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E-asTTle as a Catalyst for Change.

A thesis presented in partial fulfilment of the requirements for the degree of

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Abstract

This thesis studies the introduction and use of the formative assessment tool e-asTTle (Assessment for Teaching and Learning) in a low decile, high Māori school and the impact it has on teacher practice and student achievement. The project's aim was to identify if teachers, through using the data from the tool, moved to an evidence based teaching model which supported increased student achievement in reading and mathematics. Identifying a major shift in teaching practice and corresponding rise in student success would support the assertion unpinning the study, that e-asTTle is a catalyst for change.

The data for this study was gathered during the first quarter of the school year. Teachers of Year 7, 8 and 9 students volunteered to complete a confidential online survey. The focus of the survey was to identify previous and current assessment practices, changes to practice and prompted teachers to reflect on the usefulness of data in supporting their teaching practice. Beginning of the year and mid-year student assessment score data in reading and mathematics was gathered and compared to identify shifts in achievement of each year group. These shifts were then compared to e-asTTle nationally expected shifts to identify the level of progress.

The results suggest that the introduction of the e-asTTle tool into the school supported teachers to change to formative assessment, evidence-based teaching practice. This change had a positive effect on student achievement with accelerated progress occurring in reading and mathematics. However, the results also identified a much lower level of progress for Year 7 students, which is consistent with trends identified in national research data on the transitioning of students between primary and secondary schools. Based on this data a recommendation was made to study the transitioning of students between the local primary schools and the study school, and the impact it may be having on learning and achievement, particularly in mathematics. Should the results of the study support it, a programme could be put into place that met identified student needs and supported their successful integration into the school. Although evidence of accelerated progress met the study's brief, the continued low level of achievement of the students in reading compared not just to all schools but to other decile one, high Māori roll schools, is a concern that needs to be addressed.

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List of Tables

Table 1	Databases searched, keywords and other search parameters used	5
Table 2	Principles of Culturally Responsive Practice	13
Table 3	Comparison of Practising Teacher Criteria against Quality Teaching Dimensions	18
Table 4	Descriptive Statistics for Student Sample Group	38

List of Figures

Figure 1	Comparison of usefulness of assessment data to inform teaching practice	46
Figure 2	Comparison of teacher familiarity and confidence with the e-asTTle tool from the beginning and end of the study	47
Figure 3	Teacher belief that the use of e-asTTle tool has had a positive impact on student engagement and achievement	49
Figure 4	Year 7 average point shift in reading by gender	53
Figure 5	Year 7 average point shift in reading by ethnicity	54
Figure 6	Year 8 rate of progress in reading as compared to Year 8 results from similar schools	55
Figure 7	Year 8 average point shift in reading by gender	56
Figure 8	Year 8 average point shift in reading by ethnicity	56
Figure 9	Year 9 average score shift in reading by gender	58
Figure 10	Year 9 average score shift in reading by ethnicity	59
Figure 11	Study School Y7, 8 and 9 achievement in reading compared to Year 7, 8 and 9 results from similar schools for the quarter	60
Figure 12	Comparison of Year 7, 8 and 9 national average point shifts and the average point shifts for the study school in reading	61
Figure 13	Year 7 average score shift in mathematics by gender	62
Figure 14	Year 7 average score shift in mathematics by ethnicity	63
Figure 15	Year 8 average score shift in mathematics by gender	64
Figure 16	Year 8 average score shift in mathematics by ethnicity	65
Figure 17	Year 9 average score shift in mathematics by gender	66

Figure 18	Year 9 average score shift in mathematics by ethnicity	67
Figure 19	Study School Y7, 8 and 9 achievement in mathematics compared to Year 7, 8 and 9 results from similar schools for the quarter	68
Figure 20	Comparison of Year 7, 8 and 9 national average point shifts and the average point shifts for the study school in mathematics	69

Table of Contents

TITLE PAGE	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	iv
LIST OF FIGURES	v
CHAPTER 1: INTRODUCTION	01
Intent of Study	01
Key Characteristics of Study	02
Structure of the Thesis	02
CHAPTER 2: LITERATURE REVIEW	04
Literature Review Methodology	04
Part One: The Context of Student Achievement	06
Part Two: Elements of Effective Teaching Practice	12
Part Three: Examination of the e-asTTle Tool	22
Summary	26
CHAPTER 3: RESEARCH DESIGN AND METHODS	27
Introduction	27
Theoretical Underpinnings	27
The Research Design	28
Structure of the Study	30
Data Gathering Tools	36
Ethical Considerations	39
CHAPTER 4: RESULTS	44
Introduction	44

Teacher Survey Results	44
Student Assessment Results	50
CHAPTER 5: DISCUSSION	70
Introduction	70
Impact of Other Factors on Student Progress	71
Use of e-asTTle	72
Formative Assessment Teaching Practices in Reading	75
Formative Assessment Teaching Practices in Mathematics	78
CHAPTER 6: CONCLUSION	82
Research Limitations	82
Recommendations	87
Suggestions for further research	90
Reflections	92
BIBLIOGRAPHY	93
APPENDIX A - The “Long Tail of Underachievement” in Reading and Mathematics	106
APPENDIX B – Research Procedures Flow Chart	107
APPENDIX C - e-asTTle as a Catalyst for Change	108
APPENDIX D – Teacher Survey	109
APPENDIX E – Teacher Information Sheet	113
APPENDIX F - Teacher Consent Form	114
APPENDIX G - Letter to Board of Trustees	115
APPENDIX H - e-asTTle Norms and Curriculum Expectation by Quarter: Reading	118
APPENDIX I - e-asTTle Norms and Curriculum Expectation by Quarter: Mathematics	119
APPENDIX J - SPSS T-Test Paired Samples Data	120
ABBREVIATIONS	124

1. INTRODUCTION

INTENT OF STUDY

The low achievement of Māori students in mainstream schools was given nationwide prominence in 2003 with the publication of Bishop, Berryman, Tiakiwai and Richardson's Te Kōtahitanga report to the Ministry of Education. One of Bishop et al.'s conclusions were the importance of quality relationships and interactions within the classroom to help engage Māori students and improve learning (Bishop et al., 2003). However, despite efforts by the Ministry of Education and some teachers and schools, the academic achievement of Māori remained a concern (Education Review Office, 2010; Ministry of Education, 2012) as

...current research information and national and international achievement data continue to show sustained Māori underachievement in education. Despite this well-promulgated evidence, many schools do not yet undertake sufficiently rigorous analysis of student achievement data, or set targets for improved Māori achievement. Many do not implement strategies aimed specifically at making improvements in areas identified, and when strategies are initiated there is limited analysis of outcomes. As a result there are not enough schools where Māori student achievement is comparable to that of non-Māori, or where schools can demonstrate that they are making a difference for these students (Education Review Office, 2010, p. 30).

On-going research (Alton-Lee, Hunter, Sinnema, & Pulegtoa-Diggins, 2012; Bishop & Berryman, 2010) led to the development of a culturally responsive pedagogy that promised to support Māori academic success. Part of this learning framework (Te ako poutama) required teachers to scaffold students by providing appropriate feed forward and feedback on their learning. AsTTle¹, a formative assessment tool, was developed to provide just such information. It allowed for valid, reliable statistical analysis of data enabling schools to track student progress by cohort, gender and ethnicity.

