	.542***
Female	1.514	.306	.193***
Maori	-.424	.411	-.041
Pasifika	-.532	.587	-.043
Asian	-.529	.521	-.042
INTRVNTN X Female	.344	.471	.037
INTRVNTN X Maori	-.591	.636	-.040
INTRVNTN X Pasifika	.461	.769	.029
INTRVNTN X Asian	1.067	.776	.059

Note: $R^2 = .37$. *$p < .05$. **$p < .01$. ***$p < .001$

Before the Intervention

Prior to the intervention, the two statistically significant predictors of the number of external credits gained in the English external achievement standards were gender and prior achievement (Table 27). Female students gained an additional two credits compared to male students when ethnicity and prior achievement were controlled in the analysis. For a female, New Zealand European student with a MidYIS score of 100, the number of external credits gained on average was 6.4; for a male student this would be 4.4 credits on average gained in the external English achievement standards. This could be the difference between gaining an additional standard worth two credits in English.

Table 27.

Summary of Regression Analysis for Variables Predicting the Total Credits Gained in the English Externals for Cohort 46 (N = 456).

Variable	B	SE B	β
Intercept	-12.80	1.49	
MidYIS Score	.17	.01	.54***
Female	1.67	.31	.21***
Maori	-.17	.42	-.02
Pasifika	-.34	.57	-.02
Asian	.19	.51	-.01

Note: R^2 = .37. *p < .05. **p < .01. ***p < .001.

After the Intervention

After the intervention there were three statistically significant predictors in the number of external credits in English gained; being female; being Maori compared to being New Zealand European; and prior achievement (Table 28). After the intervention, a female New Zealand European with a MidYIS score of 100 would gain on average 6.4 credits compared to a similar male student who would gain on average 5.6 credits. The intervention has narrowed the gap between the genders albeit not statistically significantly so. Splitting the analysis in this way may lose statistical power, however, it serves as a vehicle to see where changes have occurred prior to the intervention and after the intervention.

Table 28.

Summary of Regression Analysis for Variables Predicting the Total Credits Gained in the English Externals for Cohort 57 (N = 354).

Variable	B	SE B	β
Intercept	-6.87	1.61	
MidYIS Score	.13	.02	.40***
Female	1.84	.35	.25***
Maori	-1.07	.48	-.11*
Pasifika	-.77	.52	-.07
Asian	.16	.54	-.01

Note: R^2 = .37. *p < .05. **p < .01. ***p < .001.

Aggregated or separately, the analyses indicated that for a student with an MidYIS score of 100, being part of Cohort 57 meant gaining one more additional achievement standard in the English external assessments than if you were part of Cohort 46. However, there appeared to be a detrimental effect for Maori students who gained statistically significantly fewer external credits compared to their New Zealand European counterparts, even when prior achievement and gender were controlled in the analysis.

The next stage of the analysis was to examine the quality of the standards gained by students in the English external achievement standards using a measure of quality based on a grade point score.

Grade Point Score (GPS) Analysis in English External Standards

The mean GPS for Cohort 57 was 31.3 and the mean for Cohort 46 was 25.7, a difference of 5.6 credits. To attain a GPS of 31.3, students needed to gain two three-credit external English achievement standards, one each at the achieved and merit grades. There were three different ways of attaining a GPS of 25, the nearest to 25.7; they were gaining two three-credit external standards at achieved, or one three-credit achievement standard at the excellence grade, or by gaining a two-credit standard at the achieved grade and a three-credit standard at the merit grade. The most common way of gaining a GPS of 25 was by gaining two three-credit standards at the achieved grade. Eighteen out of the 20 candidates who gained a GPS of 25 gained it in this way. So the difference in being in Cohort 57, the intervention cohort, meant that a student improved the quality of two achievement standards of equal value (three credits each in this case) from two achieved grades to an achieved grade and a merit grade.

The previous brief investigation did not take into consideration the role of gender, ethnicity and prior achievement on the GPS score in the external English achievement standards. To incorporate these factors into the analysis the following regression model was used, represented by Equation 7.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \tag{7}$$

where x_1 is the categorical variable intervention,

x_2 is the continuous variable MidYIS score,

x_3 is the dichotomous variable gender,

x_4 is the categorical variable ethnicity,

β_0 is the intercept term,

e is an error term (mean 0 and standard deviation 1).

The dependent variable, y, was the grade point score (GPS) gained in the external achievement standards in English. The results of the regression are shown in Table 29.

Table 29.

Summary of Regression Analysis for Variables Predicting the Total Grade Point Score in English (N = 731).

Variable	B	Std. Error	β
Intercept	-73.94	5.55	
INTRVNTN	5.97	1.26	.14***
MidYIS Score	.96	.05	.55***
Female	8.18	1.24	.19***
Maori	-3.18	1.68	-.06
Pasifika	-2.88	2.09	-.04
Asian	.82	2.06	.01

Note: $R^2 = .37$. $*p < .05$. $**p < .01$. $***p < .001$.

The information determined from the regression analysis indicated that the intervention students gained on average 6 more GPS points in English than those students from the control group, when gender, ethnicity and prior achievement were held constant; this was a statistically significant finding. In this model, 37% of the variance in the GPS of the English external standards was explained.

A male New Zealand European student from Cohort 57 with a MidYIS score of 100 would gain a GPS of 28.3, compared to a similar student from Cohort 46 who would score a GPS of 22.3. This could mean a difference of gaining one more standard at achieved. In terms of quality, a male student in the control group with a MidYIS score of 100 could have gained a GPS of 22 by gaining two three-credit standards at the achieved grade, one two-credit standard at merit grade and another two-credit standard at the achieved grade. A male student from the intervention group with the same MidYIS score would have improved the quality of two of the standards to merit grades to achieve a GPS of 28. These results are shown in Table 30.

Table 30.

Comparison of Possible Results for Two Similar Students, One from the Control Group and one from the Intervention Group.

	English External Standards and Credit Value				
	90053	90054	90056	90057	GPS
	3 credits	2 credits	2 credits	3 credits	
Control Group					
Male					
MidYIS =100	A	M	A	A	22
NZE					
Intervention Group					
Male					
MidYIS =100	M	M	A	M	28
NZE					

Group Analysis

The purpose of this study was to investigate how individual academic targets impact on different sub-groups of students in the school. The second model introduced all two-way categorical interactions, for example cohort by gender and cohort by ethnicity. The purpose of the introduction of these terms was to explore any differences between the genders across the cohorts and to investigate whether these had changed due to the intervention.

In this second model, there was only a very small change in the explained variance from 37.1% to 37.6% implying that the addition of these interactions did not add any further explanation to the model; all were statistically non-significant. This indicates that the difference between genders for English GPS across the cohorts has not significantly narrowed and neither have the ethnic differences significantly changed (Table 31). Again, as with the total credits, the difference between Maori achievement and New Zealand European achievement in GPS has widened slightly though not statistically significantly so. Table 31 presents the results of the analysis.

Table 31.

Summary of Regression Analysis for Variables Including Interactions Predicting the Total Grade Point Score in English (N = 731).

Variable	B	Std. Error	Beta
Intercept	-73.21	5.62	
MidYIS Score	.96	.05	.55***
Female	7.04	1.64	.17***
Maori	-1.94	2.20	-.04
Pasifika	-3.47	3.14	-.05
Asian	-2.38	2.79	-.04
INTRVNTN	4.22	2.12	.10*
INTRVNTN X Female	2.56	2.52	.05
INTRVNTN X Maori	-2.80	3.40	-.04
INTRVNTN X Pasifika	1.12	4.11	.01
INTRVNTN X Asian	6.97	4.15	.07

Note: $R^2 = .37$. *$p < .05$. **$p < .01$. ***$p < .001$.

Prior to the intervention, there were two statistically significant predictors for the GPS in the external English achievement standards, MidYIS and gender (Table 32). Female students on average gained a GPS score of 7 more than their male counterparts when all other variables were held constant.

Table 32.

Summary of Regression Analysis for Variables Predicting the Grade Point Score in English Before the Intervention (N = 418).

Variable	B	Std. Error	Beta
Intercept	-79.23	7.04	
MidYIS Score	1.02	.07	.60***
Female	7.03	1.62	.17**
Maori	-1.61	2.19	-.03
Pasifika	-2.85	3.14	-.04
Asian	-2.12	2.77	-.03

Note: $R^2 = .40$. *$p < .05$. **$p < .01$. ***$p < .001$.

After the intervention, the statistically significant predictors for GPS were the same, that is, these were the predictors of MidYIS and gender (Table 33).

Table 33.

Summary of Regression Analysis for Variables Predicting the Grade Point Score in English After the Intervention (N = 312)

Variable	B	Std. Error	Beta
Intercept	-59.58	8.99	
MidYIS Score	.87	.09	.49***
Female	9.42	1.94	.23***
Maori	-4.81	2.63	-.09
Pasifika	-3.04	2.82	-.05
Asian	4.68	3.11	.07

Note: R^2 = .40. *p < .05. **p < .01. ***p < .001.

In conclusion, the intervention made a statistically significant impact on the achievement of students in Cohort 57 in terms of number of credits and the quality of credits gained.

Mathematics Results

An analysis similar to that conducted in the previous section was carried out to evaluate the impact of the target setting initiative in the subject area of mathematics. The measures used in this analysis were the total number of external standard credits gained and a grade point score measure in mathematics.

Participants

The participants for this section of the study were those students who attended the external examination in mathematics. For the mathematics external achievement standards, the number of students who were entered and attended the external examinations differed between cohorts. Cohort 46 consisted of 582 students, of which 376 (65%) were entered and attended the examination on 24 November 2006. Cohort 57 had 559 students, of which 395 (71%) entered and attended the examinations held on 20 November 2007. Of the 376 students from Cohort 46, 51% were female and 49% were male. In Cohort 57, of the 395 students, 53% were female and 47% male. Table 34 below shows the distribution of the ethnicities

across the cohorts for those students who were entered and attended the external examinations in mathematics.

Table 34.

Percentages of Each Ethnicity from each Cohort

Entering the External Examinations in Mathematics.

Percentage	Cohort 46	Cohort 57
New Zealand European	61	51
Maori	15	18
Pasifika	8	14
Asian	15	16
Other	1	1

In 2007 there were statistically significant changes in the proportions of the different ethnicities entered for the external examinations; statistically significantly fewer New Zealand European students and statistically significantly more Pasifika students entered the examinations. The proportion of Maori and Asian students who entered the external examinations did not change.

Analysis

An analysis involving regression examined whether the intervention had an impact on the achievement of the intervention group of students by using the total number and the quality of the credits gained (as measured by the GPS) in the external achievement standards in mathematics.

Total Credits Gained in the Mathematics External Standards

A regression analysis was conducted in the same way as the previous section; there were four predictor variables on the dependant variable, total number of credits gained in the mathematics external standards. A similar hypothesis was explored, that of students from the intervention cohort achieving more credits than the control group.

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The total number of credits gained was modelled by Equation 8.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \qquad\qquad (8)$$

where y is the dependent variable, total number of external credits gained in mathematics,

x_1 is the categorical variable intervention,

x_2 is the continuous variable MidYIS score,

x_3 is the dichotomous variable gender,

x_4 is the categorical variable ethnicity,

β_0 is the intercept,

e is an error term (mean = 0 and standard deviation 1).

The results of the analysis are presented in Table 35.

Table 35.

Summary of Regression Analysis for Variables Predicting the Total Number of Credits Gained in the Mathematics Externals (N = 653).

Variable	B	Std. Error	β
Intercept	-11.46	2.04	
INTRVNTN	2.14	.43	.18***
MidYIS Score	.18	.02	.34***
Female	.55	.43	.05
Maori	-.13	.60	-.01
Pasifika	-.04	.72	-.002
Asian	3.40	.68	.19***

Note: R^2 = .17. *p < .05. **p < .01. ***p < .001.

The analysis indicated that Cohort 57 gained statistically significantly more credits in the mathematics external achievement standards than Cohort 46. Cohort 57 gained on average two more credits than Cohort 46. A male New Zealand Student with a MidYIS score of 100 from Cohort 57 would gain 8.5 credits, compared to a similar student from Cohort 46 who would gain 6.4 credits. In this instance, it could mean the difference between gaining

two external achievement standards in mathematics and gaining three achievement standards. This model accounted for 16.5% of the variance in the total number of external credits gained which was a relatively poor fit and caution must be drawn to the analysis.

Group Analysis

In the next stage of the analysis, all two-way categorical interaction variables were included in the model; again this was in order to examine the changes between ethnicities and the genders across the cohorts. In this second model, there was a small change in the explained variance from 16.5% to 17.2%, implying that the addition of these interactions did not add much further explanation to the original model. In this model, Cohort 57 students still performed statistically significantly better than Cohort 46 students in gaining external achievement credits in mathematics (Table 36).

Table 36.

Summary of Regression Analysis for Variables Predicting the Total Number of Credits Gained in the Mathematics External Achievement Standards (N = 649).

Variable	B	Std. Error	β
Intercept	-11.74	2.08	
INTRVNTN	1.78	.71	.15*
MidYIS Score	.18	.02	.35***
Female	-.24	.60	-.02
Maori	.52	.87	.03
Pasifika	.50	1.16	.03
Asian	4.00	.99	.22***
INTRVNTN X Female	1.61	.85	.12
INTRVNTN X Maori	-1.23	1.19	-.06
INTRVNTN X Pasifika	-.95	1.45	-.04
INTRVNTN X Asian	-1.22	1.36	-.05

Note: $R^2 = .17$. *$p < .05$. **$p < .01$. ***$p < .001$.

Prior to the intervention, there were two statistically significant predictors to the total number of external credits gained in mathematics; they were the MidYIS score and being Asian compared to being New Zealand European (Table 37). Asian students scored three more credits than their New Zealand European counterparts when all other variables were

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held constant. There were no significant differences between the genders in gaining external credits in mathematics.

Table 37.

Predictors in Total Mathematics Credits Before (N = 531) and After (N = 327) the Intervention.

	Before the intervention				After the intervention		
Variable	B	Std. Error	Beta		B	Std. Error	Beta
Intercept	-2.06	3.12			-18.34	2.55	
MidYIS Score	.09	.03	.17***		.27	.03	.51***
Female	-.20	.62	-.02		1.41	.56	.12**
Maori	.08	.91	.01		-.72	.76	-.05
Pasifika	-.28	1.23	-.01		.10	.83	.01
Asian	3.15	1.06	.17**		2.81	.85	.16**

Note: $R^2 = .05$. *$p < .05$. **$p < .01$. ***$p < .001$.   *Note*: $R^2 = .30$. *$p < .05$. **$p < .01$. ***$p < .001$.

After the intervention, there were three predictors to gaining credits in the external mathematics examinations. These were prior achievement, being Asian compared to being New Zealand European and being female. This new statistically significant predictor indicated that female students have performed particularly well with the introduction of the intervention in Cohort 57, so much so, that they achieved statistically significantly better than male students when all the variables in the model were controlled.

Grade Point Score (GPS) Analysis in Mathematics

The next stage of the analysis, as for the English external standards, was to examine the quality of the standards gained by students in the mathematics external achievement standards. This was again determined by a measure of GPS in the mathematics external achievement standards. The mean GPS for students in Cohort 57 was 25.5 and the mean GPS for students from Cohort 46 was 22.2, a difference of 3.3.

The previous brief analysis did not take into consideration the role of gender, ethnicity and prior achievement on the GPS score in the mathematics external achievement standards.

To incorporate these factors into the analysis the following regression model was used, represented by Equation 9.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \qquad (9)$$

where x_1 is the categorical variable intervention,

x_2 is the continuous variable MidYIS score,

x_3 is the dichotomous variable gender,

x_4 is the categorical variable ethnicity,

β_0 is the intercept,

e is an error term (mean = 0 and standard deviation = 1).

The dependent variable, y, was the grade point score (GPS) gained in the external achievement standards in mathematics. The results of the regression are shown in Table 38.

Table 38.

Summary of Regression Analysis for Variables Predicting Grade Point Score Gained in the External Mathematics Examination (N = 899).

Variable	B	SE B	β
Intercept	-92.18	5.67	
INTRVNTN	7.40	1.39	.14***
MidYIS Score	1.16	.06	.59***
Female	-.6	1.37	-.01
Maori	-4.63	1.82	-.07*
Pasifika	-2.41	2.18	-.03
Asian	9.2	2.23	.11***

Note: $R^2 = .38$. $*p < .05$. $**p < .01$. $***p < .001$.