¹ asTTle is an acronym for the **A**ssessment for **T**eaching and **L**earning tool

The provision of formative assessment data supported teachers to move from instinct-driven teaching to evidence-based teaching (Ministry of Education, 2006). The introduction and use of the e-asTTle tool in a school should therefore act as a catalyst to change teacher practice and by doing so, help raise the achievement of Māori students. It is this hypothesis the study investigates. It studies how teacher practice changes through access to e-asTTle data and it also gathers Māori student achievement data to identify if the teaching practice is making a difference for these students. The study endeavours to provide evidence to show if there is an improvement in student achievement at the study school. Although many factors can be identified as having an impact on Māori student achievement, particularly in a low socio-economic setting; this study will focus only on the impact of the e-asTTle tool on changing teacher practice, thus helping to raise Māori student achievement in reading and mathematics.

KEY CHARACTERISTICS OF STUDY

There are three parts to the study. The first is the gathering and analysis of student assessment data in reading and mathematics. Two sets of data are collected; one at the beginning of the year and the second in the middle of the year. Student data are compared and analysed by year group cohorts to identify the progress that has been made. The second part of the study is the survey of the Year 7, 8 and 9 teachers to see if the introduction of the e-asTTle tool changed their teaching practice and the way they taught. The third part of the study is to hold several group discussions with self-selected students to discuss how they think and feel about their learning and success at school. The survey data and discussion transcripts will be analysed and trends identified. Limitations of the research will be identified and discussed as will key assumptions.

STRUCTURE OF THE THESIS

This thesis begins with a literature review focused on the research question, “How does the introduction and use of the e-asTTle tool in a low decile school affect classroom practice and student achievement?”.

The review investigates three different elements of the study.

Part One studies the context of student achievement in low socio-economic schools both nationally and internationally. Part Two is an examination of the elements of effective teaching practice. Part Three is an examination of the e-asTTle tool.

A critique of current New Zealand literature is investigated to identify what constitutes culturally appropriate and effective teaching practice for Māori students. Recent thinking about improving outcomes for low-income, Māori students is also considered. The examination of the e-asTTle tool includes a brief overview of its development and purpose. Links between the e-asTTle tool and evidence-based practice are reviewed to see how they fit with current recommendations. The question of whether a sustained difference can be made and student achievement raised and accelerated is explored. This is followed by a comprehensive account of the research design and methodology. Techniques and samples used are identified as is how the measurement of data and statistical analysis was undertaken. Both qualitative and quantitative data are used to draw generalisations and to test hypotheses.

In the results chapter, outcomes are presented and explained. There is extensive analysis of results to identify and show trends, correlations, and associations. The discussion provides an explanation of the results, comparing the results to other studies. There are two foci to the discussion. Firstly, establishing if the e-asTTle tool offers teachers a way to make a significant difference in the learning of children and secondly, how the results contribute to the understanding of Māori student achievement in low socio-economic areas.

Finally, key points in the study are highlighted in the conclusion. The impact and significance of the findings are discussed and new insights based on the results of the study proposed.

The following chapter provides a literature review of the books, articles, policy documents, government and technical reports and other materials the researcher deems relevant to the study. Information is described and summarised, compared and critically evaluated in terms of its relevance and importance to the research problem being investigated.

2. LITERATURE REVIEW

LITERATURE REVIEW METHODOLOGY

The purpose of the literature review is threefold:

Firstly, to identify the factors affecting achievement rates of Māori students and effective recommended interventions with particular emphasis on what is happening in low decile schools. Factors impacting on all students who live in poverty, the effect they have on student achievement and recommendations to address them will also be critically discussed. Important elements of learning which impact on student achievement will likewise be studied. Secondly, to define and clarify the pedagogical factors that constitute 'effective teacher practice' and identify the elements of culturally responsive pedagogy and effective classroom practice. Thirdly, an understanding of the role of assessment tools to enable effective pedagogical and assessment practice will be developed.

A number of studies from the United Kingdom, America, Canada and New Zealand were reviewed with the intention of building a broad understanding of factors affecting achievement based on a variety of sources. Part One of the literature review examines evidence showing the effect different factors has on student achievement. Several studies (Benn & Millar, 2006; Berliner, 2009; Biddulph, Biddulph & Biddulph, 2003; Coleman, 1996; Ladson-Billings, 1994) contained relevant data on student achievement in low socio-economic schools and suggested interventions to achieve accelerated progress. For Part Two, a focus on New Zealand educational literature helped to establish an accurate picture of culturally responsive pedagogy. Research from the Te Kōtahitanga programme produced several reports with the influential study of Bishop, Berryman, Tiakiwai and Richardson (2003) providing valuable, detailed information on the principles underpinning culturally responsive practice. Alton-Lee's (2003) best evidence synthesis identified key aspects of quality teaching for diverse learners. More recent research (Alton-Lee, Hunter, Sinnema & Pulegoota-Diggins, 2012; Bishop & Berryman, 2010) identified aspects of practice developed from this earlier viewpoint.

A large number of reports were accessed from the Ministry of Education to provide relevant, up-to-date information focused on New Zealand issues and contexts. In Part Three of the review several reports by Hattie, Brown and Archer were found detailing the development and use of the asTTle tool (Archer & Brown, 2013; Brown, 2013; Brown & Hattie, 2003) as well as its importance as a formative assessment tool (Hattie, 2011, 2003). Information was also sourced from the Project asTTle Team (2006b, 2006c) and a number of reports and presentations which were based on Hattie’s book Visible Learning (2009d).

Although the literature review’s focus is on predominantly educational and sociological issues, the search domains included science, psychology, medicine, and human development to try to build a strong world view of the issues being reviewed. Table 1 details databases searched, keywords and other search parameters used.

Table 1.

Databases Searched, Keywords and Other Search Parameters Used

	Part One (Factors Affecting Achievement)	Part Two (Effective Teacher Practice)	Part Three (asTTle/e-asTTle)
Databases searched	Massey University Library ENCORE, Discover, ERICviaEBSCOhost, Education Source, A+ Education, Google Scholar, Newztext, PsycINFO, Index New Zealand, Australia/New Zealand Reference Centre		
Keywords Searched	Poverty, ethnicity, gender, achievement low socio-economic schools, low decile school achievement, school interventions raising achievement, impact of poverty/technology/ethnicity, Adolescent learning and engagement	Effective teacher practice, teacher efficacy, raising achievement, culturally responsive teaching practice, direct teacher instruction, Māori-centered learning, evidence based practice, feedback	AsTTle, e-asTTle, educational testing, educational assessment, assessment for learning, formative assessment, New Zealand
Other Parameters: Date and Country	Preference was given to research that was most recent (2016) or had taken place in the last decade (2005 – 2015). New Zealand, Australia, America, Canada, England, OECD countries.	Preference was given to research that was most recent (2016) or had taken place in the last decade (2005 – 2015). New Zealand, Australia, America, Canada, England, OECD countries.	2000 + New Zealand

PART ONE: THE CONTEXT OF STUDENT ACHIEVEMENT

Research focused on the links between educational achievement and student background shows the poor academic achievement of students from low income homes is not confined to New Zealand (Fullan, 2011; Gorsky, 2008; Parrett & Budge, 2011; Rothstein, 2008; Stockton, 2011). Nor are the popular opinions in the media that attribute student underachievement to failing teachers, failing schools and a need for more accountability through testing and standards (Blank & Shavit, 2016; Clark, 2013). De Vinck (2016) stated

teachers aren't the problem in this country; poverty is the problem. But politicians can't say this because they won't get elected. CEOs can't say this because their stockholders would kick them onto the streets. So let's just blame teachers (p. 4).

Internationally, in most respects, the New Zealand schooling system and its teachers are recognised as among the best in the world, as is the achievement of some New Zealand students (Education and Science Committee, 2008). What is of interest is the research of Boyd, Lankford, Loeb, and Wyckoff (2005) which identified that low-achieving students were often taught by the least skilled teachers. They believed it was likely that this factor contributed to “the substantial gaps in academic achievement among income and racial/ethnic groups of students” (p. 1).