In the regression analysis, students from Cohort 57 scored a statistically significantly higher GPS than students from Cohort 46 when all other predictor variables were held constant. Cohort 57 students gained on average 7.4 more GPS points than students from Cohort 46. This model accounts for 38% of the variance in the GPS in mathematics. A male New Zealand European student from Cohort 57 with a MidYIS score of 100 would gain a mean GPS of 31.3, compared to a similar student from Cohort 46 who would score a mean

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GPS of 24.2. This could mean a difference of gaining one more additional standard at the achieved grade in terms of quantity. In terms of quality, however, a male student in the control group with a MidYIS score of 100 could have gained a GPS of 24 (the closest possible grade point score to 25) by gaining two three-credit standards at the achieved grade and another two two-credit standards at the merit grade. A male student from the intervention group with the same MidYIS score would have improved the quality of two of the standards to a merit grade and another to an excellence grade to achieve a GPS of 31. These results are shown in Table 39.

Table 39.

Theoretical Comparison of Possible Results for Two Similar Students, One from the Control Group and One from the Intervention Group.

	Mathematics External Standards and Credit Value				
	90153	90191	90152	90151	GPS
	3 credits	2 credits	2 credits	3 credits	
Control Group Male MidYIS =100 NZE	A	M	A	M	25
Intervention Group Male MidYIS =100 NZE	M	E	M	M	32

Group Analysis

In the second stage of the modelling process, two interactions were included in the model to examine the gaps between genders and ethnicities across the cohorts. In the second model, there was a very small change to the percentage of variance explained by the included variables, compared to the first model R squared, changing from 38% to 38.8%. This can be interpreted to mean that the variables do not add much additional explanation to the model. These results are presented below in Table 40.

The information provided in this analysis indicated that the gap between the genders across the cohorts had statistically significantly changed, when all other variables were

controlled. However, there was no longer a statistically significant difference between the cohorts; this can be interpreted to mean that the improved performance of female students in the intervention has been a statistically significant factor in the GPS for mathematics.

Table 40.

Summary of Regression Analysis for Variables Predicting GPS in Mathematics External Standards (N = 899).

Variable	B	SE B	β
Intercept	-89.42	5.76	
MidYIS Score	1.16	.06	.59**
Female	-4.21	1.88	-.08*
Maori	-5.15	2.42	-.08*
Pasifika	-2.94	3.43	-.04
Asian	5.08	3.08	.06
INTRVNTN	2.19	2.32	.04
INTRVNTN X Female	7.49	2.74	.12*
INTRVNTN X Maori	1.52	3.62	.02
INTRVNTN X Pasifika	1.20	4.33	.01
INTRVNTN X Asian	8.49	4.43	.08

Note. $R^2 = .39$. *$p < .05$. **$p < .01$. ***$p < .001$.

Prior to the intervention, MidYIS, gender, and being Maori compared to being New Zealand European were statistically significant predictors in the model to determine the grade point score (GPS) in mathematics. In this model, female students gained on average a GPS of 4 four fewer points than male students when all other variables were controlled (Table 41).

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Table 41.

Summary of Regression Analysis for Variables Predicting GPS in Mathematics External Standards Before (N = 531) and After (N = 327) the Intervention.

	Before the intervention				After the intervention		
Variable	B	Std. Error	Beta		B	Std. Error	Beta
Intercept	-72.27	8.04			-105.60	7.60	
MidYIS Score	.99	.08	.51**		1.35	.08	.66**
Female	-4.06	1.94	-.08*		3.23	1.90	.06
Maori	-6.39	2.52	-.10*		-3.25	2.59	-.05
Pasifika	-4.67	3.58	-.05		.03	2.67	.001
Asian	4.14	3.19	.05		13.82	3.04	.17**

Note: $R^2 = .31$. *$p < .05$. **$p < .01$. ***$p < .001$.　　　　*Note*: $R^2 = .48$. *$p < .05$. **$p < .01$. ***$p < .001$.

Maori student gained six fewer GPS points in mathematics than New Zealand European students, when all other variables were controlled.

After the intervention, there were two predictors in the GPS mathematics and they had changed to MidYIS and being Asian compared to being New Zealand European. Female students after the intervention scored an average of 3.2 <u>more</u> GPS than male student when all other variables were held constant. This indicated that the intervention had narrowed the gap between the genders and reduced the gap between Maori and New Zealand European students, but has now created a gap between Asian and New Zealand European students. Asian students have moved from scoring an average of 4.1 GPS more than New Zealand European students to now scoring 13.8 GPS points more than New Zealand European students. A large educational change as of 14 GPS points could represent the four standards (used as an example in Table 39 page 109) being gained at the excellence level. However, statistical significant difference could not be demonstrated due to the comparatively small number of Asian students in the analysis.

In conclusion, the intervention made a small but significant impact on the achievement of students in the mathematics external standards compared to the control group.

Conclusion

The previous analyses concerning the use of targets for students in English and mathematics show there was an impact on the achievement of students in Year 11 because they were part of the intervention. In most cases, the educational outcomes of students

improved by one more standard (on average) in both English and mathematics. There was also evidence to show that the intervention improved the quality of the achievement, as measured by a grade point score. In English, for example, this could mean upgrading a student's result from three achieved grades and a merit grade to three merit grades and an achieved grade. In mathematics, the quality of the achievement could be upgraded from achieving two achieved grades and two merit grades to three merit grades and an excellence.

The findings showed there were only minimal changes to the gap in achievement between the genders and between the different ethnicities due to the intervention. There were improvements in achievement for female students but these were not statistically significant, except in the case of the quality of credits gained in mathematics. There was evidence to show a detrimental effect for Maori students in the number of credits gained in English between the control group and the intervention group, although this was not a statistically significant change.

In summary, there was evidence to show in this analysis that the intervention did have an impact on student achievement at NZHS, by lifting the achievement of the whole cohort in English and mathematics. This impact did not affect the achievement gap that exists between the genders and the different ethnicities at the school.

CHAPTER SIX

Study 1c: Reading Literacy and Mathematics Targets for Year 9 Students

Study 1c followed and extended the themes in Studies 1a and 1b in that it explored the development of targets for individual students but, in this instance, the students involved in the intervention were students from a different year level (Year 9). The targets established in Study 1c were in the form of asTTle (assessment Tools for Teaching and Learning) levels and sub-levels. As with the previous two studies, a major aspect of the work involved the examination of previous trends of asTTle data from previous cohorts of students. Subsequent to the analysis of these trends, targets were formulated for an intervention group of students at NZHS. As with Study 1b, the main method used to establish the targets was that of an adapted version of Data Envelopment Analysis (DEA). The full details of the participants, the instruments, the methods and the results are presented in the following sections.

Method

The following sections of this thesis describe, in the first instance, the datasets and participants involved. Second, a brief overview of the target setting intervention and finally a detailed explanation of how the targets were established are provided.

Datasets

The principal sets of data used in Study 1c were asTTle data, which were downloaded from Version 4 of the asTTle program. These data have been collected from Year 9 students at NZHS, at both the beginning and the end of Year 9 since 2004. The dataset contained the following variables; Last Name, First Name, Gender, Ethnicity (of which asTTle uses four categories, New Zealand European, Maori, Pasifika and Asian). Also included in the dataset were variables for a score on the asTTle scale and an associated variable, asTTle Level. The variable, asTTle Level, represented the Level of the National Curriculum the students had achieved in reading literacy and mathematics assessments and was found from the asTTle scale score.

Participants

The participants in this study were Year 9 students from NZHS and two control groups. The first control group comprised of Year 9 students from the previous academic

year from NZHS and the second were students from eight other local high schools from the same year as the intervention (2007), referred to in this study as NZSI schools (New Zealand School Improvement Initiative Schools). NZHS is one of nine schools in a region of New Zealand that were part of a school improvement initiative. One of the elements of the initiative was to use asTTle to measure reading literacy and mathematics progress at the nine schools. asTTle reading literacy and mathematics progress data had been collected at NZHS and eight of the other nine schools since 2004. These scores had been collected at the beginning and the end of Year 9.

Process

One of the main concepts behind this study was to use student academic achievement data to identify patterns and trends to help improve academic performance of future students. Typically, when an analysis of student data is made, the average or mean score is reported; this was the case for the asTTle data at NZHS. At the end of Year 9, when a second asTTle test was taken by students, the results were matched for individual students so that each student had an asTTle score in both reading literacy and mathematics at both the start and the end of the year. A measure of progress would then be calculated by working out the difference between the two scores. Each individual student's asTTle score was aggregated to produce a mean score for different groups of students. These means scores were produced for teaching groups and for the year group, which were then reported to the school's senior management team and the staff from the English and mathematics departments. By analysing past asTTle scores and exploring any trends and patterns in the data, this study proposed that the information gathered from these patterns and trends could be used to establish academic achievement targets for current students, rather than using the data retrospectively.

The first step in this analysis was to consider data collected in 2005 and 2006 for students in the NZSI schools in reading literacy and mathematics. An example of paired data from all students in NZHS for numeracy was collected in 2006 and is shown in a scatter diagram in Figure 13.
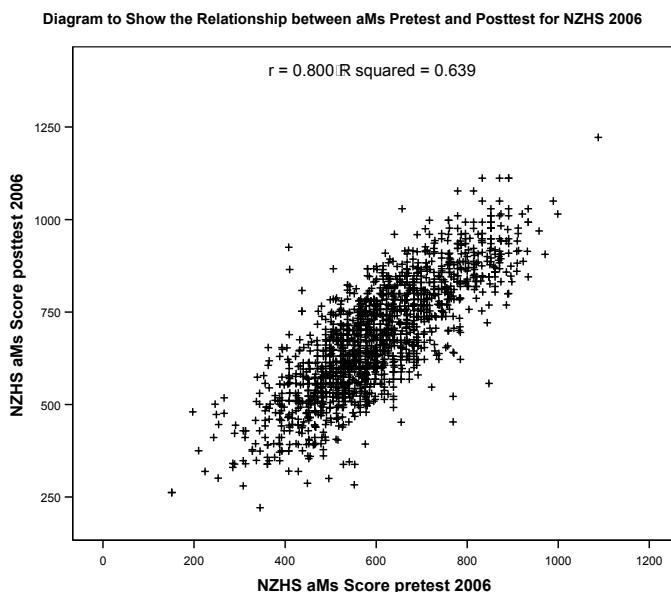
Diagram to Show the Relationship between aMs Pretest and Posttest for NZHS 2006

Figure 13: A scatter diagram to show the relationship between the aMs pre and post test in numeracy for NZHS in 2006.

For both years (2005 and 2006), it was noted there was a strong correlation (r = 0.80 in 2006 in mathematics) between the scores achieved, at the beginning and those that were achieved at the end of the same academic year, in both asTTle reading literacy and asTTle mathematics. This strong correlation existed both at NZHS and for the NZSI schools. Having the knowledge that there was a high correlation between the asTTle scores at the beginning of the year and at the end of the year allowed the following assumption to be made: there was a strong relationship between the two scores and this pattern could be expected in future years. Generally speaking, there was a strong positive association between the scores at the beginning of the year and at the end of the year, such that, as the pre-test scores increased so did the post-test scores. In fact, this has been the case for asTTle in NZSI schools since 2004; there has always been a strong correlation between the asTTle scale score at the beginning of the year and at the end of the year for the same students.

A regression line was fitted to all the data from the NZSI schools to gain a basic insight into the relationship between the first test and the second test. A separate regression line was fitted to the data from NZHS. By overlapping the regression lines for NZHS and NZSI schools, it was possible to identify the differences in performance for different asTTle scores. In this case, on average, NZHS performed better than the NZSI schools except, for the

students with an asTTle score below [313 (2B)] in reading literacy and below [535 (3P)] in mathematics.

The intention of the target setting intervention was not to predict the outcome for each student in Cohort 79 but to have a target for the students and teachers to aim for, a target that included an element of challenge. The problem with using mean scores as targets was that there was always a portion of students for whom the goal or target would be too low and a portion of students for whom the goal or target would be too high. To overcome this particular problem, this study developed two targets for students in Year 9 in reading literacy and mathematics; a lower target based on average performance and an upper target based on the adapted DEA method. Another rationale for having two targets was that the teachers would be able to more readily identify the students for whom the upper target was more appropriate and for those whom the target based on the mean would be more relevant.

To develop the upper target, a simplified version of data envelopment analysis was used. Data envelopment analysis was described in detail in an earlier section of this thesis but a brief recap in the context of this study (1c) is appropriate. Data envelopment analysis (DEA) looks at the upper boundary of achievement rather than the average achievement. As shown in Figure 10 (Study 1b, p. 86), instead of a regression line being placed on the data through the middle of the data, an outer envelope of all top achievements was formed around the upper edge of the data. So, instead of a student who starts Year 9 with an asTTle score of 600 having the target based on the average score established using regression techniques, the student will be given a target or goal of the highest score achieved by students with similar prior achievement. To keep the analysis straightforward and easily reproducible for future use, the upper target or the data envelopment line was calculated to be parallel with the regression line and set to include 95% of all students. Using these two processes, calculation of the mean regression line and one additional parallel line, two target scores were calculated for each student at NZHS in reading literacy and mathematics. Each score was converted into a level and sub-level and presented to subject teachers. The students had access to this information from their subject teachers and from Deans who carried out academic counselling. In the academic counselling sessions, the reading literacy and mathematics targets were discussed with students.

Analyses

A two-stage regression analysis was performed, firstly, to determine the effect of the intervention and, secondly, to explore the effect of the intervention on different sub-groups of

students at the school. The effectiveness of the target setting intervention was assessed by measuring the achievement of the students. Each analysis compared the achievement of NZHS firstly with Year 9 students from the previous academic year. The second part of the analysis compared the achievement of NZHS students with the performance of the Year 9 students in the NZSI schools. The following sections present the findings of the study, first, for reading literacy and, second, for mathematics.

Reading Literacy Results

Participants

Table 42 shows the demographic details of the 1250 students from NZHS and 2032 from NZSI schools included in the analysis of the intervention results.

Table 42.

Year 9 Demographic Details of Each Cohort Included in Analysis (%).

Cohort	n	Male	Female	NZE	Maori	Pasifika	Asian
Intervention Students (79)	575	53	47	40	26	18	16
Comparison Students (68)	675	54	46	45	21	17	17
NZSI Students	2032	54	46	42	20	22	16

KEY: NZE – New Zealand European

Reading Literacy

In the following analysis, the question of whether targets improved the achievement of Year 9 students in reading literacy was explored by comparing the achievement of students at NZHS in reading before and after the intervention using linear regression. A four-predictor regression model was fitted to the data to analyse the success of using targets at NZHS. All predictor variables were included into the analysis as direct effects on the dependent variable. The dependent variable was a continuous variable for achievement in reading literacy at the end of Year 9 as measured by asTTle (ACHR). The predictor variables in the model included a continuous variable for prior achievement in reading as measured by asTTle (PRIOR). Gender was incorporated into the model as a dummy variable, with male used as the reference category (coded 0). Ethnicity was also incorporated in the model as dummy

variables with New Zealand European being used as the reference category. The other variable included in the model was the variable associated with being in the intervention or not. Cohort 79 were the students involved in the intervention and the reference category was Cohort 68, students not involved in the intervention, that is, students from the previous academic year (coded 0).

In the model described above, achievement in reading (ACHR) can be represented by the following regression equation:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \tag{10}$$

such that

$$ACHR = \beta_0 + \beta_1 \text{ PRIOR} + \beta_2 \text{ Gender} + \beta_3 \text{ Ethnicity} + e \tag{11}$$

where the error term (*e*) has a mean of 0 and a standard deviation of 1.

Table 43.

Summary Regression Analysis Predicting Achievement in Reading Literacy (N = 1250).

Variable	B	SE B	β
Constant	17.51	14.99	
PRIOR	1.07	.03	.81***
Female	4.12	3.81	.02
Maori	-8.35	5.03	-.03
Pasifika	-14.45	5.57	-.05*
Asian	-8.60	5.38	-.03
INTRVNTN	48.34	3.82	.24***

Note. $R^2 = 0.68$. *p < .05. **p < .01. ***p < .001

In the model above, approximately 68% of the variance in reading literacy as measured by asTTle was accounted for by the predictor variables, prior achievement in reading, ethnicity, gender and being in the intervention. The analysis indicated that there were two statistically significant effects on student achievement in reading literacy; these were a

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student's prior achievement and whether the students were involved in the intervention. Students from the intervention group achieved a statistically significantly higher score on the independent variable, reading achievement, than those students not in the intervention, when prior achievement, ethnicity and gender had been held constant. On average, students from the intervention (Cohort 79) gained an extra 48 asTTle points than students from the previous year (Cohort 68). In the asTTle manual (Ministry of Education, 2005a, p. 25) 'the average growth per year based on the multi-year cross-sectional sampling used by asTTle is generally … around 50 points a year at secondary school'. This means that, on average, students in Cohort 79 had almost one more year's additional growth in reading than students from Cohort 68.

Reading Literacy Results Compared to NZSI Schools

In the second stage of the analysis, the achievement of the Year 9 intervention group was compared to the achievement of Year 9 students in the NZSI schools. In this analysis, a six-predictor model was fitted to the data using ordinary least squares (OLS) regression techniques and this model was then used to measure the performance of the students in reading literacy at the end of Year 9. The dependent variable in the analysis was achievement in reading literacy, as measured by asTTle (ACHR). The predictor variables in the model were prior achievement in reading as measured by asTTle (PRIOR). Gender was incorporated in the model with male used as the reference category (coded 0). Ethnicity was incorporated in the model as dummy variables, with New Zealand European being used as the reference category. Attending NZHS was a dichotomous variable, such that students either attended NZHS or they did not, meaning they attended one of the other NZSI schools. The other variables included in the model were associated with the school attended, school decile categorised as low decile (1 – 3), medium decile (4 – 7) and high decile (8 – 10). The final school variable included in the model was school denomination which was a dichotomous variable categorised as a school being a catholic school or not.

In the model described above, achievement in reading (ACHR) can be represented by the following regression equation, Equation 12:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + e \tag{12}$$

such that

$$ACHR = \beta_0 + \beta_1 \, PRIOR + \beta_2 \, Gender + \beta_3 \, Ethnicity + \beta_4 \, NZHS + \beta_5 \, School \, Type +$$
$$\beta_6 \, School \, Catholic + e \qquad\qquad (13)$$

where the error term (e) has a mean of 0 and a standard deviation of 1.

Table 44 shows the resulting β coefficients and significance levels:

Table 44.

Summary of Multiple Regression Analysis for Variables Predicting Achievement in Reading at the End of Year 9 (N = 1770).

Variable	B	SE B	β
Constant	79.62	11.30	
PRIOR	.94	.02	.80***
NZHS	59.41	3.84	.26***
Female	2.89	2.97	.01
Maori	-13.00	4.09	-.05**
Pasifika	-21.60	4.12	-.09***
Asian	-10.01	4.41	-.04*
Low Decile	39.131	4.12	.16***
Catholic	22.16	4.74	.08***

Note. $R^2 = 0.63$. *$p < .05$. **$p < .01$. ***$p < .001$.

The specified model accounted for 63% of the variance in achievement in reading literacy. Controlling for all variables in the model, that is, gender, ethnicity, attending NZHS, school decile and school denomination, there was a statistically significant relationship between prior achievement in reading and achievement in reading literacy at the end of Year 9. For every 100 point increase in prior achievement score the achievement in reading literacy at the end of Year 9 increased by 94 points.

Students attending NZHS scored on average an additional 59 more points in reading literacy than those students who did not attend NZHS. This proved to be a statistically

significant relationship when all other variables were controlled. Again this was bigger than the growth reported in the asTTle manual for one year.

The results above show that attending NZHS had a statistically significant impact on the achievement scores in reading literacy, compared to those students who did not attend NZHS. In the next model, each individual school from the NZSI schools was included in the model to ascertain the true impact of attending NZHS on the achievement in reading literacy at the end of Year 9, compared to individual schools.

In the second model each school in NZSI was included as a predictor variable; the other predictors used in the model were prior achievement in reading, gender and ethnicity. The NZSI schools were entered into the model as dummy variables with NZHS being used as the reference category.

In model two, school features such as type and gender were not specified in the model to avoid problems of collinearity, as each school type was included in the variable for the school. For example, school H is a single sex girls' school of Catholic denomination.

Model two accounted for 69% of the variance in achievement on reading at the end of Year 9 as measured by asTTle, and therefore fits the data set better than model one. As with model one, model two indicated statistically significant positive relationship between prior achievement in reading and reading literacy at the end of Year 9, such that when controlling for all the other variables in the model, for every 100 point increase in prior achievement score, the achievement in reading at the end of Year 9 increased by 91 points. This information is displayed in the coefficient summary in Table 45 below.

Controlling for gender, ethnicity and prior achievement there was a statistically significant difference in achievement in reading at the end of Year 9 for students in all schools when they were compared to students at NZHS (Table 45). The size and sign of the beta coefficients indicate whether the performance was better or worse than that at NZHS. A negative sign indicated that the school achieved a mean score that was less than the average score achieved at NZHS.

Six of the eight schools in NZSI performed statistically significantly less well than NZHS, when controlling for ethnicity and prior achievement, as indicated by the negative sign of the beta co-efficient. For example, the mean achievement score for students at School A was 43 points lower than the mean score for students at NZHS.

Table 45.

Summary of Multiple Regression Analysis for Variables Predicting Achievement at the End of Year 9 (N = 1770).

Variable	B	SE B	β
Constant	155.25	10.016	
PRIOR	.91	.02	.77***
Female	1.89	3.39	.01
Maori	-14.68	3.79	-.06***
Pasifika	-22.26	3.84	-.09***
Asian	-10.94	4.10	-.04**
School A	-42.87	5.50	-.11***
School B	-76.53	5.50	-.21***
School C	-72.31	4.80	-.23***
School D	-35.35	5.42	-.10***
School E	21.34	6.84	.05**
School F	-69.88	5.72	-.19***
School G	-47.58	4.96	-02***
School H	13.84	5.41	.04*

Note. R^2 = .69. *p < .05. **p < .01. ***p < .001.

Two schools in the NZSI cluster scored statistically significantly higher than NZHS on achievement in reading when ethnicity and prior achievement were controlled, though the significance of the difference did not hold true at the 1% significance level.

Achieving the Reading Literacy Target

The next stage of the analysis explored the concept of students meeting the target set for them in reading literacy. In Figure 14 below, the y-axis represents the differences between the target and the actual reading score at the end of Term 4 2007 for students from NZHS. A value of zero or above indicated that the target had been met or exceeded. The box and

whisker diagram in Figure 14 shows the distribution of the differences between the lower target and the actual reading score for students in Year 9 at NZHS.
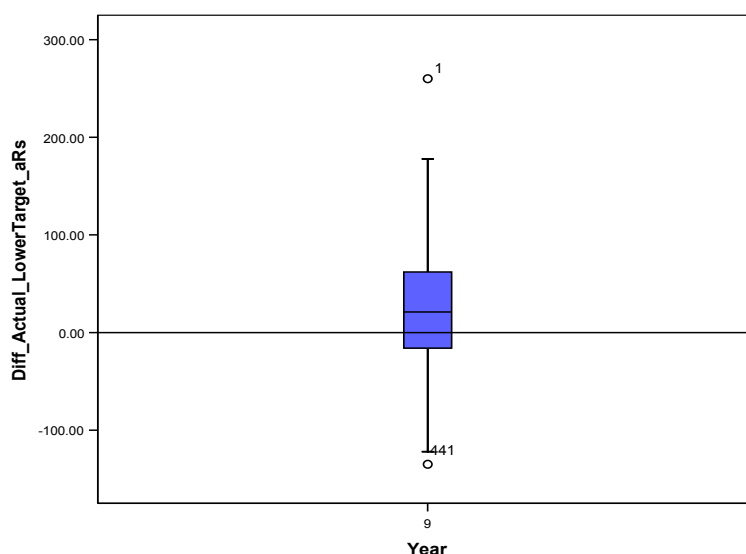

Figure 14. Box and whisker diagram to show the distribution of differences between the lower target and the actual reading score.

A horizontal line is drawn at a value of zero on the y-axis indicating the break-point between where the students have met the target (above the line) and where the students have not met the target (below the line). Sixty-six percent of the Year 9 students who had a result for the first and second asTTle assessments achieved or exceeded the lower target set for them in reading literacy, as shown in Figure 15. An independent sample t-test was performed on the data to investigate whether there was a statistically significant difference between the lower target and the actual score on the reading test. A *p*-value of less than 0.001 indicated that there was a statistically significant difference between the lower target in the reading score and the actual reading score, at the 5% and the 1% significance levels (t = 8.578, *df* = 440, p <0.001). This was also confirmed by a confidence interval analysis, the results of which are shown graphically below in Figure 15.
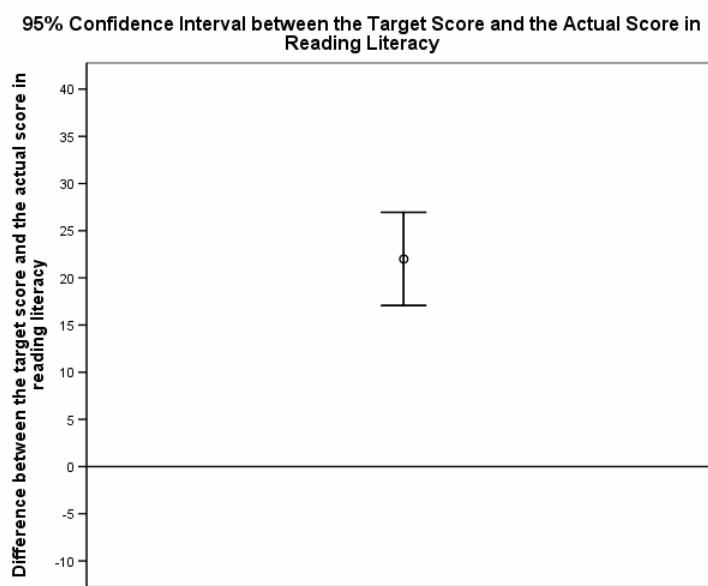
Figure 15. A confidence interval diagram to show the difference between the lower target and the actual score in reading literacy.

In Figure 15, above, the confidence interval diagram does not intersect with the horizontal line at zero and this indicates a statistically significant difference between the mean scores for the two assessments being compared. In summary, in asTTle reading, there was on average a statistically significant difference between the lower target set and the actual target achieved as measured by the reading asTTle score. Therefore, it is possible to conclude that the targets set for 2007 in reading for Year 9 students at NZHS were met or exceeded.

Logistic Regression Analysis for Reading Literacy

The following analysis will explore the effects of the intervention, by examining the performance of NZHS and the NZSI schools in 2007. It is to be noted that, in this analysis, targets were calculated for each school in the NZSI but not shared with the schools or the students, except for the intervention school, NZHS. This was done in order to compare the achievement of the students in NZHS with those students in the other NZSI cluster schools. In the next stage of the analysis, the dependent variable was 'achieving the target'. There were two outcomes possible for the dependent variable; meeting the target, or failing to meet the target. Due to the dichotomous nature of the dependent variable, logistic regression was used to analyse the model. Table 46 presents the summary of the logistic regression analysis.

Table 46.

Logistic Regression Analysis for Reaching the Reading Literacy Target (N = 1770).

Variable	β	β (SE)	Walds χ^2	df	p	e^{β}	95% CI for e^{β}
PRIOR	.002	.001	12.92	1	<.001	1.00	1.00 to 1.00
MHS	1.59	.14	137.49	1	<.001	4.91	3.76 to 6.41
Catholic	.38	.17	4.72	1	.030	1.46	1.04 to 2.04
Female	.03	.11	.06	1	.807	1.03	.84 to 1.26
Maori	-.14	.15	.88	1	.345	.87	.66 to 1.16
Pasifika	-.33	.15	5.10	1	.024	.72	.54 to .96
Asian	-.22	.16	1.95	1	.16	.80	.59 to 1.09
Low Decile	1.04	.14	52.05	1	<.001	2.83	2.03 to 3.75
Constant	.29	.40	.53	1	.47	1.34	

Test			χ^2	df	p		
Overall model evaluation							
Likelihood ratio test			211.45	8	<.001		
Goodness-of-fit test							
Hosmer & Lemeshow			16.01	8	.042		

Note. Cox & Snell R^2 = .11, Nagelkerke R^2 =.15.

The variables in the analysis were the independent predictor variables of gender, ethnicity, prior achievement in reading, school type, school decile, school denomination and attending NZHS. Gender, school type and school denomination were dichotomous variables as documented in the multiple regression analysis earlier.

     According to the analysis, the log odds of a student meeting the literacy target was positively related to attending NZHS (*p* = .001). The odds of meeting the reading target was 4.9 ($e^{4.91}$) times greater for students at NZHS than the odds for meeting the reading target for students who did not attend NZHS when all other variables were controlled.

The effect of ethnicity on the dependent variable, meeting the reading target, was not statistically significant when compared to New Zealand/European students except for Pasifika students. The odds of New Zealand/European students meeting the reading target were 1.4 ($e^{-.33}$) times greater than the odds of Pasifika students meeting the reading target, when all other variables were controlled. The odds of students at low decile schools meeting the reading target were 2.8 ($e^{1.04}$) times the odds of medium decile schools meeting the reading target when all the other variables in the model have been controlled.

Mathematics Results

The same kinds of analyses that were used to evaluate the success of the targets in reading literacy were carried for the mathematics targets. The dependent variable was achievement in mathematics (ACHM) as measured by asTTle. The same independent variables were used in the model for achievement in mathematics as used in the model for achievement in reading. These were prior achievement in mathematics, gender, ethnicity and being part of the intervention.

Table 47.

Summary Regression Analysis Predicting Achievement in Mathematics (N = 1647).

Variable	B	SE B	β
Constant	113.39	14.82	
PRIOR	.99	.02	.83***
Female	15.01	5.72	.05**
Maori	-16.85	7.67	-.04*
Pasifika	-25.73	8.50	-.06**
Asian	.88	8.12	.002
INTRVNTN	2.649	5.721	.01

Note. $R^2 = 0.72$. *p < .05. **p < .01. ***p < .001

The independent variables in the model outlined above explain 72% of the variance in the dependent variable of mathematics achievement. The variables that were statistically

significant predictors of achievement in mathematics were prior achievement, ethnicity – specifically being Maori or Pasifika compared to being New Zealand European – and being female. The regression analysis indicated that, in mathematics, there was not a statistically significant improvement in achievement for the intervention group compared to the previous cohort of students, when all other variables were held constant.

Mathematics Results Compared to NZSI Schools

In the second stage of the analysis of numeracy achievement, the performance of the Year 9 intervention group was compared to the achievement of Year 9 students in the NZSI schools. As with reading literacy, a six-predictor model was fitted to the data using least squares regression techniques and this was then used to measure the performance of the students in mathematics at the end of Year 9. The dependent variable in the analysis was achievement in numeracy, as measured by asTTle (ACHN). The predictor variables in the model were prior achievement in numeracy as measured by asTTle (PRIOR). Gender was incorporated in the model with male used as the reference category (coded 0) and ethnicity was incorporated as dummy variables, with New Zealand European being used as the reference category. Attending NZHS was a dichotomous variable, such that students either attended NZHS or they did not, meaning they attended one of the other NZSI schools. The other variables included in the model were variables associated with the school attended: school decile (categorised as low decile, medium decile and high decile) and school denomination, which was a dichotomous variable categorised as a school being a Catholic school or not. The predictor variable of school gender was not included in the model because of high collinearity between the decile of the school and the school gender. In essence, each variable measured the same predictor.

In the model described above, achievement in numeracy (ACHN) can be represented by the following regression equation:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + e \tag{14}$$

such that

$$ACHN = \beta_0 + \beta_1 \text{ PRIOR} + \beta_2 \text{ Gender} + \beta_3 \text{ Ethnicity} + \beta_4 \text{ NZHS} + \beta_5 \text{ School Type} +$$
$$\beta_6 \text{ School Catholic} + e \tag{15}$$

The following Table 48 shows the resulting β coefficients and significance levels:

Table 48.

Summary of Multiple Regression analysis for Variables Predicting Achievement in Numeracy at the End of Year 9 (N = 1770).

Variable	B	SE B	β
Constant	160.25	11.38	
PRIOR	.89	.02	.78***
NZHS	26.30	5.33	.08***
Female	-4.19	4.19	-.02
Maori	-19.44	5.78	-.06**
Pasifika	-21.70	5.85	-.06***
Asian	1.46	6.07	-.004
Low Decile	5.57	5.78	.02
Catholic	7.24	6.72	.02

Note. $R^2 = 0.67$. *p < .05. **p < .01. ***p < .001.