Berliner (2009) insists that if discussion is to occur around low achievement then a robust, in-depth, and logical examination of the factors related to poverty that contribute to poor educational outcomes must happen first.

Berliner (2009) identifies seven significant out-of-school factors; low birth weight, medical care, food insecurity, pollutants, family relations, stress, diminishing vocabulary acquisition, and neighbourhood norms that contribute to student outcomes within school. These out of school factors are comparable to the family attributes identified by Biddulph, Biddulph and Biddulph (2003)².

² Ethnicity and culture, parental income, levels of human and material resources available within families, home language, family structure and type, frequent mobility, and common health problems.

Both the factors and family attributes are key levers for high quality outcomes for diverse children as individually and collectively they pose significant barriers to student achievement. There is little disagreement between researchers as to the significant effects poverty has on families. Unfortunately, these factors are also beyond what schools can control or influence although many schools and organisations try to put in place programmes and interventions to address such serious and urgent needs (Education and Science Committee, 2008).

The provision of ICT into schools, particularly low-decile schools, makes possible new forms of overarching classroom practice that could have an impact on the engagement, teaching and learning of students. Crook, Harrison, Farrington-Flint, Tomas and Underwood (2010) identified that this change occurred through the

reconfiguration of space such that new patterns of mobility, flexible working, and activity management can occur; (through the) new ways in which class activities (can be) triggered, orchestrated and monitored and new experiences (which can occur) associated with the virtualisation of established and routine practices – such as using multiple documents in parallel, or manipulating spatial representations (p. 59).

ITL Research (2011) found innovative teaching practices are more likely to flourish when a set of supportive conditions are in place³. However, these conditions “to support the adoption of innovative teaching was lacking in most of the schools and all of the systems” (p. 12). The need for e-learning initiatives to be based on sound pedagogical foundation means that student achievement is unlikely to improve just because of a move to e-learning practices. Jasinski (2007) stated that “technology use tends to sustain rather than alter existing patterns of teaching practice... [and it] will do nothing to improve ineffective teaching” (p. 3).

Research has shown that technological integration in lessons can increase engagement and through engagement have an impact on student achievement.

³ These conditions included teacher collaboration, professional development that involves the active and direct engagement of teachers, a school culture with a common vision of innovation as well as consistent support, that encouraged new types of teaching (p. 12)

Sheehan and Nillas (2010) showed that when students were the primary users of technology they were more engaged in learning and attained higher levels of mathematical understanding.

Falloon (2010) found the use of digital learning objects supported students to become more independent, engaged and motivated. Rather than minimising the role of the teacher the use of devices encouraged interaction between teachers and students. This study will gather information from both teachers and students and through synthesis of the data endeavour to determine the effect interventions, such as the provision of a digital device to every student, had on student learning and teaching practice.

Current issues for Māori in education.

The Maxim Institute⁴ published an education policy paper in September 2006 focused on current issues in Māori schooling. Their research identified that enrolment, participation, truancy, bullying, alcohol and parental concern were issues facing Māori in their education and affecting student achievement. The study was situated in a community of low-income families. Reardon (2012) states that “family socioeconomic characteristics continue to be among the strongest predictors of student achievement” (p. 19).

Reardon’s data shows there is an achievement gap between students who live in poverty and their more affluent peers, regardless of ethnicity. Without social and economic reforms combined with school improvements the achievement gap will remain unfulfilled and schools and teachers will be unfairly condemned for not closing it (Rothstein, 2008).

Stephen Machin, in his 2006 OECD report on Social Disadvantage and Educational Experiences, notes “the evidence from empirical research is that education and social disadvantage are closely connected and that people from less advantaged family backgrounds acquire significantly less education than their more advantaged counterparts” (p. 26). The report states the belief that while teacher quality is a big ‘in-school’ factor for student success, the ‘out-of-school factors’—the socio-economic factors impacting the student every single day — have by far the biggest impact overall.

⁴ The Maxim Institute is a research and public policy think tank based in Auckland, New Zealand. The Institute's work is oriented toward a conservative perspective on its issues of primary concern - education policy, tax, and welfare policy.

Snook (2009b) agrees that the widening gap between wealthy and poor is instrumental in the decline in overall school achievement, arguing that ‘the long tail of underachievement’ (See Appendix A) may just as well be called ‘the long tail of poverty’ (p. 5).

It is clear that schools and teachers cannot be held solely accountable for differences in the attainment of social groups. It is equally clear that closing the gap requires an emphasis on policies to remove the causes of poverty. However, these arguments do not absolve schools and teachers from taking no action. When social and economic action takes place, combined with focused effort to raise the achievement of vulnerable students, improvements should occur (Rothstein, 2008). There is a need for research set in high Māori, low decile schools to see whether this conclusion is correct.

Crucial elements of student learning

The problem of student engagement has become an issue in many schools around the world. Leadbeater and Wong (2010) stated that;

disaffection with school, evident in high dropout rates and exam failure, suggests there is a pent-up demand for a different kind of school experience — an experience that is more engaging, rewarding and relevant to the skills people will need in the century to come (p. 3).

Gibbs and Poskitt (2010) saw student engagement as a multidimensional and interconnected construct comprising three elements — behavioural, emotional and cognitive engagement. When issues arise, these elements combine to create the typical form of student disengagement experienced in schools.

In New Zealand, disengagement from school is evident in truancy, stand-down, suspension, and expulsion rates. There is a rapid increase in disengagement from the age of eleven onwards (Gibbs and Poskitt, 2010). Smink and Reimer (2005) state that “early identification of poor attendance patterns of children and the ensuing truancy issue are vital to ensuring a successful school experience” (p. 5) as are “student-centered strategies [which] provide dynamic and meaningful learning opportunities” (p. 5).

To combat disengagement within school Smink and Reimer (2005) proposed a total of fifteen effective strategies with five strategies⁵ focused on making the most of instruction.

Smink and Reimer (2005) believed

what happens in the classroom is at the heart of keeping students in school. Strategies that address the different learning styles of students, increase the knowledge and skills of teachers, and harness the power of technology can increase learning and attendance. These school-based interventions are particularly effective with students in at-risk situations (p. 5).

Gibbs and Poskitt (2010) identified eight categories that influence student engagement (p. 24). Several of the factors (goal orientation, academic self-regulation, self-efficacy, personal agency, motivation and interest) are underpinned by the notions that students deserve and desire to exercise self-determination with respect to their learning. Gibbs and Poskitt (2010) recognised that effective, engaged learning requires goal-setting, risk taking or experimenting and academic self-regulated learning. They saw effective teaching practice as placing a professional responsibility on teachers to foster student engagement in classrooms. This could be achieved by developing interactive, varied and relevant lessons and by teachers being encouraging and supportive to students. An important aspect of effective teaching practice was identified as learning environments in which students felt comfortable asking questions, were expected to do their best and where instruction was challenging.

Effective teachers also needed to ensure specific feedback was given to help students with their current learning. Lessons needed to be paced with varied learning tasks and a focus on active learning. A relevant curriculum was seen as a fundamental requirement.

Making connections between information taught and real life was acknowledged as highly effective in engaging students. Encouraging students to set goals, make choices in their learning, experiment with new ideas, and self-regulate their learning were also seen as an effective way to enhance their engagement and achievement (Gibbs & Poskitt, 2010).

⁵ Professional development, active learning, educational technology, individualized instruction and career and technical education

One of the most valuable tools teachers have available to support effective teaching and assessment practices is the e-asTTle tool. It supports sharing learning goals with students, helps students to know and recognise the standards they are aiming for, involves students in self-assessment and provides feedback which leads students to recognise their next steps and how to take them.