The specified model accounted for 67% of the variance in achievement in numeracy. Controlling for all variables in the model, that is, gender, ethnicity, attending NZHS, school decile and school denomination, there was a statistically significant relationship between prior achievement and numeracy. For every 100 point increase in prior achievement score, the achievement in numeracy at the end of Year 9 increased by 89 points. Students attending NZHS scored on average an additional 26 points in numeracy than those students who did not attend NZHS; this proved to be a statistically significant result when all other variables were controlled. The results above show that attending NZHS had a statistically significant impact on achievement scores in numeracy, compared to those students who did not attend NZHS.

In the next model, model two, each school from the NZSI schools was included in the model to compare the impact of attending NZHS on the achievement in numeracy at the end of Year 9 to individual schools. Each school in NZSI was included as a predictor variable and the other predictors used in the model were those demonstrated to be statistically significant

from the first model, that is, prior achievement in numeracy and ethnicity. The NZSI schools were entered into the model as dummy variables with NZHS being used as the reference category (coded 0).

In model two, school features such as type and gender were not specified in the model as they would create problems of collinearity. Each school type was included in the variable for the school; school H, for example, was a single sex girl's school of Catholic denomination.

Model two accounted for 69% of the variance in achievement numeracy at the end of Year 9, as measured by asTTle. Model two therefore fits the data set marginally better than model one. As with model one, model two indicated there was a statistically significant positive relationship between prior achievement in numeracy and the numeracy score gained at the end of Year 9, to the extent that, when controlling for all the other variables in the model, for every 100 point increase in prior achievement score, the achievement in numeracy at the end of Year 9 increased by 91 points. This information is displayed in the co-efficient summary table shown below in Table 49.

Controlling for gender, ethnicity and prior achievement, there was a statistically significant difference in achievement in numeracy at the end of Year 9 for students in all schools, when they were compared to students at NZHS. This is clearly identified by the *p*-values Table 49. The size and sign of the beta co-efficient indicate whether the performance was better or worse than that at NZHS.

Four of the seven schools in NZSI performed statistically significantly less well than NZHS, when controlling for gender, ethnicity and prior achievement, as indicated by the negative sign of the beta co-efficient. For example, the mean achievement score for students at School A was 50 points lower than the mean score for students at NZHS. Three schools had on average the same achievement in the numeracy end of year test as NZHS.

Table 49.

Summary of Multiple Regression Analysis for Variables Predicting Numeracy Achievement at the End of Year 9 (N = 1770).

Variable	B	SE B	β
Constant	171.49	11.88	
PRIOR	.90	.02	.80***
Female	11.27	5.47	.04*
Maori	-20.00	5.68	-.06***
Pasifika	-18.66	5.81	-.06**
Asian	3.90	6.00	.01
School A	-50.45	6.89	-.12***
School C	-28.28	7.02	-.07***
School D	7.88	7.59	.02
School E	12.05	10.02	.02
School F	-42.85	8.40	-.09***
School G	-8.01	7.40	-.02
School H	-37.18	8.09	-08***

Note. R^2 = .69. *p < .05. **p < .01. ***p < .001.

Students in the intervention, that is students from NZHS Year 9 2007 (Cohort 79) scored significantly higher on the asTTle numeracy assessment than the Year 9 students from the other local secondary schools combined, however the achievement of these students (Cohort 79) was not higher than students at the same school in the previous academic year (Cohort 68), who had not had targets set for them.

Achieving the Mathematics Target

As with reading literacy, the next stage of the mathematics analysis was to explore the concept of meeting the targets. The box and whisker diagram shown in Figure 16 portrays the distribution of the differences between the lower target and the actual mathematics score for students in Year 9 at NZHS.
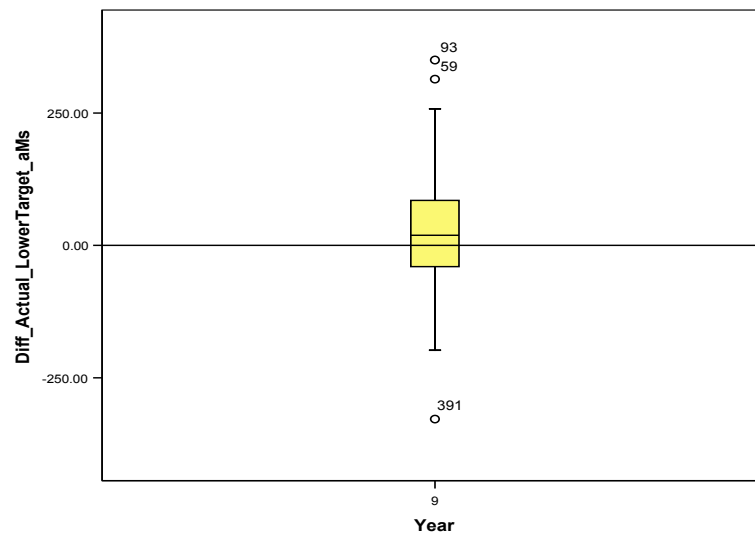

Figure 16. Box and whisker diagram to show the distribution of differences between the lower target and the actual mathematics score.

In Figure 16, the horizontal line indicates the break-point between students reaching and/or exceeding the lower target and not meeting the lower target. Fifty-nine percent of the students met or exceeded the lower target. In a confidence interval analysis, shown in Figure 17, there was a statistically significant difference between the lower target and the actual score (both as measured by asTTle). This conclusion is formed because the confidence interval for the difference between the lower target and actual score does not intersect with the horizontal line at drawn at zero in Figure 17.
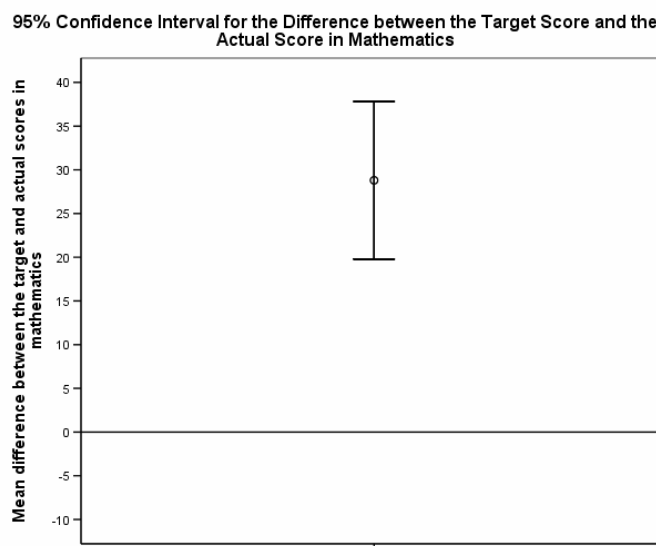
Figure 17. A confidence interval diagram to show the difference between the lower target and the actual score in mathematics.

To further explore the difference for mathematics between the mean lower target and the actual score as measured by asTTle, a paired samples t-test was calculated. The t-test indicated there was a statistically significant difference between the lower target and the actual mathematics score, both at the 5% and the 1% significance levels. (t = 5.120, *df* = 404, *p* < 0.001). In conclusion, it is possible to conclude that the targets set for 2007 in mathematics for Year 9 at NZHS were met or exceeded.

Logistic Regression Analysis for Mathematics

The following analysis explored the effects of the intervention through the performance of NZHS and the NZSI schools in 2007. It should be noted, as for reading literacy, targets were calculated for each school in the NZSI but not shared with the schools or the students, except for the intervention school. This was done in order to compare the achievement of the students in NZHS with those students in the other NZSI schools. In the next stage of the analysis, the dependent variable was 'achieving the target'. There were two outcomes possible for the dependent variable meeting the target or failing to meet the target. Due to the dichotomous nature of the dependent variable, logistic regression was used to analyse the model.

The following table, Table 50, presents the summary of the logistic regression analysis based on the independent predictor variables of gender, ethnicity, prior achievement in mathematics, school type, school decile, school denomination and attending NZHS.

Gender, school type and school denomination were dichotomous variables as documented in the multiple regression analysis earlier.

Table 50.

Logistic Regression Analysis for Reaching the Mathematics Target (N = 1649).

Variable	β	β (SE)	Walds χ^2	df	p	e^β	95% CI for e^β
PRIOR	.003	.00	45.38	1	<.001	1.00	1.00 to 1.00
MHS	.42	.13	10.33	1	<.001	1.53	1.18 to 1.98
Catholic	-.10	.16	.39	1	.530	.90	.66 to 1.24
Female	-.08	.10	.61	1	.434	.92	.76 to 1.13
Maori	-.55	.14	14.84	1	.000	.58	.44 to .77
Pasifika	-.48	.14	11.16	1	.001	.62	.47 to .82
Asian	-.12	.15	.62	1	.431	.89	.66 to 1.19
Low Decile	.20	.14	2.00	1	.157	1.22	.93 to 1.61
Constant	2.05	.29	51.11	1	.000	7.76	

Test	χ^2	df	p
Overall model evaluation			
Likelihood ratio test	71.02	8	<.001
Goodness-of-fit test			
Hosmer & Lemeshow	6.76	8	.563

Note. Cox & Snell R^2 = .04, Nagelkerke R^2 =.06.

In the full logistic regression model the statistically significant predictors of meeting the mathematics target were being at NZHS, prior achievement in mathematics and ethnicity. The odds of meeting the mathematics target was 1.5 times greater for students at NZHS than the odds for meeting the mathematics target for students who did not attend NZHS, when all other variables were controlled.

The effect of ethnicity on the dependent variable meeting the mathematics target was statistically significant when compared to New Zealand/European students, such that, the odds of New Zealand/European students meeting the mathematics target were approximately 1.7 ($e^{-.55}$) times greater than the odds of Maori students, and 1.7 ($e^{-.48}$) times greater than the odds of Pasifika students meeting the mathematics target, when all other variables were controlled.

In light of the previous findings, that students from the intervention did not achieve a statistically significantly greater score, than students from the previous year group at the same school, yet did achieve statistically significantly more on the numeracy assessment compared to students in the local high schools, the question of whether the target set was appropriate for this group of students was raised. To attempt to address this question, the assumption was made that all students from the intervention group achieved the lower target. A regression analysis was performed, that showed, had all the students achieved at the lower target this would not have produced a significant improvement in achievement compared to the control group from the previous year when gender, ethnicity and prior achievement were all controlled in the analysis.

This information poses a conundrum. Fifty-nine percent of the intervention students at NZHS met or exceeded the mathematics target, but this was insufficient to show improved achievement compared to the previous cohort of students. Yet compared to other schools, there was a significant difference in achievement in mathematics. In conclusion, it is therefore difficult to fully assess the impact of the intervention on the achievement in mathematics in Year 9 at NZHS.

As noted in Chapter 4, two other interventions existed at NZHS in 2006 and 2007; the first was a communication skills programme for Year 9 students aimed at improving reading. The second was a professional development project for all teachers aimed at improving the achievement of Maori students. It is recognised that these programmes may have contributed to the outcomes of this study but, as both programmes existed prior to the intervention and during the intervention, they have been effectively controlled for in the model, although there may of course have been differential effects across both these years**.**

Conclusion

The analyses indicated some difference in performance between reading literacy and mathematics. The targets associated with reading literacy have been met and appear to have led to a generally better performance on the asTTle reading test, when compared to a cohort

of students in the previous year that did not have targets established for them. This finding was also true when the achievement of the intervention group was compared to the achievement of students in the NZSI schools. The odds of students at NZHS meeting the reading literacy target was 4.91 ($e^{1.59}$) times the odds of students from the NZSI schools meeting the target when school factors, gender and ethnicity were controlled in the model.

This was not the case in mathematics; the targets do not appear to have had the same impact as in reading literacy, particularly when compared to the previous cohort of students from NZHS.

CHAPTER SEVEN

Study 2: Qualitative Study of Teachers' Experiences of Target Setting

Study 2 sought to investigate teachers' experiences, attitudes and thoughts about the target setting intervention at NZHS. The academic counselling and target setting programme in its entirety began in 2007, and had a strong focus on school wide and individual student targets, subject choice, goal setting and future aspirations of the students at the school. The implementation of the targets relied heavily on teachers in the classroom being engaged in the process and working collaboratively with students to succeed in reaching the targets. It could be argued that, with classroom teacher support and cooperation, working towards targets with students would be a more powerful intervention than students working toward a target on their own. It was important therefore to understand the teachers' experiences of the intervention and from them identify factors of the intervention that were successful or caused concern.

This investigation was part of a wider qualitative evaluation of the academic counselling programme at NZHS, which was carried out by the Starpath research team. The Starpath Project for Tertiary Participation and Success was established as a Partnership for Excellence between the New Zealand Government and the University of Auckland. Provision was made in the evaluation to explore the teachers' experiences of the target setting elements of the academic counselling programme specifically to answer the third main research question of this thesis. The third research question of this thesis was "what are teachers experiences of target setting?" and to gain answers to this question, four broad areas of the target setting initiative were explored. Questions related to the context and implementation of the intervention, the teachers' experiences of the intervention and the effectiveness of the programme. The study explored these themes through a series of semi-structured individual interviews and focus group sessions and by collecting and reviewing relevant school documentation about the programme.

Although academic counselling was delivered to all students in the school from Year 9 to Year 13, this thesis investigated its impact on Year 9 and Year 11 students only. Further, it was the academic counselling of Year 11 students only towards the achievement of credits and standards required to satisfy the criteria of the NCEA Level 1 Certificate that was the

focus of this small qualitative study. The findings presented in Study 2 relate to the target setting aspects of the academic counselling programme only.

The Programme

Study 1a, 1b and 1c documented the development of individual targets for students and the resulting effect on student achievement. The following information describes how the targets established in the earlier studies were disseminated to the students. There were two main methods of discussing the students' targets. The first involved academic counselling sessions with one of two Deans who had responsibility for the pastoral care of students at NZHS. These formal sessions were timetabled to occur at least three times a year, with specific guided questions that related to the students' progress toward the targets established using the processes described in study 1a. The second method of discussing the targets related to subject targets which were established using the processes described in Studies 1b and 1c. The subject targets were discussed with the students with their subject teachers. The following paragraphs describe the guidance given to staff about the discussions they were to hold with students about the student targets.

The Deans met with students individually or in small groups on three occasions throughout the academic year to discuss their academic progress, their future career aspirations and their progression towards their goals and targets. Guidance was given to the Deans for the academic counselling sessions in the form of the Personal Education Plans (PEPs) for the students. These PEPs were provided to the Deans by the Student Achievement Manager, the person holding a management role for student achievement at NZHS. These plans provided the structure for the conversations between the Deans and the students. There were three distinct areas of focus for the academic counselling sessions. The first was a discussion with Year 11 students about the targets established in study 1a, that is, gaining Level 1 of NCEA. This discussion included an analysis of student progress to date, including the academic profile of the student (described in Study 1a) that had been generated from information provided by each student's subject teachers. The dialogue between Deans and students also included the number of credits gained and at what grade, what standards were left to achieve and how the student was going to achieve these credits. The record of achievement generated by Kamar, the school's Student Management System (SMS), was also used in this discussion as it had specific and up-to-date details about the achievement of each student in each subject area.

The guidance provided by the Student Achievement Manager suggested that the second part of the discussion focus on more general student goals such as, attendance, punctuality and homework completion. This section of the discussion was influenced by each student's individual circumstances and needs. Deans were also provided with a booklet containing useful study hints and the examination timetable to give and discuss with students. Guidance given to the Deans proposed both these areas of discussion were included with reference to the students' long term goals for employment or further education, and for students and teachers to co-construct a way of achieving the targets. The final topic of conversation in the academic counselling sessions between the Deans and the students covered the students' involvement in extra curricular activities, such as, sports teams, cultural, dramatic and artistic groups at NZHS.

The second way in which targets were discussed with students was during class time with their subject teachers. These discussions were about the subject specific targets for English and mathematics. There was no formal guidance given by the Student Achievement Manager for the subject teachers to discuss the subject targets with their students, other than to request that a conversation took place and to work towards achieving the targets with students.

Method

The following sections describe the sources of information for study 2, the participants involved in the study, the ethical issues associated with the interviews and focus group sessions, the questions participants were asked, the method of analysis and how the reliability of teachers' attitudes to the target setting was established.