The tool encourages in teachers a confidence that every student can improve and involves both teachers and students in reviewing and reflecting on assessment data (Archer & Brown, 2013; Brown, 2013).

What interventions or factors have been shown to affect student engagement and achievement?

The Te Kōtahitanga programme (Bishop, Berryman, Cavanagh & Teddy, 2007) was effective in raising Māori student achievement due to “overall changes in teaching practices from traditional to discursive, overall improvement in the in-class relationships, changes in teacher-student proximity and increases in the cognitive level of the classroom” (p. 81). The Ministry of Education’s policy document Tātaiako – Cultural Competencies of Teachers of Māori Learners was released to schools in 2011 to support the directive that teachers needed to develop culturally sensitive practice.

Tātaiako was followed shortly after by the Building on Success programme (BOS) renamed as Ko Eke Panuku to help support teachers build authentic, strong relationships with students, whānau and their communities. However, schools have not achieved the corresponding rise in student achievement that the development of strong relationships are believed to underpin. “... current research information and national and international achievement data continue to show sustained Māori underachievement in education” (Education Review Office, 2010, p. 30).

For teachers to make a real difference in student achievement, particularly with Māori students, the teachers must also develop a skill set of excellent teaching practices that fosters evidence based practices (Alton-Lee, 2003).

Timperley and Parr (2004) stated they have increasing evidence to suggest that teachers make the greatest difference to student achievement (p. 3).

They believed the progress of students is significantly related to the level of pedagogical content knowledge their teachers have (Parr and Timperley, 2009).

PART TWO: ELEMENTS OF EFFECTIVE TEACHING PRACTICE

As the study is based in a low decile school with a predominantly Māori roll it is important to examine the literature on culturally appropriate and effective teaching practice for diverse (including Māori) students.

Gay (2000) describes cultural responsive teaching as all-encompassing and empowering. She defines it as the use of “cultural knowledge, prior experiences, frame of reference, and performance styles of ethnically diverse students to make learning more relevant ... it teaches to and through strengths of the students. It is culturally validating and affirming” (p. 29).

Culturally responsive pedagogy is neither new nor confined to New Zealand. In 1994, Ladson-Billings identified culturally responsive education as a framework that incorporated students’ cultural references in all aspects of learning. Her research on effective teachers in schools with diverse student populations led Ladson-Billings to identify eight principles which effective culturally responsive practitioners displayed. In 1995 Wlodkowski and Ginsberg further refined these principles creating what they called a ‘Motivational Framework’ for culturally responsive pedagogy based on establishing inclusion, developing attitude, enhancing meaning and engendering competence (Wlodkowski & Ginsberg, 1995, p. xii).

Bishop, Berryman, Tiakiwai and Richardson (2003) identified the elements that would come to form ‘The Effective Teaching Profile’ for effective culturally responsive classroom practitioners. It comprised two major understandings for teachers: rejection of deficit theorising to explain Māori students’ educational achievement levels and knowledge of and professional agency regarding how to bring about change in Māori students’ educational achievement (Bishop et al., 2003, p. 95). These two major understandings are demonstrated through six dimensions of teaching and learning (Bishop et al, 2003, p. 96).

As evident in Table 2 below, the research by Ladson-Billings (1994), Ginsberg & Wlodkowski (1995), and Bishop et al. (2003) identified a number of important principles which were common to all.

Table 2.

Comparison of Elements of Culturally Responsive Practice (Susan Carnegie-Harding, 2016)

Principles for Culturally Responsive Practice		
Ladson-Billings (1994)	Ginsberg and Wlodkowski (1995)	Bishop, Berryman, Tiakiwai and Richardson (2003)
Communication of high expectations	Communication of high expectations	Mana motuhake - high expectations for learning
Active teaching methods	Active teaching methods	Wānanga - discursive teaching practices
Practitioner as facilitator	Teacher as Facilitator – create safe, inclusive, respectful learning environment	Ako - range of strategies to facilitate learning Ngā whakapiringātanga – managing the classroom to promote learning
Inclusion of culturally and linguistically diverse students	Positive perspectives on parents and families of culturally and linguistically diverse students	Manaakitanga - caring for students as culturally located individuals
Cultural sensitivity	Cultural sensitivity – respect diversity	Rejection of deficit theorising to explain Māori students' educational achievement levels
Reshaping the curriculum or delivery of services	Reshaping the curriculum – collaborative and co-operative learning	
	Culturally mediated instruction – positive interdependence, individual accountability, promotive interaction	Knowledge of and professional agency regarding how to bring about change in Māori students' educational achievement
Student-controlled discourse	Student-controlled classroom discourse – active learner participation and engagement	Wānanga – student-student learning interactions
Small group instruction	Small group instruction and academically-related discourse	Kōtahitanga - promote, monitor and reflect on learning outcomes for students

Comparison of the elements did not just identify the factors which were common to all (having high expectations, using active teaching methods that used strategies to facilitate learning, inclusion of culturally diverse students, showing cultural sensitivity, respect and promoting student-driven learning) but helped show that the simpler ideas in the earlier studies were precursors of the deeper more culturally specific elements identified by Bishop et al (2003).

Through focusing on New Zealand research, pivotal documents relating to culturally appropriate teaching practice were found. All research papers identified referred to Te Kōtahitanga, a Māori research and development project, that sought to improve the educational achievement of New Zealand's indigenous Māori students in mainstream secondary schools. Started in 2001, the project commenced with a short scoping exercise in which student voice was gathered (Bishop, Berryman, Glynn, McKinley, Devine & Richardson, 2001c). Students identified that the quality of their relationships with their teacher, and in-class interactions and relationships with other students, had a significant impact on their learning. Students also shared, through changing the ways teachers related to and interacted with Māori students, how teachers could create a classroom setting in which Māori students' educational achievement improved (Bishop et al., 2003).

Using student voice as a base, along with relevant research and feedback from other stakeholders, an Effective Teaching Profile (ETP) was developed. It is this profile which underpins Te Kōtahitanga professional development around culturally responsive practice. The Te Kōtahitanga Effective Teaching Profile made very clear that teachers must practice manaakitanga, mana motuhake, ngā whakapiringātanga, wānanga, ako and kōtahitanga⁶ to raise the achievement of Māori students.

⁶ Manaakitanga – caring for students as Māori

Mana Motuhake – caring for the performance of Māori students

Ngā whakapiringātanga – creating a secure, well-managed learning environment

Wānanga – Engaging in effective learning interactions with Māori students

Ako – Using a range of teaching strategies

Kōtahitanga – Using student progress to inform teaching practices

Researchers found in the schools involved with the Te Kōtahitanga Programme 2004 - 2008 that

most teachers were able to highlight subject strategies introduced by Te Kōtahitanga with a relational focus that improved practice and outcomes for Māori students. Teachers spoke of changes in factors including their beliefs, expectations and understandings; improved teacher agency; and increased job satisfaction, motivation and empowerment. They reported increased valuing of Māori students' language and cultural knowledge, a shift to student-focused classrooms, improved assessment practices, and more use of group work and cooperative learning (Bishop & Berryman, 2009, p. 29).

The success of the programme in raising achievement is not evident in the reports. The programme has now been superseded by the Building on Success (BOS) programme, renamed recently as Te Eke Panuku⁷ which continues to introduce and encourage culturally responsive practice in mainstream schools. The study school has been involved with BOS since opening and the elements of TEP have been introduced to teaching staff as part of their professional development. Culturally responsive and relational pedagogy underpins Te Eke Panuku. Teaching practice based on TEP is seen as providing learning activities responsive to the interests and abilities of individual learners. TEP aspires to raise Māori achievement and posits itself as providing the best model of effective teaching practice to do this.

Effective teaching practice.

There is a wealth of international and national research that provides conclusive evidence that good teaching practice is based on effective evidence-based practice which incorporates important formative assessment strategies (Absolum, 2006; Assessment Reform Group, 1997; Clarke, Timperley & Hattie, 2001; Timperley & Parr, 2004). Darling-Hammond found in her research “student learning should be enhanced by the efforts of teachers who are more knowledgeable in their field and are skilful at teaching it to others” (2000, p. 33).

⁷ <http://kep.org.nz/>

This knowledge involves the ability to identify student's strengths, gaps and next learning steps, review what has been done, assessing effectiveness of teaching in terms of what progress has been achieved and look forward to work out what to teach next (Timperley and Parr, 2004). This information (next learning steps) comes from ongoing assessment to inform and guide the teaching and learning (Black and William, 1998).

Hattie, a long-time advocate of targeted teaching identifies the key factor for enhancing student achievement as being "the degree that students develop self-strategies: to seek and receive feedback to verify rather than enhance their sense of achievement efficacy" (Hattie, 1999, p. 15). Self-efficacy can be defined as the self-perceptions individuals hold about their capabilities (Pajares, 2010). Motivation is enhanced when students perceive they are making progress in learning. In turn, as students work on tasks and become more skilful, they maintain a sense of self-efficacy for performing well (Schunk, 1991, p. 2).

When classroom structures are individualised and instruction tailored to students' capabilities, students are more likely to compare their academic progress to their own standards rather than comparing themselves to others in the class (Pajares, 2010). The classroom practices of self and peer assessment support students' abilities in this area and encourages both independent and collaborative learning (Hattie, 2007, 2009b). Hattie (2009b) emphasises that what works best for students is similar to what works best for teachers. This includes an attention to setting challenging learning intentions, being clear about what success means and an attention to learning strategies for developing conceptual understanding about what teachers and students know and understand.

Alton-Lee (2003) identified not only the importance of teacher quality on student achievement but that teacher quality varies more than the differences between school levels.

"Quality teaching is identified as a key influence on high quality outcomes for diverse students. The evidence reveals that up to 59% of variance in student performance is attributable to differences between teachers and classes, while up to almost 21%, but generally less, is attributable to school level variables" (Alton-Lee, 2003, p. v).

The Assessment Reform Group's (1997) research indicates that improving learning through assessment depends on five key factors:

- the provision of effective feedback to students;
- the active involvement of students in their own learning;
- adjusting teaching to take account of the results of assessment;
- a recognition of the profound influence assessment has on the motivation and self-esteem of students, both of which are crucial influences on learning;
- the need for students to be able to assess themselves and understand how to improve (p. 4).

Implementation of these factors rests on the effectiveness of teachers' practice in assessment for learning (Assessment Reform Group, 1997, p. 12).

With such a clear understanding of the elements of effective teaching practice, it would be reasonable to expect these elements would form the criteria against which teacher quality could be assessed. All practising teachers in New Zealand mainstream schools must have a current practising certificate. Certification is seen as a means of ensuring a quality workforce of teachers who are well-trained, up-to-date and using best practice in the classroom. When applying for renewed certification teachers must supply ample evidence of how they have met the practising teacher criteria (PTC). Preparation for registration is an on-going process and teachers spend a lot of time and effort gathering data and reflecting on their practice in relation to the PTCs.

It is therefore disappointing that a comparison of the practising teacher criteria against quality teaching dimensions (see Table 3) shows that it is not as clearly based on those elements as it could be. Although two of the four overarching PTC statements exhort teachers to be "aware of and respect the languages, heritages and cultures of all ākonga" and to "promote equitable learning outcomes" (Education Council, n.d. para 3) there are no clear references to the principles of culturally responsive practice (CRP) developed by Bishop et al., (2003, p. 95). When the aim is to have effective teachers in culturally diverse teaching environments, it would make sense to have criteria that explicitly states the principles of accepted quality, culturally responsive teaching.

The following table (Table 3) compares the key aspects of Alton-Lee’s 2003 Quality Teaching for Diverse Students model, the later 2012 Quality Teaching Dimensions developed by Alton-Lee, Hunter, Sinnema and Pulegatoa-Diggins, and the principles of Culturally Responsive Practice released by Bishop, Berryman, Tiakiwai and Richardson in 2003 against the New Zealand Education Council’s Practising Teacher Criteria.

It is against this criterion that all teachers must prove themselves, to receive their Practising Teacher Certificate which certifies they are fit to teach in New Zealand schools.

Table 3.

Comparison of Practising Teacher Criteria against Quality Teaching Dimensions (Susan Carnegie-Harding, 2016)

Comparison of Effective Teaching Practice Models			
Practising Teacher Criteria – Education Council (2016)	Quality Teaching Dimensions – Alton-Lee, Hunter, Sinnema and Pulegatoa-Diggins (2012) ⁸	Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis Iteration. (BES) Alton-Lee (2003) ⁹	Principles of Culturally Responsive Practice. Bishop, Berryman, Tiakiwai and Richardson (2003)
1. Establish and maintain effective professional relationships focused on the learning	Outcomes focus <i>Hua te ako, hua te ākongā</i> Quality teaching is focused on valued outcomes and facilitates high standards for diverse learners.	1. Quality teaching is focused on student achievement (including social outcomes) and facilitates high standards of student outcomes for heterogeneous groups of students	Mana motuhake - high expectations for learning, caring for the performance of Māori students
2. Demonstrate commitment to promoting the well-being of all ākongā	Responsiveness <i>Tauaronui</i> Quality teaching is responsive to all students’ learning, identities, and wellbeing.		Manaakitanga - caring for students as Māori and acknowledging their mana Rejection of deficit theorising to explain Māori students’ educational achievement levels.
3. Demonstrate commitment to bicultural partnership in Aotearoa New Zealand			Manaakitanga - caring for students as culturally located individuals
4. Demonstrate commitment to ongoing professional learning and development of personal professional practice			
5. Show leadership that contributes to effective teaching and learning			Knowledge of and professional agency regarding how to bring about change in Māori students’ educational achievement

⁸ Quality Teaching for Diverse (All) Learners in Schooling/He Ako Reikura, He Ākongā Rerekura (Te Katoa): Hei Kete Raukura (BES) Exemplar 1, Mathematical inquiry, April 2012.

⁹ The ten research-based characteristics of quality teaching derived from the research are generic in that they reflect principles derived from research across the curriculum and for students across the range of schooling years in New Zealand (from age five to eighteen, p. vi – x).