Sources of Information

The information analysed in this study was collected from focus group sessions, semi-structured individual interviews, notes from the Student Achievement Manager's work diary and any available documentation gathered from the school about the intervention and about the school's structures and systems.

Participants

The participants in this study consisted of thirty-five secondary school teachers from the intervention school. The participants were identified by virtue of being the staff involved in the implementation of the intervention. The teachers ranged in age and experience from

first-year teachers to more experienced teachers with positions of responsibility in the school. The teachers taking part in the study came from four separate and distinct groups within the school; these were the Deans, teachers of English, teachers of mathematics, and a group of senior leaders from the school. Many of the English and mathematics teachers were also form teachers. The Deans, English and mathematics teachers were involved in focus group sessions, whereas the senior leaders were asked questions about the intervention in a semi-structured individual interview.

The Deans consisted of ten teachers who had responsibility for the pastoral care of the students during their time at the school. They were also the staff who delivered the academic counselling programme involving the discussion of goals and targets with the students.

The English and mathematics teachers involved in this investigation taught Year 11 students English and mathematics and had been provided with targets for each student relating to the external achievement standards at Level 1 in English and mathematics (as established by the methods described in Study 1b). The teachers had been requested to discuss these targets and work toward achieving them with the students.

The senior leaders involved in the investigation consisted of the principal, the deputy principal of the school with responsibility for achievement, the curriculum manager and the careers advisor at the school. Individual semi-structured interviews were carried out with these staff.

Interviews and Focus Group Sessions

One issue highlighted by the University of Auckland ethics committee in this study was the position of the researcher as an employee at the intervention school. Another factor considered was the position of the researcher as the person managing, organising and establishing the student targets and the academic counselling sessions. Specifically, as an employee in the intervention school, there was concern that some methodological bias might be introduced into the study. The aim of the interview and focus group sessions was to understand the perceptions of teachers regarding the intervention. It was agreed that it was inappropriate for a person, who was both an employee of the school with ongoing professional relationships with staff and students, and also researching a programme in their place of employment, to conduct the interviews and focus group discussions themselves. An independent person or persons therefore carried out this part of the investigation.

Starpath was approached by the intervention school to carry out a qualitative evaluation of the academic counselling and target setting intervention as a whole. There was

no conflict of interest for the Starpath researchers in the same way that there may have been for the researcher employed as a staff member at the school. On conclusion of the sessions and interviews, the researcher had permission to access only to the transcripts of the focus group sessions and the interviews. All participants were made aware that the information supplied in the interviews and focus group sessions would be made available to this researcher.

All interviews and focus group sessions were carried out by Starpath researchers using an interview schedule. A semi-structured interview of this nature allowed key questions to be asked to ensure that the data gathered from participants was relevant and comprehensive. Participation in the interviews and focus group sessions was voluntary and informed consent was given by all the participants for all the information collected during these sessions to be available for use in this thesis. Each focus group interview consisted of two to ten people and lasted between 40 and 65 minutes.

Questions

A semi-structured interview schedule was used to ensure that the data gathered from participants was relevant and comprehensive (Appendix C). The initial questions in the individual semi-structured interviews were designed to explore the existing practices with regard to academic counselling and target setting prior to the intervention and to investigate perceptions of the need for the intervention. Participants were then asked to describe the intervention, its features, what was needed to resource it and any expectations they might have had of the intervention. They were also asked to describe the implementation of the intervention and their role if they had one. They were asked to describe their experiences of the intervention and reflect upon how effective it had been, and also give an indication of their thoughts on the sustainability of the intervention.

Similar questions were posed in all of the focus groups and some additional questions were asked of the English and mathematics subject teachers. These additional questions were related to the target setting for individual students in the external English and mathematics achievement standards. Subject teachers were asked if provision of the targets had changed the teachers' expectations of individual students and whether teachers had changed their teaching practice in light of discussions with students about their targets. The final questions explored whether student teacher relationships had changed and, if so, in what way had these relationships changed.

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Method of Analysis of the Transcripts

The purpose of the transcript analysis was to identify comments within the individual interviews and focus group sessions that indicated teachers' experiences of the target setting intervention. The transcripts were analysed to identify comments relating to the four focus questions. Common themes were noted and reported on in this study. However a further in-depth analysis was carried out specifically to examine two foci related to the English and mathematics teachers. The first focus was to identify teachers' attitudes to being involved in the intervention and the second was to identify how teachers talked about implementing the intervention in their English and mathematics lessons. These two foci were chosen because groups of people often talk about their support for an intervention but do not actually implement the intervention. An important part of the research was to gain an understanding of whether and how the teachers had actually used the targets with their students.

The transcripts were searched for statements that reflected the two foci above and these were highlighted and counted. For example the following is an example from a transcript that represents a negative attitude to the intervention.

"In terms of improving their grades I don't know how effective it is"   FGO4.

Statements from the transcripts that reflect positive implementation of the target setting are represented by the following example from a teacher in Focus Group 1.

"I had xxx class and I got round to discussing [the targets] with most of [the students]."

To ensure rigour of the analysis and to validate the findings, an independent researcher repeated the procedure of highlighting relevant comments that reflected attitude and implementation on a sample of pages from the transcripts and the percentage of agreement between the two procedures was calculated. Initially there was a 75% agreement between the two separate repetitions of the process. One of the problems that required clarifying during the analysis was due to the nature of employing semi-structured questions in a focus group setting. For example the following comment from one of the focus group sessions; "we were definitely nervous about the time it was going to involve" (FGO4) referred to a restructured parent teacher meeting that was part of the academic counselling aspect of the intervention

and not the target setting. However, to clarify meaning, reading around sections of the transcripts was required. Another example from one of the transcripts "I feel that this programme is good improving student and teacher relationship" (FG01) does refer to the target setting aspect of the intervention but could equally have referred to academic counselling.

Following discussion and the addition of a further ten sample pages an 80% agreement was reached between the two researchers, to confirm the focus of the discussion was on target setting and not other aspects of academic counselling. All disagreements were discussed and resolved. This level of reliability, plus the resolution method, was deemed sufficient for the validity of the findings.

Findings

The findings are presented in response to the four broad aims of inquiry, these were, questions relating to the context of the intervention, questions about the implementation of the intervention, questions about the teacher's experiences of the intervention and, finally, questions about the effectiveness of the programme.

Context

Prior to the intervention all participants in the interviews and focus group sessions reported there had been no formal school-wide system of target setting and no formal way of teachers (other than individual subject teachers) knowing about the aspirations and overall performance of students at the school.

> '*there was nothing set in place for me … to say this is how you guys*
> *are going, to find out about where you are and what you are doing*'
>
> (FG03)

Some form teachers did provide informal guidance to students about their subject choices and career pathways and encouraged them to achieve highly. Such form teachers did this because they were interested, proactive and understood the NCEA system. Whether students received this guidance was described as 'the luck of the draw, it wasn't organised' (FG07).

Both mathematics and English teachers reported that, before the academic counselling and target setting intervention, it was very much left up to individual teachers in individual subject areas to negotiate with students what their goals were. Form teachers reported that the

topic of student goals was discussed in a general sense in form time, if there was time to have these conversations with students. There was some support for students from the careers department in terms of careers information and guidance relating to specific entry requirements for university courses and job choices. In addition to the careers department providing support for students, there were also mentoring programmes for small numbers of students; these were predominantly for Year 12 and Year 13 students. However, other than these comments, nothing relating to target setting was reported.

The Deans reported that, before the intervention, there was no formal school-wide system of monitoring student progress towards the achievement of the NCEA certificates. The only system referred to in the focus group sessions was the practice of uploading NCEA achievement data to NZQA by the Curriculum Manager. This process involved checking student entries only and was not a system that monitored student progress.

The teachers reported that prior to the intervention there was no formal discussion with students around their goals or any formal methods of recording such information. There was guidance given to some students regarding careers options but this was tailored more for senior school students. The only time the Deans would become involved in any discussions relating to course selection or academic progress of students in the school was when a student was having problems in class.

Implementation

There was no specific guidance or step-by-step instructions issued to subject teachers around the implementation of the targets and so teachers reported many different ways of using the targets in the classroom. The most common method used by the teachers involved some kind of discussion with individual students regarding the expectations that teachers had of the students. Some teachers went around the classroom and showed the students their targets making comments similar to the following;

'I expect you to be doing this … you're are all capable of it'   FG03

Other teachers took small groups of students aside to talk about the credits they had already attained and the credits still available to them from internal assessments and those coming up externally in their subject at the end of the year. Other reported discussions about the targets set in this study, described teachers who talked with students about the specific requirements

needed to attain each of the targets and how the student 'was going to achieve these targets' (FG04).

One mathematics teacher put the targets established in this study to one side while she asked her students in her mathematics class to write down what they were aiming for in the external standards. She then wrote her own targets based on her knowledge of the student and their performance during the year. She then collated all three versions of the targets – the targets from the study; the students' own targets and her own targets – and then proceeded to have an individual discussion with each of the students around these targets.

Teacher Experiences

Although some teachers reported that they had concerns about the target setting aspect of the intervention, there were instances reported in the focus group sessions where teachers perceived the process of interacting with students and talking to them about their targets had made a positive difference. For example, one teacher spoke of a student in her class who had higher targets than the teacher was expecting and 'looked fantastic on paper' but had in fact sat in class and 'done hardly anything'. After a discussion with the student regarding the targets for the external standards, the teacher told the student of the high expectations the teacher had for her, saying 'we know what you can do' and 'now you need to show us'. The student 'literally sat back in her chair and her eyes opened and it was a jaw dropping moment'. This student, who had completed very little work until then, went on to gain all the external achievement standards (FG04).

English teachers reported that the discussions with the students about the targets appeared to increase the motivation of the students. Almost all the teachers in all focus groups indicated that the target setting and the academic counselling intervention had been an awareness raising exercise for everyone in the school, from the staff to the students.

> *'Well I think that was valuable in that it's a little bit of consciousness raising and it gets everybody interested and counting and so on.'*　　　　FG03.

In the English teachers' focus group, there was a discussion that suggested it was not 'what' the goal was but the 'exposure' to a goal that was important

> *'In some ways the important thing is just that you are talking about it. It's not really actually what the goal is at all in a way.'*　　　　FG04.

and it was this discussion between subject staff on an individual basis with students that were the key motivators for students rather than the provision of a goal or target. This perception of the teachers appears to contradict the research on goal setting theory. Goal setting theory claims that being specific about a goal improves performance (Locke & Latham, 2006). Having a vague goal brings some improvement; however, having a specific goal brings more.

Effectiveness of Target Setting in English and Mathematics.

An analysis of the information collected in the focus group sessions of English and mathematics teachers showed a marked difference between each of the groups of subject teachers in both attitudes towards and implementation of the target setting programme.

This conclusion was determined by carefully examining the transcripts of each of the focus group sessions, as discussed earlier, and highlighting positive and negative statements from the participants regarding the attitude of the teachers, firstly, toward the achievement standard targets and secondly, toward the implementation of the targets. This process was repeated and validated by an independent researcher, as described earlier.

Table 51 presents counts of the number of positive and negative statements made by English and mathematics teachers regarding attitude and implementation of the target setting at the intervention school.

Table 51.

Number of Positive and Negative Statements from English and Mathematics Teachers Regarding their Attitude to and Implementation of the Target Setting.

Teachers	Positive Statements	Negative statements	Total
English			
Attitude	17	1	18
Implementation	14	4	18
Mathematics			
Attitude	5	15	20
Implementation	7	0	7

With regard to both attitude and implementation, the teachers of English made many more positive than negative statements about the target setting initiative than the mathematics teachers. Mathematics teachers made slightly more negative than positive comments overall about the target setting intervention. However, they made more negative statements than positive regarding their attitude to the target setting, while in contrast, they made some positive and no negative statements about the implementation itself.

The number of counted responses from English teachers about their attitude (N = 18) to the intervention was equal to their response about the implementation (N = 18) of the intervention. These responses were generally positive. However, for the mathematics teachers the number of responses about the implementation (N = 7) were fewer than about their attitude (N = 20) to the intervention. These responses were generally negative. This difference did give an insight into the extent of implementation of the intervention and suggest that the mathematics teachers did not implement the intervention as comprehensively as they might have done.

The more positive attitude of the English Department teachers to the target setting initiative was reflected in their comments about seeing a need for the implementation of the academic counselling and the target setting initiative. Most comments indicated agreement with the general philosophy that allowed everyone in the school – students, teachers, and other staff – to be aware of the students' progress towards the goals and targets.

'*I liked the idea from the beginning*'   FG03.

'*In a school such as [NZHS] which is really big, it was really cool*
to be in an environment where everyone was on the same page'   FG03.

Both English and mathematics teachers saw the initiative as an awareness raising intervention, developing more knowledge about both a student's current level of attainment and what could be expected from the student.

In terms of implementation, again, the English teachers spoke more positively in the focus group interviews about the initiative than the mathematics teachers. The mathematics teachers made no negative comments regarding implementation – in fact they made positive comments.

There were many instances in the focus group sessions where teachers in the mathematics department stated that they were already doing their best for students, ' always

aiming for the best' and, hence, 'we teach what [we] think is appropriate for the students' (FG04). Some mathematics teachers saw the whole academic counselling and target setting intervention as a way 'for the student to take more ownership of their own progression in school' (FG04) and not as something that would affect teacher practice. Indeed, not one subject teacher, in either subject area, in any of the focus group sessions claimed to change their teaching practice in light of the information provided by the target setting data.

Positive Relationships

Almost all teachers from the focus groups – the English teachers, the mathematics teachers, the form teachers, and the Deans – reported that talking to students about their targets and progress in the National Certificate of Educational Achievement (NCEA) improved the relationship they had with the students.

The Deans commented in the focus group sessions that they particularly enjoyed the 'positive interactions with students', and the fact they got to meet with students they would not normally see. Prior to the intervention, the Deans' responsibility in NZHS was the pastoral care of students and this frequently involved dealing with student discipline issues, rather than working with students who needed support academically. The Deans reported that conducting academic counselling allowed them to identify students who 'need [a] push, that are just drifting along', as before the academic counselling and target setting intervention they had not had many dealings with this type of student. The Deans reported in the focus group sessions that seeing students who needed support academically was a positive attribute of the intervention.

Form teachers described how they could now confidently discuss information regarding the NCEA progress of students in their form class and were more likely to ask their students about the number of credits they had gained in NCEA than they had done prior to the intervention. All teachers agreed in the focus group sessions that the target setting and academic counselling was consciousness raising and that more students were now more informed about the number of credits they had obtained. One participant's comment was representative of the general comments made by the form teachers, specifically, that there was:

> *'more interest amongst students in classes about how many credits things were worth and how many [credits] they've got at the moment and how many more are coming up'*   FG03.

Students approached their teachers and the Deans outside as well as inside the classroom, to tell them they had achieved certain credits, in literacy, for example, or that they had gained credits in particular achievement standards or in fact achieved all the requirements to gain the Level 1 Certificate in NCEA. One form teacher reported celebrating with her form class whenever one of the students met all the criteria for the Level 1 Certificate.

Teachers said the improved student-teacher relationships allowed staff to 'connect with the kids' and that students needed to feel that the staff they talk to in school 'have a genuine interest in them' (FG05). Being able to talk individually to students about their subject targets, goals and aspirations showed students that teachers were interested in them and that 'someone cares about my achievement in school'. One teacher reported that students enjoyed the individual attention they received as part of the intervention.

Teachers' Concerns

The concerns reported by the English and mathematics teachers during the focus group sessions regarding the target setting were wide ranging and covered many themes. Some teachers felt that the target setting exercise challenged their professional judgement concerning what students could achieve and other teachers questioned the validity of the targets, as they perceived some of the targets were too high for students they were teaching. This was particularly prevalent in the responses from the mathematics teachers.

      'It's almost impossible to get that target with weak students'   FGO1

      'I can't take this to my class because they're not going to achieve,
       they are not going to achieve'.   FG02

It should be noted that at NZHS there were two bands of Year 11 students studying towards the external achievement standards. Only one was being taught the content for the full range of achieved, merit and excellence grades. This placed constraints on the successful implementation of the targets as it could mean that some students were misplaced, and there were many perceived logistic reasons why this would cause concern for the teachers. In the second band, only the material for the achieved grade was being taught to students (this was despite the analysis used to develop the targets in study 1b showed that some of the students would be capable of achieving merit or excellence grades). This arrangement created a

conflict between some of the targets established for the students and the material they were learning.