6. Conceptualise, plan and implement an appropriate learning programme	Alignment <i>Tātarite</i> Curriculum goals, resources, task design, teaching, school practices, and home support are effectively aligned.	4. Quality teaching is responsive to student learning processes. 5. Opportunity to learn is effective and sufficient. 6. Multiple task contexts support learning cycles. 7. Curriculum goals, resources including ICT usage, task design, teaching and school practices are effectively aligned.	Wānanga and Ako - discursive teaching practices, using a range of dynamic, interactive teaching styles
7. Promote a collaborative, inclusive and supportive learning environment	Opportunity <i>Kapohia, akona</i> Opportunity to learn is effective and efficient.	9. Pedagogy promotes learning orientations, student self-regulation, metacognitive strategies and thoughtful student discourse.	Rejection of deficit theorising to explain Māori students' educational achievement levels. Ngā whakapiringātanga – creating a secure, well-managed learning environment, managing the classroom to promote learning
8. Demonstrate in practice their knowledge and understanding of how ākongā learn	Scaffolding <i>Te ako poutama</i> Pedagogy scaffolds, and provides appropriate feed forward and feedback on, learning. Thoughtful learning strategies <i>Takina te wānanga</i> Pedagogy promotes learning orientation, student self-regulation, metacognitive strategies, and thoughtful student discourse.	8. Pedagogy scaffolds and provides appropriate feedback on students' task engagement.	Ako - range of strategies to facilitate learning Wānanga – student-student learning interactions Kotahitanga – using student progress to inform further teaching practices – teachers and students reflecting on student achievement in order to move forward collaboratively
9. Respond effectively to the diverse language and cultural experiences, and the varied strengths, interests and needs of individuals and groups of ākongā	Connection <i>Tūhono</i> Teaching makes educationally powerful connections to students' knowledge, experiences, and identities.	2. Pedagogical practices enable classes and other learning groupings to work as caring, inclusive, and cohesive learning communities.	Manaakitanga - caring for students as culturally located individuals
10. Work effectively within the bicultural context of Aotearoa New Zealand	Caring and inclusive learning communities <i>Te ako, he tohu manaaki, he piringa tangata</i> Pedagogical practices enable classes and other learning groups to work as caring, inclusive, and cohesive learning communities.	3. Effective links are created between school and other cultural contexts in which students are socialised to facilitate learning.	Manaakitanga - caring for students as culturally located individuals
11. Analyse and appropriately use assessment information that has been gathered formally and informally	Assessment for learning <i>He aromatawai i roto i te ako</i> Teachers and students engage constructively in goal-oriented assessment.	10. Teachers and students engage constructively in goal-oriented assessment.	Kōtahitanga - promote, monitor and reflect on learning outcomes for students
12. Use critical inquiry and problem-solving effectively in their professional practice	Teacher inquiry <i>Te tikanga uiui</i> Teacher knowledge, inquiry, and use of smart tools <i>Te mōhio o te kaiako, te tikanga uiui, te raweke tapu ngaio</i> Teachers work smarter, not harder, through the use of evidence for continuous improvement	1. Quality teaching is focused on student achievement (including social outcomes) and facilitates high standards of student outcomes for heterogeneous groups of students.	

Comparison of the four effective teaching models (Table 3) clearly shows that key aspects of Bishop et al.'s model are not matched by Alton-Lee's BES (2003) nor have they been added to Alton-Lee et al.'s Quality Teaching Dimensions (2012).

Rejection of deficit theorising to explain Māori students' educational achievement levels is not explicitly stated nor is the directive for teachers to see themselves as capable of making a difference for Māori students. These were the two key elements of the first part of the Te Kōtahitanga Effective Teaching Profile.

The call for professional knowledge and agency regarding how to bring about change in Māori students' educational achievement is not included in either model. A curious omission when the driver for all these models must surely rest on teachers' professional knowledge and effectiveness in this area. It is interesting to note the changes between Alton-Lee's 2003 model and the 2012 model. The Quality Teaching Dimensions now makes explicit its bi-cultural focus through the use of both Māori and English and includes the concept 'Responsiveness/Tauaranui' which was not mentioned in 2003. I believe that it is the influence of the Te Kōtahitanga programme (2003) that can be seen in these changes.

However, there is no evidence that the Te Kōtahitanga programme has had any impact on the Practising Teacher Criteria (PTC). Even the mention of PTC 10 "working effectively within the bicultural context of Aotearoa New Zealand" came from a need for teachers to show they were aware of Treaty of Waitangi obligations rather than the more explicit Manaakitanga – caring for students as culturally located individuals (Education Council, 2016).

Recommendations to address issues facing Māori in main-stream education

The Office of the Auditor-General New Zealand (2016) conducted a five-year study researching the reasons for Māori underachievement. They found while some reasons were generic and common to all students, regardless of their ethnicity, other barriers were not. A 2012 report from the Office of the Auditor General noted that transitioning between primary and secondary schools proved difficult for Māori students and emphasised the importance of relationships for Māori (Bishop et al., 2003; Cox & Kennedy, 2008; McGee, Ward, Gibbons & Harlow, 2003).

The 2012 report noted “this is especially so for students with low achievement levels, of lower socio-economic status, from kura kaupapa Māori, and from diverse cultural backgrounds” (p. 23). Lower teacher expectations for Māori students causing direct negative results in student achievement were also identified at all year levels in the 2012 report. Whilst research by the Office of the Auditor-General (2016) showed the barriers to raising achievement of Māori students was varied and complex, it also showed that raising academic achievement could be successfully accomplished through a move to culturally responsive teaching.

Ginsberg and Wlodkowski (2009, p. 24) state that “culturally responsive teaching occurs when there is respect for the backgrounds and circumstances of students regardless of individual status and power”. In the classroom, the learning is designed to include a full range of needs, orientations, and interests, creating experiences that “protect the knowledge, skills and experiences that learners possess and supports academic attainment and mobility by finding ways for students to develop their strengths” (Ginsberg et al, p. 24).

Earl, Timperley and Stewart (2008) speak of “culturally inclusive and responsive learning communities” and assert that “culture counts” (p. 12). Earl et al. (2008) define cultural responsiveness as

much more than introducing myths or metaphors into class. It means interacting with their families to truly understand their reality; it means understanding the socio-political history and how it impacts on classroom life; it means challenging personal beliefs and actions; and, it means changing practices to engage all students in their learning and make the classroom a positive learning place for all students (p. 12).

According to Bishop, Berryman, Cavanagh and Teddy (2007) the important aspects of Māori pedagogy which underpin effective culturally responsive teacher practices are self-determination, cultural aspirations, reciprocal learning, mediation of socio-economic and home difficulties, extended family, collective vision and philosophy (p. 13).

This study investigates how the introduction of the e-asTTle tool can trigger the acceptance and uptake of effective teaching practices through the provision of reports and data which support these. The role of e-asTTle will also be reviewed to identify how its use and the formative assessment programme it supports might also help improve outcomes for diverse students.

PART THREE: EXAMINATION OF THE E-ASTTLE TOOL

The review examines the links between the e-asTTle tool and its role in changing and supporting teaching practice and efficacy, with possible links to raising student achievement.

Short history of the development of the asTTle tool

In 2000 the Labour government of New Zealand saw a need for high-quality national assessments. Specifically, they wanted assessments that could contribute to improving the quality of school assessment decisions, ensuring national standards and improving the quality of reporting to parents. Proposals for national, externally referenced tests at years 5 and 7 in literacy and numeracy in English and Māori were requested.

A number of bids were received but it was the proposal from the University of Auckland, led by Professor John Hattie that was ultimately successful and selected (Brown, 2013). The asTTle testing system was developed at the behest of the Ministry of Education to “meet the goals of improved learning outcomes for all students and improved accountability for meeting national standards” (Brown, 2013, p. 39). The preliminary contract required the development, by the end of 2002, of

a testing system in English and Māori for mathematics/pangarau, reading/panui and writing/tuhituhi for use in Years 5 - 7 and related to Curriculum Levels 2 - 4. This meant that asTTle had to report against both norms and standards so that consistent interpretation of performance in the key domains of literacy and numeracy could be achieved (Brown, 2013, p. 40).

AsTTle tool developers, Brown and Hattie, saw the tool as being developed specifically to “be a curriculum-based, teacher-managed approach to national assessment as the best means of improving achievement, reporting to teachers, schools, and systems, and generating confidence in schooling” (Brown & Hattie, 2003, p. i). AsTTle was first trialled in 2000 with improvements made in 2002, 2003 and 2004. Version 4 was released to schools in early 2005. In spite of the technical advances of this version the Ministry was soon calling for proposals to develop a fully electronic testing system.

Since 2002 schools have been provided, upon request, the asTTle software free of charge and usage is completely voluntary.

AsTTle allowed schools and teachers to create curriculum-aligned customised, standardised, tests from large banks of calibrated test questions for English and Māori medium students. Reporting was against both the objectives and strands of Curriculum Levels 2 to 6 and norms for students in Years 4 to 12 (Archer & Brown, 2013, p.6).

The Ministry of Education (2006a) advised that the tool supported education practice focused on assessment for learning. Not only does asTTle present a snapshot of student achievement, but the tool also draws links between achievement and attitudes, gender, ethnicity, English at home and characteristics of the school. As well as the snapshots which promote discussion and reflection between student and teacher, in-depth reports on reading, writing and maths are available for data analysis. Findings from a number of student achievement reports can also be consolidated into one report to form a summative view of the progress of the class or school. (Ministry of Education, 2006a).

Changes attributed to the introduction of asTTle

Schools using the asTTle system soon reported seeing important changes in student learning outcomes. This was most evident in the curriculum area of writing, where significant gains in achievement were seen at the conclusion of a two-year professional development programme (Brown, 2013; Harland, 2003; Limbrick, 2008).

Archer and Brown (2013) identified six changes in teaching practice that they believed were linked to asTTle use. “These involved the role of assessment, the ownership of learning, teachers’ views of students, changed teaching practices, teachers’ views of the curriculum, and changes in classroom contexts” (Archer & Brown, 2013, p.9). Archer and Brown (2013) asserted that the combination of professional development and assessment tools brought about a fundamental change in the philosophical assessment framework of teachers in NZ. AsTTle has in many instances underpinned significant student improvement in their learning (Education Review Office, 2007). Once teachers could identify the learning needs, these could be addressed and shifts in the learning could be accurately measured against the curriculum using asTTle.

Systematic evidence, as opposed to anecdotal evidence, supports the contention that the introduction of asTTle supported substantial learning gains (Brown, 2013).

Problems perceived to have occurred with the introduction of asTTle

For a number of reasons, the introduction of the asTTle tool into schools met with some resistance (Archer & Brown, 2013, p.11). Six areas were identified as contributing to the resistance experienced during the roll out of asTTle and e-asTTle into schools. Firstly, there was a fear of high stakes accountability (Archer & Brown, 2013, p. 11).

Secondly, teachers also felt vulnerable through the transparency of the tool as it enabled “Principals and HoDs¹⁰ (to) also gain greater insight into the comparative performance of various classes in the school ... and may legitimately fear negative consequences for being seen to have performed poorly” (Archer & Brown, 2013, p. 12).

Thirdly, a wide range of assessment tools were already available in New Zealand (Archer & Brown, 2013, p. 12). Fourthly, teachers’ shock at standardised results compared to national standards (Archer & Brown, 2013, p. 12) did not help the fifth factor which was a fear of change that was felt by many (Archer & Brown, 2013, p. 12). Lastly, there were also persistent complaints by schools that using asTTle tests was extremely expensive (Brown, 2013, p. 51) yet the introduction of e-asTTle saved considerable time and money, according to Archer and Brown (2013).

¹⁰ Heads of Departments

The asTTle tool enables the teacher and student to identify learning goals and collaboratively work together to implement a programme to meet the identified learning needs and gaps. Students work both collectively through group work and individually, taking responsibility for finding out more and teaching themselves skills they have chosen to learn. Through this collaborative and individualised approach the student is motivated to take ownership of their learning. Talking with whānau (family), sharing and explaining their learning reports, allow the student to take charge of their learning. Whānau can then become involved in authentic and purposeful ways to support the student to achieve their goals.

When analysis of school data occurred a number of major sources of variance were identified. Hattie (2003) stated that teachers account for about 30% of the variance of achievement.

This was a significant percentage and showed what teachers know, do, and care about is very powerful in the learning equation (Hattie, 2003). Hattie's (2003) analysis of data also showed "the difference (between Māori and Pakeha) is still there even when socio-economic background is held constant" (p. 7) causing a "long tail of underachievement"¹¹ (See Appendix A). The introduction of asTTle has increased teacher knowledge and changed teacher attitudes to assessment (Archer & Brown, 2013; Education Review Office, 2007). Because of this, e-asTTle with its alignment to culturally responsive and effective pedagogical practice and formative assessment, has the potential for making a difference to student achievement.

SUMMARY

The review of the literature showed there are within school factors which affect student achievement. However, there are also factors beyond the school which also affect student achievement, often to a much greater degree. To close the achievement gap, researchers recommended school improvements combined with social and economic reform.

¹¹ Hattie through his analysis of data from 2001 – 2004 showed that while the distribution of achievement for Māori was the same as for other ethnicities (Asian, Pakeha and Pasifika), the position of the bell curve for Māori sat lower in the range and coined the term 'long tail of underachievement'.

The only factor in this equation schools can influence is teacher quality. The quality teacher dimensions fall under the umbrella of effective teaching practice.

For Māori students to achieve success they must experience teaching practice that is culturally responsive and uses evidence based formative assessment. The introduction of the e-asTTle tool and accompanying professional development to the study provided a unique opportunity to research the impact its use had on teaching practice and student achievement. If Hattie and Brown are correct, the introduction and effective use of the tool would help support the development of quality teaching practice and most importantly, help raise student achievement and engagement within the school. It was to research this premise that the following study was implemented and carried out.

A comprehensive and detailed discussion of the research design and methodology for this investigation is covered in the next chapter.

3. Research Design and Methods

INTRODUCTION

This chapter describes the theoretical framework and research methods of a mixed method investigation. The structure of the study, methods of data collection and analysis tools used will be discussed. Ethical considerations and issues encountered will also be examined.

THEORETICAL UNDERPINNINGS

Creswell (2014) stated that any approach to research involves philosophical assumptions as well as decisions about procedures and methods. Slife and Williams (1995) cautioned researchers that “although philosophical ideas remain largely hidden in research, they still influence the practices of research and need to be identified” (as cited in Creswell, 2014, p. 34). The philosophy underpinning this study is a pragmatic worldview. Creswell (2014) describes it as not being committed to one philosophy and reality, rather arising “out of actions, situations, and consequences rather than antecedent conditions” (p. 39). Pragmatism applies to mixed method research in that inquirers

draw liberally from both quantitative and qualitative assumptions when they engage in their research. Individual researchers have a freedom of choice. In this way, researchers are free to choose the methods, techniques, and procedures of research that best meet their needs and purposes (p. 40).

The mixed method approach creates a dual research paradigm. When considering the ontological¹² grounds of this study it was apparent that the philosophical view of the nature of reality varied when applied to quantitative research as against qualitative research. In the quantitative study the nature of reality was objective and the researcher was apart from the study.

In contrast, in the qualitative aspect of the project, the nature of reality was subjective and multiple as seen by the participants involved in the study. A key concept on which the study was based was causal determinism.

¹² As understood in a philosophical context: what constitutes reality and how can we understand existence?

Causal determinism is the idea that every event is caused by antecedent events and conditions including one's own deliberations, choices, and actions (Eshleman, 2009). It is the effect of the use of the e-asTTle tool on teacher practice which in turn could affect student achievement that meets the principles of causal determination. The duality of the research paradigm was also evident when considering the epistemological¹³ assumptions within the study around the role of the researcher. The researcher when involved in the quantitative study had a role independent of what was being researched; unlike the collaborative role in the qualitative research where the researcher interacted with the participants.

The quantitative methods of numerical data gathering using an independent tool meant the data gathered were less likely to be biased or untrue. Consideration was given to ensuring the gathering of qualitative data to ensure they were valid, reliable and lacked bias. The criteria for knowledge within the study was also determined to ensure clarity about what would be accepted as knowledge and true and what was belief and possibly (knowingly or unknowingly) untrue. Justification to accept the results of the study were based on an understanding that the findings would be clearly and fully stated, underpinned by acceptable data demonstrating both validity and reliability. The inclusion of other justified beliefs as part of the study would help determine that the findings were not only true and justified but were also based on solid evidence.