> '*We did not teach merits, their [target] was achieved. And I saw some*
> *merits on the sheet and I said how can we get a merit?'* FG01

Many teachers found it difficult to work towards the targets and as one teacher said, they 'weren't sure whether, it was properly done', particularly when the targets did not match up with their expectations for students. Mathematics teachers in particular said they did not think 'there was any very good, numerical basis for the way in which those targets were arrived at'. One teacher did admit to perhaps some 'arrogance' with regard to the target setting, as they assumed that if there was a mismatch between the targets established and their own expectations of a student, it was the targets, rather than their own expectations, that were incorrect.

Teachers also reported finding it difficult to make time in their classes to discuss the targets and frequently commented that it would have been useful to receive them earlier in the year.

Discussion and Conclusion

The first of ten characteristics published in the Best Evidence Synthesis (BES) Quality Teaching for Diverse Learners in Schooling (Alton-Lee, 2003) was that 'quality teaching is focused on student achievement'. The research-based evidence in that document lists four other factors to achieve this: that quality teaching should be focused on student achievement, that quality teaching facilitates the learning of diverse students and raises achievement for all learners; that teachers should establish and follow through on appropriate expectations for learning outcomes and that high expectations are necessary to improve student outcomes. However, research over the last two decades has revealed that many teachers in New Zealand hold inappropriately low expectations for, and make inappropriate assessments of some groups of students (Bishop, 1989; Bishop et al., 2003; Rubie-Davies et al., 2006; Rubie, 2003; Weinstein, 2002). Some of the comments made in the focus group sessions support these claims with respect to low expectations.

It was clear from comments made in the focus group sessions that some teachers did not have high expectations for some of their students, a factor that was exacerbated by the streaming practices and associated teaching that occurred in the English and particularly in

mathematics departments (as described in the NZHS senior curriculum booklet). For example, in mathematics in Year 11, students were streamed into three bands, according to student test results taken at the end of Year 10 and accompanying teacher comments. The consequence of the streaming was that only students streamed into two of the three bands attempted the external achievement standards in mathematics. In English a similar procedure occurred, with students streamed into three bands, of which two were taught the content and entered for the external achievement standards in English at Level 1.

If the assumption was made that the targets were correct, then the arrangement of bands and associated teaching content has serious consequences for students, as the streaming process and restriction of access to the content taught could be acting as a barrier to student achievement and, thus, preventing students reaching their potential. Even if the targets were incorrect, students at the upper boundaries of the streamed classes are likely to be disadvantaged by the streaming policies. Furthermore, a student's placement in a particular band affected the course choices available to them in English and mathematics for the rest of their time at NZHS, due to the entry criteria into different courses.

Teachers recognised that NCEA results for individual achievement standards were not consistent over time and that target setting under these circumstances would prove difficult. In the analysis described in study 1b, which compared individual achievement standards with MidYIS and asTTle scores, there was a large overlap between the achieved, merit and excellence grades. For example, students with the same prior achievement score on MidYIS or asTTle often scored at all grades of each achievement standard (that is, not achieved, achieved, merit and excellence grades) with the largest overlaps being found in the data between the achieved and merit grades. This was a consistent finding for all the external achievement standards used in this study, holding true for all students at NZHS and for all students from the New Zealand School Improvement (NZSI) schools who sat external assessments in 2006 and 2007. If it is assumed that the MidYIS assessment grade the student obtains accurately predicts the achievement on an achievement standard, then this assumption suggests that any student has the potential to reach at least the merit grade in the external achievement standards. This finding could have positive implications for students at the intervention school if the achieved grade only classes started to be taught the material for the achieved and merit grades.

One other interesting finding was the belief expressed by some of teachers that it was not the specific target that was important in improving outcomes, but that there was something general to aim for and, that it was the conversation with students about that aim

that was more important in improving student outcomes. These teacher beliefs directly contradict the literature about goal setting. Goal setting theory states that specific goals are much more productive than do your best goals (Locke & Latham, 2002).

Teachers reported making judgements about a student's performance based on their classroom experiences and knowledge over the time that they had taught the student; typically, this would be less than one year. (In contrast, the targets were based on up to three years of data collected from the students whilst they had been at NZHS). Encouraging teachers to reflect on their assumptions about students was one of the intentions of the target setting initiative, as it is known that some teachers' expectations of student achievement can be too low, particularly for some groups of students (as discussed in Chapter 2). Hattie (2009) argues that reflective teaching should be based on evidence and not just on post-hoc justification.

Summary

Generally teachers' experiences of the academic counselling and target setting initiative were positive ones. Teachers regarded having the time and information with which to talk to their students about their future aspirations, their targets and their achievement was a positive attribute of the whole intervention.

Subject teachers' experiences of the target setting element of the intervention were less positive. There were some tensions apparent between the teachers' expectations of students and the targets established using the processes in study 1b. Teachers were more likely to dismiss the target from the intervention than question their own expectations. This tension was further exacerbated by the streaming practices and course selection procedures at the school, because once a student was assigned to a particular class, expectations of the students were based on the group or class, rather than on the student themselves. However, subject teachers reported positive experiences when they talked about their interactions with their students, as they discussed students' targets.

CHAPTER EIGHT

Conclusions and Discussion

Introduction

In this concluding chapter, the main findings and their contribution to our understanding of the use of achievement data to establish academic achievement targets for students is presented. The first section in this chapter provides a summary of the methods utilised and the findings from each of the studies in relation to the three guiding research questions. The first research question asked, 'To what extent does the development of individual student academic targets impact on student achievement?' The second asked, 'Does the development of individual academic targets impact differently on different sub-groups of students in the school?' The final research question asked, 'What are teachers' experiences of target setting?' Following the main findings a presentation and discussion of four major themes that have arisen from a synthesis of the literature and the conclusions made from the two studies is presented. The next section will discuss the contribution made across these studies to the wider knowledge of goal setting theory. Finally, the wider contributions and implications of the research study and suggestions for further research, policy and practice are outlined.

Overview

The research presented in this thesis investigated the use of achievement data to establish targets for students in a large urban secondary school in New Zealand. Study 1 attempted to answer the first and second research questions, whereas study 2 answered the third research question.

Study 1 explored how to develop achievement targets for students from three separate types of datasets. It was divided into three parts (1a, 1b and 1c) to explore target setting with each of these datasets. The targets were established by examining patterns and trends that occurred in longitudinal achievement data collected at the school. This information was used to develop high expectations for students in the form of targets. An element of challenge was incorporated into the targets to accelerate the achievement of students and to differentiate between the concept of a prediction and a target. Each study also explored the effects of target setting on different sub-groups of students at the school.

The outcomes of the three studies provided evidence to show that the target setting intervention had an impact on students' achievement, when compared to the achievement of a control group of students (students from NZHS from the previous academic year).

Main Findings

Study 1a dealt with a binary outcome, achieving the NCEA Level 1 Certificate or not; as such, logistic regression was used to analyse the success of the intervention. Study 1a also explored the number of credits gained in total by Year 11 students and used ordinary least squares (OLS) regression techniques to evaluate the achievement of students. Studies 1b and 1c also used OLS regression techniques to evaluate the impact of the targets, firstly, on Year 11 students in the NCEA subject areas of English and mathematics, compared to previous students at the same school. The success of the intervention in Level 1 English and mathematics was measured by quantity (number of credits) and quality (grade point score) from data collected from the external assessments only (Study 1b). Secondly, the impact of the intervention was explored on Year 9 students in reading literacy and numeracy (Study 1c) using asTTle, and compared the results of the intervention to a previous cohort of students at the intervention school and also to eight other local secondary schools. An analysis using logistic regression was also used to determine whether Year 9 students had met their target.

In Study 1a, an answer to the first research question was provided. In the attainment of the National Certificate of Achievement (NCEA) at Level 1, there was statistically significant evidence to show that students who were part of the academic counselling and target setting intervention performed better than those students who were not part of the intervention. The students involved in the intervention were 1.9 times more likely to gain the Level 1 Certificate than those students not in the intervention. This outcome occurred when prior achievement, ethnicity and gender variables were held constant. Another notable point to make in support of the first research question was that being part of the intervention allowed students who entered the school at a significantly lower intake score (as measured by MidYIS) to be successful in gaining the Level 1 Certificate.

Study 1b also supported the same conclusion as Study 1a, that is, that the development of individual student achievement targets impacted positively on student achievement. In study 1b, the use of targets was explored in the subject areas of English and mathematics. In this study, targets were established for each student in each of the external achievement standards available in NCEA, in these subject areas. In this analysis, there was evidence to show that the quantity (number of credits) and quality (grade point score) of the

achievement was improved when students had targets and they could discuss them with their teachers. The improvement, as measured by the number of credits (quantity), was on average a statistically significant additional 1.2 credits in English and 2 credits in mathematics. This could mean gaining a standard worth three credits (rather than two) in English or an additional standard in mathematics. Each credit is intended to be worth 10 hours of teaching, learning, homework and assessment time (for an average student operating at the correct curriculum level) (NZQA, 2009). The improvement in quality, as measured by the grade point score, was on average a statistically significant 6 points in English and 7 points in mathematics.

Study 1c explored the use of targets with Year 9 students in reading literacy and mathematics. In reading literacy there was statistically significant evidence to suggest that the targets had contributed to the achievement of students, compared to students from the previous academic year at NZHS, such that students scored on average 48 more asTTle points than the control group. Students at NZHS also performed statistically significantly better in reading literacy than students from the other local secondary schools. Students from NZHS were 4.9 times more likely to reach the reading literacy target than students from the New Zealand School Improvement (NZSI) schools,

This was not the case in mathematics. In mathematics, students did not achieve as well as students from the previous academic year. However, these students did perform statistically significantly better than the students from the local secondary schools. Fifty-nine percent of the students gained or exceed the lower target. This finding combined with the lack of enthusiasm and concern by mathematics teachers about the validity of the target setting mechanisms as reported in the qualitative study (study 2) does offer a possible explanation for the lack of statistically significant evidence for improvement in mathematics at Year 9, compared to the control group.

The findings relating to the second research question – whether the development of individual academic targets impacts differently on different sub-groups of students at the school – again showed some evidence to support the establishment of the targets. There were several sub-groups of students being referred to in this research question, such as gender, ethnicity and school groups. Although not statistically significant, there was evidence to show the gap had narrowed between the genders and across all the ethnicities in achieving the Level 1 Certificate. More specifically, following the introduction of the intervention, the reduction in the gap between the achievements of New Zealand European and Pasifika students in the Level 1 Certificate was statistically significant. A key finding was that lower

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achieving groups benefited from the target setting intervention, enabling them to be more successful in gaining NCEA Level 1, in particular.

Study 2 explored the teachers' experiences of target setting in the English and mathematics departments by conducting focus group sessions with teachers at the same New Zealand school. There were varying degrees of support reported for the intervention but, generally speaking, teachers described their perceptions of the main effect of the target setting intervention was one that improved their relationships with students. Some teachers were not convinced about the validity of using achievement data to set targets, particularly when this challenged their own views of what a student had the potential to achieve. There was no evidence to support the idea that teachers changed their teaching practice in light of the information supplied as part of the target setting intervention. However, as reported in the previous sections, there was still evidence to show improved achievement outcomes for the students with targets.

Themes Emerging from Studies

There are four major themes that have emerged from these studies. These themes are challenging goals, policies and practices around achievement data, teachers' experiences of target setting and target setting and standards based assessment.

Theme 1 – Challenging Goals

This study has demonstrated a method by which appropriately challenging goals can be established for students based on a longitudinal achievement data collected about students. By using an adapted version of Data Envelopment Analysis (DEA), challenging targets were developed for students. DEA is a model in which the outer envelope of a distribution of two variables is plotted rather than the usual ordinary least squares regression type of plot which generally represents the average performance of the variable being measured. Thannassoulis (1999) explored the idea of DEA in education as a theoretical target setting mechanism in which the achievement level each student could reach was based on the achievement of the best performing students with the same characteristics. These characteristics could be gender, ethnicity, prior achievement and or socio-economic status (SES). In this study, Data Envelopment Analysis (DEA) as a theoretical model was put to the test in a school setting. From this research, it can be concluded that as a model the concepts underpinning DEA have worked well as demonstrated by the quality of information that led many teachers to then improve the achievement of students at NZHS (Studies 1b and 1c).

In order to make, what is, a sophisticated model work in the New Zealand context and practically in a school setting, it was necessary to make adaptations to the DEA model. These adaptations were associated with the dependent variable being an ordered categorical variable (Study 1b), and there was also a requirement to simplify the calculation to establish the outer envelope used to develop targets in Study 1c. However, these adaptations did not undermine the theoretical basis of the intervention, which was one of devising a method for establishing challenging yet achievable targets for students.

One condition necessary when trying to improve the performance of individuals, by setting goals, as argued by Locke and Latham (1999, 2002, 2006), is the provision for goals to be achievable yet challenging. A condition also reinforced in the educational context by Hattie (2009) who stated that a challenging goal enhances achievement more than a 'do your best goal' a finding confirmed by other researchers in the educational field (Bandura, 1986; Schunk, 1990). DEA supports the provision for challenging goals because the theory underlying the concept argues that if some students can gain a high grade or mark (for example a merit grade in NCEA) then students who have the same prior achievement should be able to achieve the same grade (Thannoussiliss, 1999).

Frequently in educational contexts a generic or amorphous goal is established for students, an example of which is reported in study 2. A mathematics teacher reported teaching everyone in her class to the achieved level of a standard rather than accommodating each individual. A further example comes from the UK context, where new target setting advice refers to all students gaining two levels of progress (DCSF, 2009). However, adopting this style of generic goal for everyone may be inappropriate as some students may be able to make more progress and for some making small gains may be a challenge.

The method of developing challenging targets for individual students described in this study needs to be trialled at other schools in New Zealand to reinforce the validity of the findings from this study. Transferring these methods to other schools would also unpack the necessary conditions that need to exist in all schools for this intervention to work. Trialling this study in other schools would also enable answers to the questions about the barriers to such interventions, in light of the learning at NZHS, and what conditions change when moving this kind of intervention to a different setting, and how these conditions can be addressed. One condition, already identified as needed as a prerequisite for developing targets are the policies and practices around achievement data.

Theme 2 – Policies and Practices around Achievement Data

Given this need to ensure that goals are both appropriately challenging and indexed to each student, then accurate and efficient data management structures and procedures are needed to ensure progress towards the goal or target can be monitored. The findings in this study supported Sammons et al.'s (1995) claims that frequent and systematic monitoring of student performance is an important ingredient of an effective school. The evidential database and the targets established in this study allowed the progress of individuals to be tracked and monitored relative to the challenging goal. The process of monitoring student progress also allowed feedback to be made to students on how they were progressing toward their targets. This feedback is an essential aspect of teaching and learning and it is recalled that feedback can be more effective when it is directed to 'closing a gap' in this case between the students' current status and their goal. Locke and Latham (2002, 2006) have provided extensive evidence that, when individuals receive feedback about progress in relation to their goals, then progression toward the goal is more likely than goals or targets alone in improving performance. Careful data management practices and policies, therefore, enable the progression toward the goals to be monitored effectively and as a result feedback can be given to students.

In order to establish the goals/targets described in this study, there were rigorous policies and practices for data collection, organisation, retrieval, analysis and use of achievement data. Without the existence of these practices and policies, the construction of an evidential database and student profile used to produce targets for individual students and then allow tracking and monitoring of their progress toward the goal would have been extremely difficult and would have prevented the development of the targets.

So although implicit rather than explicit in this thesis, one theme that underpinned the development of the targets for students was the availability of data at the intervention school. Therefore, a critical aspect of this study that would be necessary for replication of this intervention at other schools, to maximise the effectiveness of target setting for student achievement and add to the knowledge about target setting in education, are the policies and practices within schools around the collection, organisation, retrieval, analysis and use of achievement data. These policies and practices must relate to achievement data collected and used both annually and longitudinally over time. Data about student achievement must become an explicit part of school systems, much the same way that there are rigorous procedures and auditing processes that occur in schools regarding the school roll information.

A further investigation is required to determine what conditions, resources and skill levels are required for a school to be able to establish a coherent and useful database of student achievement longitudinally. Teachers, school administrators and school leaders will need to be trained in best practices regarding the collection and organisation of student data. In particular, teachers need to be trained in the skills required to gather pertinent data and to interrogate the data so that these skills will help raise the achievement of students in their classroom. Although this conclusion is not a new one, this study adds further evidence to the argument that there is a need for teachers to incorporate data analysis into their regular teaching activities (Feldman & Tung, 2001, Robinson et al., 2002).

Theme 3 – Teachers' Experiences of Target Setting

Information collected from study 2 showed that some teachers saw the use of data to establish targets for their students in their classes as a challenge to their professional judgement rather than a source of information to support their teaching practices. There was a tension between the targets that had been generated from an evidential database away from the classroom teacher's control and teachers' expectations of a student. If the classroom teachers' expectations were in conflict with the data established goals as reported in study 2, then teachers were more likely to think that the externally generated expectations (the targets) were incorrect. This concern may be considered a valid one if it were not for the large literature, as described in Chapter 2, that some teachers' expectations of some groups of students are unacceptably low. Teachers' expectations have been reported to become their goals for students (Timperley & Phillips, 2003), so if these goals are too low than this could result in the under achievement of some students.

The use of targets in education has arisen as a consequence of accountability measures being introduced by governments across the globe. However, they have the potential to be used in a positive and formative manner to raise the achievement of students if teachers and schools can change their mindsets to view the information contained in the targets as a way of providing information about students. This information is then subsequently used to improve the performance of students. The general perception of some of the teachers in this study, particularly the mathematics teachers, was one of mistrust of the targets; this may be as a result of the fear of judgemental consequences and punitive retributions, if the targets were not achieved. When a benchmark or target is in place, it is relatively straightforward to see if that benchmark or target has been met or even surpassed. This observation can also be linked to individual staff, adding another layer of anxiety for

teachers. There are, of course, numerous examples of judgements of schools that have been based on examination performance, the publication of league tables to name just one.

Ingram, Seashore Louis and Schroeder (2004) found that teachers do not rely on data to examine the effectiveness of teaching and they also found that teachers disassociate their own performance and that of students causing them to overlook the information that can be gained from assessment data. The tension is that teachers may not perceive that their efforts in the classroom will change student outcomes (Diamond & Spillane, 2004) believing other factors affect student achievement more. So to have one's performance judged on something that teachers believe cannot be changed may lead to mistrust of assessment data.

One outcome that resulted from the analysis of the intervention in study 1c was that the target setting intervention produced more statistically significant gains in asTTle scores (compared to the control groups) in achievement for the targets set in the English department compared to the gains in the mathematics department. This finding was also true for the total credits gained in the external standards in English and mathematics, compared to the control groups. It was also apparent from the data collected in study 2 that there were differences in attitude and implementation towards the target setting, such that the English teachers reported being more enthusiastic about the implementation of the target setting than the mathematics teachers. It was beyond the scope of this study to monitor if teachers used the targets with their students, so the reported use in study 2 could not be confirmed. However, there was evidence of improved achievement in English and mathematics. This improved achievement could be explained by the fact that the Deans spoke to all students about their progress in Year 9 and toward the NCEA Level 1 Certificate with Year 11 students. One product of this focus on the aggregated achievement for the Certificate and in Year 9 in the academic counselling sessions was that the performance in the subject areas of English and mathematics improved.

In order to further improve the outcomes for students, teachers (in the context of each subject area) must be able to fully explain the details of the target that the student and the teacher are aiming for. For example, gaining a merit grade in English, teachers must be able to clearly articulate the requirement for this standard to students, and to monitor student progress toward the attainment of this grade. By giving detailed feedback to the student about the skills they have demonstrated and the further skills involved, students will make better progression towards the target. These specific and clear conditions were not stipulated to subject teachers and improvements in the instructions to subject teachers around the

formative use of targets in the classroom would further improve the success of the intervention.

Theme 4 – Target Setting and the Standards Based Environment

The results from this study, based on NCEA achievement, suggest that goal or target setting is suited to a standards based environment, although research with different standards based models is needed to confirm this. In a standards based environment, the relationship with setting targets occurs because the specific requirements to succeed on an Achievement Standard are clearly articulated. Specificity is one aspect of goal setting theory reported as necessary to improve performance (Locke & Latham, 2006). Further, Locke and Latham (2006) state specific high goals lead to higher performance than non-specific goals. Being specific means that the criteria for success are explicitly described and there will be no doubt as to whether the goal or target has been achieved or not.

In the previous norm-based assessment system used in New Zealand, students took one or two papers in each subject area and the percentage of questions they answered correctly out of the total questions or marks available for all aspects of each subject area was calculated. The resulting normal distribution of ranked results became the basis for the establishment of grade boundaries. For example, getting 50% correct on a paper was typically associated with a pass or 'C' grade. However, it is easier for teachers and students to focus attention on clearly defined items and specific skills (such as, substituting values into a formula as in the specification for the Algebra Standard at Level 1 of NCEA) than on getting 50% in an assessment test. Therefore, the standards based environment of NCEA with its focus on specific activities, aligns well with goal setting theory.

The National Certificate of Educational Achievement (NCEA) is the national examination system used in New Zealand and it is based on a standard based assessment system. Each certificate for NCEA is awarded on the aggregation of subject specific standards (plus literacy and numeracy requirements at Level 1). The specification of each standard articulates what is required to gain each standard. Each subject is made up of standards, worth a number of credits, a proportion of which are internally assessed; this means that students can collect credits throughout the year as they progress towards the attainment of the certificate. The above aspects of NCEA mean that it is easier for students to focus their attention on specific aspects of study at certain times and manage their workload throughout the course of the academic year. Progression towards the achievement of the Level 1 Certificate is also easier to monitor in this environment. Creating focus on goal

related activities is one element of goal setting theory that is well documented in the literature. One other powerful component of the standards based environment is the ability to give accurate and relevant feedback to students in relation to the standard, and also to monitor progress toward gaining the Certificate as students progress through the academic year.

Locke and Latham (2006) have also claimed that the effects of goal setting seem to go beyond increasing motivation and many studies have found that individuals develop their own strategies in response to their goals. In such a system as NCEA, it can be argued that students and teachers working together to achieve student goals have the potential to be more powerful than students working alone to achieve their goals. Teachers can support and guide students in the development of specific and appropriate strategies to solve problems.

Contribution

There are continual calls for teachers and schools to have high expectations of all their students. There are also demands to base decision making about teaching and learning on evidence. The research presented in this thesis has responded to these calls by using past student achievement collected about students to set quantifiable high expectations for current students in the form of challenging targets. Achievement targets that show what is expected of students and by implication what is expected of teachers and the school.

This study has re-oriented the perspective on data from a focus on past achievement data by synthesising several theories in educational research relating to raising achievement (goal setting, high expectations, feedback and leadership) to a focus on the use of data to strategise and establish targets for the present and future achievement of students. Data have been transformed into a dynamic and valuable resource which has circulated throughout all elements of the school system to improve the academic achievement of students.

This information means that teachers have the necessary data to correctly identify the gap between what students know and can do and can begin to address it. The more information that teachers have available to diagnose this gap and consequently address it, the closer teachers will be to reducing it. Target setting is one way of using data from student assessment to identify a meaningful specific, measurable, achievable yet challenging goal for students, a goal for which tracking and monitoring can be put in place to ensure progress.

There is no literature in New Zealand confirming the use of data in this way, that is, to establish individual academic targets for students in a New Zealand school. Therefore, this may be the first time targets of this type, as developed from the design models in the three parts of study 1, have been introduced to a secondary school in New Zealand.

Implications

There were two types of implication that arose from these groups of studies. These were the implications for practice in schools and the implications for further research. The next two sections will discuss each of these implications beginning with the implications for practice.

Implications for Practice

The main implication for practice in schools, which has arisen from this research, is that teachers and school leaders have to become competent, confident and frequent users and synthesisers of student achievement data. The target setting intervention made a difference to student achievement at NZHS but to make further gains in achievement, teachers will need the skills to use data so that they can monitor student progress efficiently. These skills will then enable teachers to give effective and specific feedback to students and perhaps most importantly of all to inform their own teaching practice. Using student targets as a basis by which student progress can be monitored and adjustments in teaching styles and support provision in the classroom would be one way of improving student outcomes.

At the school organisational level as demonstrated in this study there needs to be facility in the school for adequate monitoring of student progress against challenging expectations for students; that is the targets. This will allow schools to monitor progress of students' performance throughout the students' journey to the attainment of the National Certificates of Achievement and not a vehicle to measure student performance after the fact.

Having the facility to achieve these goals, means having the skills, processes, systems and resources at all levels of the institution to monitor student achievement and, hence to act if students are not performing to expectations.

Implications for further research

This set of studies was based on one large secondary school. To explore the effects of the intervention further, further trials in more schools needs to be undertaken. This suggestion has already been picked up by the Starpath project who has been trialling the ideas and methods specifically described in this thesis at four other schools in New Zealand since 2009. In addition to this trialling, funding has been provided for an additional programme (Enhancing Maori and Pacific Student Pathways into University: Academic Counselling Project) to implement the academic counselling and target setting programme in eight other schools in 2009 and 2010, with a particular emphasis on Maori and Pasifika students.

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One aspect of this intervention that was not studied was the student perspectives on the intervention. In further research, it would be valuable to explore students' thoughts on the intervention. Exploring students' thoughts would allow answers to the following questions to be formulated. Were the conversations with the Deans as important as those with their subject teachers? Did the intervention motivate them to aim for the higher grades of achievement? Did the intervention cause anxiety and stress for the students, and if so, in what way? In what way, do the students think the intervention could be improved? What was the process and what were the strategies students used to either move gradually towards the target or to move straight to the target? All of these questions could be explored in further research about target setting.

Another aspect of the intervention that requires further research would be to carry out an in-depth research project to investigate how teachers can use targets effectively in the classroom. Specifically, how they talk to students about the student targets, how they incorporate the knowledge of these targets into lesson plans and what this would look like in terms of actions in the classroom. From these findings, guidance for other teachers could be formulated.

A further important piece of work would be to explore the tensions that were apparent between targets derived from an external evidential database and the teachers own expectations of students. This work would assist to unpack the reasons teachers are sometimes distrustful of data collected in schools.

A final aspect of this work that requires further exploration is the formulation of targets within different assessment environments, for example, other standards based assessment environments and also the norm based assessment environment. The main difference between a standards based assessment system and a norm-based assessment system is that the students' grades in the standards based assessment system are arrived at by comparing student work to the standard whereas, in a norm-based assessment system, the students' grades are arrived at by ranking all students' work and scaling the results so that approximately the same proportions of the students pass. In the norm-based assessment system, this process could and did result in the actual standard of work fluctuating depending on (a) the quality of the students and (b) the quality of the assessment. In a standards based assessment system, there can be some fluctuations in students achieving specific standards. However the criteria described to gain the achievement, i.e. the standard, should not change.

Due to these very different types of assessment system, it would be valuable to explore whether goal/target setting aligns itself within other standards based assessment

systems where the criteria to achieve the standards are clearly specified and articulated in the standard documentation, or whether goal/target setting would work efficiently within a norm based assessment system. Specificity also has repercussions for the classroom. It is far more difficult to articulate, teach and learn the skills and tasks to aim for 50% or 60% than it is when criteria are clearly defined, as in a standards based assessment system.

This thesis concludes that, when targets form the basis of conversations between teachers and students, a difference can be made to student achievement. Further, the impact of the targets could be greater still if the targets are used in the classroom by students and teachers to co-construct a pathway to the achievement of the target and if teachers change their practice in response to detailed feedback as progress to the target is monitored and tracked.

CHAPTER NINE

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CHAPTER TEN

Appendices

Appendix A – Glossary

Note: Many of these definitions are taken or adapted from the NZQA website (www.nzqa.govt.nz). Some are taken or adapted from other websites: in these cases the website is indicated in brackets after the definition.

achieved see not achieved/achieved/merit/excellence

achievement standard a nationally registered, coherent set of learning outcomes and associated assessment criteria. Achievement standards are at Levels 1, 2 and 3 on the National Qualifications Framework and cover learning areas related to the school curriculum, including subjects previously covered by School Certificate, Sixth Form Certificate and Bursary (secondary school qualifications that were replaced by NCEA). Generally speaking, there are between five and eight achievement standards worth a total of 24 credits in each subject at each level. Achievement standards can be not achieved, achieved, achieved with merit, or achieved with excellence. Some are assessed internally and others are externally assessed.

approved subject NZQA maintains a list of approved subjects for University Entrance, and specifies which standards are included in these subjects. Many subjects offered at schools are not on the University Entrance approved list. (See University Entrance).

asTTle Assessment Tools for Teaching and Learning. An assessment tool which tests the reading, writing and mathematics skills of students in Years 4 to 12. (www.minedu.govt.nz; www.tki.org.nz/r/asttle)

Board of Trustees (BOT) Group elected by parents and caregivers to govern the school. The Board of Trustees is the legal entity of the school, and all contracts and employment agreements are with the Board. (www.minedu.govt.nz)

BOT Board of Trustees.

careers advisor a member of staff at a school who advises students on study options and career pathways.

credit a numerical value assigned to unit and achievement standards that represents the estimated time needed for a typical learner to demonstrate that all specified outcomes have been met. It should take around ten hours per credit (including class time, independent study, and time spent in assessment) to meet the requirements of a standard. Students must gain a certain number of credits to get NCEA Level 1, Level 2, and Level 3 (see National Certificate of Educational Achievement).

credit tracker a form provided to students at MHS where they keep a record of the internal NCEA credits they have gained each term.

curriculum manager a staff member at MHS who is responsible for the school timetable and the KAMAR database, manages the level co-ordinators, and is the principal's nominee.

dean a member of staff at a secondary school with responsibilities in student personnel services, which may include discipline, administration, pastoral care, and course placement. Schools usually have multiple deans, each of whom are responsible for a particular group of students, such as a certain Year level.

decile all state schools are given a decile rating from 1 to 10. A school's decile indicates the extent to which the school draws its students from low socio-economic communities. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of these students. The lower the school's decile, the more funding it receives from the Ministry of Education. Usually, schools with a decile of between 1 and 3 schools are considered to be 'low-decile' schools, decile 4 to 7 schools are considered to be 'mid-decile' schools, and decile 8 to 10 schools are considered to be 'high-decile' schools. (www.minedu.govt.nz)

Education Review Office (ERO) government agency responsible for reviewing and reporting regularly on the performance of New Zealand schools and early childhood education centres. (www.minedu.govt.nz)

endorsement students have their NCEA certificates endorsed with excellence if they get 50 credits at excellence, at or above the level of the certificate (these credits can be gained over more than one year). For example, students can gain 'NCEA Level 2 with excellence'. Likewise, students that gain 50 credits at merit (or merit and excellence) will have their NCEA endorsed with merit.

ERO Education Review Office.

excellence see not achieved/achieved/merit/excellence.

external assessment all those assessments where the assessment judgement is made by persons outside of the learning institution/school. In NCEA, external assessment is done once a year, through national exams sat in November and December. A few externally assessed standards, such as in graphics, require students to submit a portfolio or collection of work. (www.educationcounts.govt.nz)

external standard an achievement standard that is externally assessed (see external assessment).

faculty leader see head of faculty.

Focus Learning Department staff at NZHS that assess and support students at the school that have special needs and those in the gifted and talented group.

form teacher a teacher who has a coordinating and pastoral oversight of a class of students. In some schools such teachers may be referred to as whānau teachers or tutor teachers.

guidance counsellor a member of staff at a school who provides pastoral care to students and supports them in dealing with personal problems and difficulties.

head of department (HOD) a middle management position in a secondary school with oversight of the teaching of a subject area in the school.

head of faculty a middle management position that exists in some secondary schools that has overall responsibility for a broad learning area, such as sciences or languages, and acts as a manager of a group of HODs. (www.coda.ac.nz/unitec_educ_di/4)

high school see secondary school.

HOD head of department

internal assessment all those assessments where the assessment judgement is made within a learning institution. In NCEA internal assessment is carried out throughout the year by schools. All unit standards and some achievement standards are internally assessed. Schools decide how they will assess internal standards and marking is carried out by teachers.

KAMAR a student management software system designed to assist staff in recording, manipulating and reporting student data. (www.kamar.co.nz)

level there are 10 levels of the National Qualifications Framework - 1 is the least complex and 10 the most. Qualifications, as well as their components, such as unit and achievement standards, all sit at a specified level. Levels 1-3 are of approximately the same standard as senior secondary education and basic trades training. Levels 4-6 approximate to advanced trades, technical and business qualifications. Levels 7 and above approximate to advanced qualifications of graduate and postgraduate standard. NCEA qualifications and achievement standards only exist at Levels 1 to 3 as they are designed for secondary school students (see National Certificate of Educational Achievement). For a different meaning of the term level, see Year level.

level coordinator an administrative position in some secondary schools with responsibilities for a particular Year level, in particular with regards to the timetabling of courses and changes in subject choices.

low-decile see decile

merit see not achieved/achieved/merit/excellence.

mid-decile see decile.

MidYIS Middle Years Information System. Provides, among other things, baseline assessments of learning ability at Year 9. (www.cem.canterbury.ac.nz/midyis)

MoE Ministry of Education.

National Certificate a qualification on the National Qualifications Framework made up of unit standards in a particular area, such as Computing or Tourism. National Certificates are usually registered between Levels 1 and 4, and require a minimum of 40 credits at or above the level at which the qualification is registered. Credits gained for a National Certificate can also be counted towards NCEA qualifications. Many schools offer National Certificates, and they can also be studied in tertiary courses or in workplace training.

National Certificate of Educational Achievement (NCEA) standards-based national qualifications for senior secondary students in New Zealand, registered between Levels 1 and 3 on the National Qualifications Framework. Credits gained from both unit standards and achievement standards count towards NCEA qualifications, which students are awarded at Level 1, Level 2 and Level 3 if they meet the following requirements:

> Level 1: 80 credits at any level including 8 in literacy (reading & writing) and 8 in numeracy (maths)
> Level 2: 60 credits at Level 2 or above + 20 credits from any level
> Level 3: 60 credits at Level 3 or above + 20 credits from Level 2 or above

Typically students work towards Level 1 in Year 11, Level 2 in Year 12 and Level 3 in Year 13. Credits can be gained over more than one year, and used for more than one qualification (e.g. credits gained for NCEA Level 1 can be carried over and used towards Level 2 as the 20 credits which can come from any level).

National Diploma a qualification on the National Qualifications Framework made up of unit standards and registered between Levels 5 and 7. The top 72 credits define the level at which the qualification can be registered and at least 120 of all credits contributing towards the qualification must be at Level 4 or above. National diplomas usually take one or two years of full-time study to complete. They are taught through industry training and apprenticeships, as well as by tertiary education providers such as polytechnics and private training establishments.

National Education Guidelines (NEGs) These are defined by Section 60A of the Education Act 1989 and contain a statement of goals for education in New Zealand, as well as curriculum and administration requirements. They are incorporated into all school charters. (www.minedu.govt.nz)

National Qualifications Framework (NQF) collectively, all national qualifications, unit standards, and achievement standards, together with the relationships among these. The National Qualifications Framework (NQF) is designed to provide nationally recognised standards and qualifications as well as recognition and credit for a wide range of knowledge and skills.

NCEA National Certificate of Educational Achievement.

NEGs National Education Guidelines.

New Zealand Qualifications Authority (NZQA) NZQA's primary function is to coordinate the administration and quality assurance of national qualifications in New Zealand. Among other things, NZQA administers the National Qualifications Framework

(including NCEA), runs national senior secondary school examinations, registers and monitors private providers of education and training to ensure they meet quality standards, and evaluates overseas qualifications for people who want their qualification recognised in New Zealand.

not achieved/achieved/merit/excellence the four results possible for achievement standards. Not achieved means that the student has not demonstrated the learning outcomes specified in the standard, and is not awarded any credits for the standard. Achieved means that the student has met the specified basic standard and will be awarded the number of credits which the standard is worth. If a student meets further specified criteria they can be awarded a merit or excellence grade (excellence being the highest possible grade on a achievement standard). Merit and excellence grades for a standard attract the same number of credits as an achieved grade, but count towards NCEA endorsements and can help students compete for entrance to limited-entry tertiary programmes. There are only two possible results for unit standards – not achieved, if the specified outcomes have not been demonstrated, and achieved, if they have.

NQF National Qualifications Framework

NZQA New Zealand Qualifications Authority

NZHS The acronym used in this report for New Zealand High School.

Principal's Nominee a staff member nominated by the principal of a school, who carries out duties and responsibilities on behalf of the school and liaises with NZQA for the purpose of the administration of all NZQA rules and procedures.

Record of Learning an individual learner's transcript of unit standards and achievement standards credited and national qualifications completed, provided by NZQA from a national database. Has now been renamed 'Record of Achievement'.

school charter all schools are required to have a charter. The charter establishes the school's mission, aims, objectives, directions and targets to give effect to the government's National Education Guidelines and the Board of Trustees' priorities. The Charter must include all annual or long-term plans the Board is required to have or has prepared for its own purposes (or a summary of each plan or a reference to it). It should be regularly updated, setting targets for the key activities and achievement of objectives for that year. (www.minedu.govt.nz)

secondary school In New Zealand, a school that caters for students from Year 9 to Year 13 (i.e. from around the age of 12 or 13 to 17 or 18). Also known as high school.

senior management/senior management team the group of staff in a school who have senior leadership and management roles, such as the principal, deputy principal(s) and assistant principal(s).

stakeholder a person, group, or organisation which has interests in a particular endeavour, policy or programme.

standards defined <u>learning outcome</u>s, together with <u>performance</u> or <u>assessment</u> criteria, examples of their interpretation and application, and associated <u>quality assurance</u> processes. Includes <u>unit standard</u>s and <u>achievement standard</u>s.

student achievement manager a staff member at NZHS who analyses student data, develops achievement targets for the school and individual students, manages the academic counselling programme, and is an understudy to the curriculum manager.

TEC Tertiary Education Commission.

tertiary education post-secondary education; includes learning undertaken in the workplace as well as with <u>provider</u>s such as polytechnics, universities, wānanga and private training establishments.

Tertiary Education Commission (TEC) The agency responsible for leading the government's relationship with the tertiary education sector, and for policy development and implementation. (<u>www.tec.govt.nz</u>)

UE University Entrance.

unit standard a nationally registered, coherent set of <u>learning outcome</u>s and associated <u>performance criteria</u>. Unit standards were originally developed to assess workplace learning but were subsequently developed for conventional school subjects. Unlike achievement standards, unit standards can only be achieved or not-achieved, and are all internally assessed. All unit standards are registered on the <u>National Qualifications Framework</u>, assigned a <u>level</u> and a <u>credit</u> value, and may contribute to the award of a <u>National Certificate</u> or <u>Diploma</u>, as well as NCEAs and University Entrance.

University Entrance (UE) the common educational standard established, after consultation with the universities and the <u>New Zealand Vice-Chancellors' Committee</u>, and maintained by NZQA as a prerequisite for entrance to university for people under 20. Currently gaining University Entrance requires:
- a minimum of 42 credits at Level 3 or higher on the National Qualifications Framework, including a minimum of 14 credits at Level 3 or higher in each of two subjects from the <u>approved subject list</u>, with a further 14 credits at Level 3 or higher taken from no more than two additional domains on the National Qualifications Framework or approved subjects.
- a minimum of 14 credits at Level 1 or higher in Mathematics or Pāngarau on the National Qualifications Framework
- a minimum of 8 credits at Level 2 or higher in English or Te Reo Māori; 4 credits must be in Reading and 4 credits must be in Writing.

Generally New Zealand universities have a number of limited-entry programmes – particularly in professional areas such as medicine, engineering and architecture – which have entry criteria additional to University Entrance. From 2009, all undergraduate qualifications at the University of Auckland will be limited-entry.

Year level school students move from Year 0 or 1 through to Year 13. Secondary schools teach Years 9 to 13, and students usually work towards NCEA Level 1 in Year 11, NCEA Level 2 in Year 12 and NCEA Level 3 in Year 13.

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Appendix B – Ethics Forms

<div align="right">
The University of Auckland
Faculty of Education
Private Bag
Auckland
New Zealand

Telephone: +64 9 623 8899
January 2007
</div>

Participant Consent Form: Intervention School

Project Title: Academic Target Setting at a New Zealand High School.

Researcher: Samantha Smith

I have been given and have understood an explanation of this research project and I have had an opportunity to ask questions and have had them answered.

I agree to Samantha Smith having access to asTTle, MidYIS and NCEA Level 1 data to develop academic targets.

I understand that the anonymous and generalised findings of the study may be published in research journals and presented at conference.

I am aware that all collected data will be stored securely for six years at The Faculty of Education, Project asTTle, University of Auckland and then professionally destroyed.

I would / would not (delete as appropriate) like a copy of the resulting study emailed to me.

Signed: _____

Name: _____

School: _____

Date: _____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS
ETHICS COMMITTEE for 3 years, from 3/1/2007 to 3/1/2010. Reference 2007/038.

Participant Consent Form: Evaluation School

Project Title: Academic Target Setting at a New Zealand High School.

Researcher: Samantha Smith

I have been given and have understood an explanation of this research project and I have had an opportunity to ask questions and have had them answered.

I agree to Samantha Smith having access to asTTle and NCEA Level 1 data to evaluate the study.

I understand that the anonymous and generalised findings of the study may be published in research journals and presented at conference.

I am aware that all collected data will be stored securely for six years at The Faculty of Education, Project asTTle, University of Auckland and then professionally destroyed.

I would / would not (delete as appropriate) like a copy of the resulting study emailed to me.

Signed: _____

Name: _____

School: _____

Date: _____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE for 3 years, from 3/1/2007 to 3/1/2010. Reference 2007/038.

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The University of Auckland
Faculty of Education
Private Bag
Auckland
New Zealand

Telephone: 64 – 9 – 623 8899
January 2007

Participant Information Sheet
Principal – Intervention School

Project Title: Academic Target Setting at a New Zealand High School.

My name is Samantha Smith and I am currently in my first year of doctoral studies at the University of Auckland.

I am writing to invite your school to participate in a research project which seeks to design and evaluate an academic target setting program. I will develop academic targets using longitudinal data from previous cohorts of students.

In order to conduct the project I ask your permission to have access to student data. This data will be in the form of electronic data files which I will collect personally from your school. The data consists of MidYIS, asTTle and NCEA Level 1 information.

No names or identifying information will be given to any other parties and no identifying information will be used when reporting the results of the study. The information will be used for research purposes only. All collected data will be securely stored for six years at the Faculty of Education, Project asTTle, University of Auckland and then professionally destroyed.

You have the right to withdraw from this project at anytime and you also have the right to withdraw the data used in this project up to one month after the data has been submitted.

Once the project has been evaluated I would like to offer you a copy of the resulting study. I hope to publish the anonymous and general findings of the study in education journals and present at conferences.

If you have any questions or concerns about this project, please contact me at the following address for clarification. Please complete the attached Participant Consent Form if you consent to participate in this study and send it to the following address.

If you do not wish to contact me directly, but wish clarification of this study, please contact my supervisors at the addresses given below.

My address:	My Supervisors:
Samantha Smith	**Professor John Hattie**
c/o Project asTTle	**Project asTTle**
The University of Auckland	**The University of Auckland**
Private Bag 92019	**Private Bag 92019**
	Telephone: (09) 373 7599
	Extn. 82496
	Professor Helen Timperley
	c/o Project asTTle
	The University of Auckland
	Private Bag 92019
	Telephone: (09) 373 7599
	Extn. 87401

For any enquiries regarding ethical concerns please contact: The Chair, University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland.
Telephone: (09) 373 7599 Extn. 87830.

Thank you for taking the time to read this letter. I look forward to receiving your consent form.

Yours sincerely

Samantha Smith

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE for 3 years, from 3/1/2007 to 3/1/2010. Reference 2007/038.

Participant Information Sheet
Principal – Evaluation School

Project Title: Academic Target Setting at a New Zealand High School.

My name is Samantha Smith and I am currently in my first year of doctoral studies at the University of Auckland.

I am writing to invite your school to participate in a research project which seeks to design and evaluate an academic target setting program.

In order to conduct the project I ask your permission to have access to student data. This data will be in the form of electronic data files which I will collect personally from your school. The data consists of asTTle and NCEA Level 1 information.

No names or identifying information will be given to any other parties and no identifying information will be used when reporting the results of the study. The information will be used for research purposes only. All collected data will be securely stored for six years at the Faculty of Education, Project asTTle, University of Auckland and then professionally destroyed.

Once the project has been evaluated I would like to offer you a copy of the resulting study. I hope to publish the anonymous and general findings of the study in education journals and present at conferences.

If you have any questions or concerns about this project, please contact me at the following address for clarification. Please complete the attached Participant Consent Form if you consent to participate in this study and send it to the following address.

If you do not wish to contact me directly, but wish clarification of this study, please contact my supervisors at the addresses given below.

My address:	My Supervisors:
Samantha Smith	**Professor John Hattie**
c/o Project asTTle	**Project asTTle**
The University of Auckland	**The University of Auckland**
Private Bag 92019	**Private Bag 92019**
	Telephone: (09) 373 7599
	Extn. 82496
	Professor Helen Timperley
	c/o Project asTTle
	The University of Auckland
	Private Bag 92019
	Telephone: (09) 373 7599
	Extn. 87401

For any enquiries regarding ethical concerns please contact: The Chair, University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland.
Telephone: (09) 373 7599 Extn. 87830.

Thank you for taking the time to read this letter. I look forward to receiving your consent form.

Yours sincerely

Samantha Smith

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE for 3 years, from 3/1/2007 to 3/1/2010. Reference 2007/038.

Appendix C – Focus Group Interview Schedule

Questions about the context

What was the existing practice with regard to academic counselling and why was change needed?

- What were the practices related to academic counselling for Year 11 students before the intervention was implemented?
- What issues/concerns were there about those existing practices *(if any)*?
- What/who identified a need for a new programme?
- How was the new programme designed and by whom?
- To what extent, and in what way, were others *(students, teachers, parents)* involved in the design of the new programme *(if at all)*?

Questions about the Programme

Can you tell me about the new programmme – what are its features, what is needed to resource it, and what are the expectations?

- What was the nature of the new programme *(What did it consist of in practice)*?
- What were the aims of the new programme *(For students? For staff?)*
- What measurable changes were expected as the result of the new programme?
- What was the time line for the intervention?
- What resources *(financial, material, staff time)* were identified as necessary for the implementation of the new programme

Questions about the implementation

How well was the intervention implemented from your role/position?

- Were you involved in designing the intervention
- What information did you have/receive before the intervention?
- Did you have any expectations of the intervention?
- Were you aware how much time/effort it would require from you?

FOR MATHS AND ENGLISH TEACHERS ONLY

- The teacher received targets for individual students in the External Standards at Level 1
- The teacher read through the targets
- The teacher discussed targets with students
- Did the targets change the teacher's expectations of the individual students?
- Did the teachers change their teaching practice in class as a result of the discussion with students?
- Did the discussion change the relationship the teacher had with the students? How, and in what way?

Questions about your experiences

What were your experiences of the implementation of the intervention?

- To what extent have you participated in advising students from the Year 11 cohort?
- Have you noticed any academic patterns/trends in the Year 11 student cohort? *(in terms of gender, socioeconomic background, cultural/ethnic affiliation or other factors)?*

- Has your experience with the academic counselling been positive/negative?
- How has the Year 11 cohort responded to the academic counselling intervention?
- How have the parents/caregivers of the Year 11 cohort reacted to the academic counselling intervention?
- Has the academic counselling intervention changed your relationship with the Year 11 cohort (positively/negatively)?
- How were you involved and/or affected by the intervention?
- What effect/impact did the intervention have on you *(work, study, personal feelings)?*

Questions about the effectiveness
On reflection, how effective has the intervention been and is it sustainable?
- Did the intervention deliver what it promised?
- Did the intervention deliver what you expected?
- What immediate and subsequent benefits can you identify?
- What changes can you see as a result of the intervention?
- Are the identified changes/benefits worth the effort/resources involved?
- Is the new program sustainable (should it be sustained)?
- What were the unexpected consequences (if any)?
- What were the negative consequences (if any)?
- What have you learnt as the result of this experience?

PLEASE NOTE
Sam is interested that these questions are answered. Please ask them **ONLY** if you think the focus group has not answered them through other questions.

- What were your thoughts on the "whole school targets" when these were announced in July 2007 (*by Sam, doing a powerpoint presentation – in case they need reminding*)?

- What do you see as the main contributor to the school's academic success in 2007 (given the NCEA results they've just received for last year)?