THE RESEARCH DESIGN

The empirical research design took the form of a single study. Whereas in true experiments participants are randomly assigned to a control and treatment group, in single study research the participants serve as both the control and treatment group. This means that each student serves as his or her own control. The student's level of knowledge is measured at the start of the study before the intervention is put into place.

The student's level of knowledge is then measured again at the end of the study to determine what impact, if any, has occurred because of the intervention.

¹³ What is the nature of knowledge, what constitutes valid knowledge and how do we know what can or cannot be known?

The gathering of both quantitative and qualitative data within the study meant a mixed method approach was required to support a more comprehensive view of the research topic (Punch & Oancea, 2014, p. 338).

Johnson and Onwuegbuzie (2004) stated that “mixed methods of research will be superior to monomethod studies” if the effective use of different strategies, approaches and methods was adhered to (p. 18). Combining the two methods allows the strengths of both methods to be utilised while at the same time compensating for any weaknesses in the design of the other method (Punch & Oancea, 2014). This is referred to as the “fundamental principle of mixed research” (Johnson & Turner, 2003, p. 299).

The study took the form of three strands of concurrent research (See Appendix B). The first strand was a qualitative study focused on teacher knowledge and practice. The second strand was also qualitative study focused on gathering student voice with the third strand focused on gathering quantitative data comprising student pre and post test results. Results from each strand would then be used to confirm or corroborate findings. Cohen, Manion and Morrison (2010) define triangulation as the use of “two or more methods of data collection in the study of some aspect of human behaviour” (p. 141). Triangular approaches attempt to explain more fully the richness and complexity of human behaviour by studying it from more than one standpoint (Cohen et al., 2010, p. 141). Four types of triangulation are frequently used in educational research. The most common is methodological triangulation, as it is characterised by using “different methods on the same object of study” (Cohen et al., 2010, p. 142). In this study, normative¹⁴ (using the scientific method) and interpretive research methods (to interpret elements of the study) were used.

Using the triangular model; data were gathered at the same time and then integrated in order to clarify or better understand the problem.

Quantitative and qualitative data were given equal priority. Findings were reported on, in separate sections, with discussion bringing together relevant points in the report. Multiple level sampling occurred in the study.

¹⁴ Normative research clearly defines the study population, outlines the phenomena under research and appropriately interprets the results. The focus is not only to gather facts but also to point out in which respects the object of study can be improved and usually includes planning an approach for carrying out the necessary improvements.

In the first and last phase of the investigation (quantitative phase) sampling of students occurred. In the second phase (qualitative) sampling of teachers and students took place (Onwuegbuzie & Collins, 2007). The sampling scheme is “theory-based” as the setting, groups and individuals were chosen because their inclusion helped the researcher to develop a theory (Onwuegbuzie & Collins, 2007, p. 286).

The research school was a Decile 1 Year 7 to 13 school in a rural setting with a roll of approximately 430 students, 86% of whom identified themselves as being Māori. Year 7 had 70 students, Year 8 comprised 65 students and Year 9 had 80 students. Nine teachers taught in this area, three teachers to a year group. The sample group were purposefully selected as were the settings to “maximize understanding of the underlying phenomenon” (Onwuegbuzie & Collins, 2007, p. 287). This enabled invitation to participation of all the students in each year group, providing a larger sample for the study than if smaller homogeneous groups had been chosen. By increasing the size of the sample group the confidence interval and its width decreases because it decreases the standard error. This provides a more precise estimate of the population value leading to an increased likelihood of important themes and outcomes within the data being identified and understood from a larger sample group.

STRUCTURE OF THE STUDY

The research problem to be investigated was the impact the introduction and use of the e-asTTle formative assessment tool had on student achievement. For the tool to have an impact on student learning, the teachers needed to know how to use the tool and this they had to learn. Teachers also had to familiarise themselves with the data and reports the programme provided. It is not the tool per se which causes the change but its use (See Appendix C). The e-asTTle tool acts as a catalyst for change by supporting formative assessment practices (Absolum, 2006; Clarke, Timperley & Hattie, 2001; Timperley & Parr, 2004). The reports provided by the tool can change teaching practice if teachers use the data and embrace the evidence based practices made possible.

Therefore, the first part of the study was to find out the extent of the impact the use of the tool had had on teacher practice.

Although some teachers had been teaching at the school when the tool was introduced and others had started teaching afterwards the questions were framed to include all teachers.

The teacher survey was made available in Term Two at the same time as the post tests were administered to the students.

This meant all teachers, regardless of initial exposure to the tool, had had one term using the tool and had attended several workshops on the use of the tool.

Although this timeframe was shorter than what might be considered ideal, it was still considered sufficient for teachers to make changes to their practice and for this change to be obvious enough to be identified and reflected on. The teachers' responses to the questions should provide sufficient material for the extent of that change and the form it took to be identified.

The second part of the inquiry was based on the premise that using the e-asTTle tool would increase the likelihood that evidence based practice would be used in the classroom, thus helping to raise achievement. To be able to identify shifts in student progress because of this, two sets of student assessment data for each year group in reading and mathematics were collected for comparative analysis to national norms to allow identification of progress. The results from the assessments were also broken down by ethnicity and gender to allow further comparison with other low decile, high Māori schools.

Part One: Mixed qualitative and quantitative data from teacher responses to on-line survey questions.

An important part of the study was to see if there was a change in teacher practice after the introduction of the e-asTTle tool. A change to a formative assessment, evidence based style of teaching would be significant with a possible long-term positive impact on student engagement, learning and achievement. The gathering of evidence that showed this would not only be of interest and value to the teachers and school, it would also enable information to be matched with student data, allowing more detailed understanding to be drawn from either matching or conflicting evidence.

A qualitative aspect to the research design was required as analysis of the impact on teacher practice and efficacy through the introduction of the e-asTTle tool would be poorly served by a purely numerical approach. A qualitative approach enabled in-depth, contextual data to be gathered.

Specifically, teacher's perception of how knowledgeable and confident they were in the use of formative assessment strategies and evidence-based practice would be collected.

The purpose of the research was to track over time changes in teacher thinking, confidence and expertise and to compare this information with the student achievement and progress data. Thus, the qualitative data provided contextual information and facilitated understanding and interpretation of the quantitative data.

The first part of the survey requested retrospective data by asking teachers to reflect on their teaching and assessment practice prior to the introduction of the e-asTTle tool. The teachers were asked to identify their level of knowledge and expertise around assessments, use of data to inform their teaching practice and experience with the e-asTTle tool.

Teachers were not asked to complete a separate survey at the start of the year to minimise inconvenience and demands on the teachers at this very busy time and this year it was an extraordinarily busy time. Teachers were busy building relationships with students in a new and different learning environment. Learning now occurred via a digital platform, requiring the development of new teaching methods as well as supporting students who were also learning and adjusting to all these changes. Requiring teachers to complete only one survey also ensured there was less risk of confidentiality being compromised.

The other two parts of the survey required current information at the end of the study period. Peters (1988) calculated recall accuracy as reducing by 3.8% per year when collecting retrospective data (p. 493). As the time period in question for the retrospective section of the survey was within 12 months the risk of inaccurate recall was small enough to not affect validity and reliability. It is not unusual to collect retrospective data as almost all questionnaires and most surveys use recall data. A possible benefit of retrospective data is that it is not subject to 'reactive effects' whereby respondents change their behaviour as a

result of being interviewed or questioned thus affecting the validity and reliability of the data (Butz, 1981).

Cohen et al. (2007) suggested further benefits resulted from the researcher having a clear focus within the area of investigation. Such a focus will result in a well-constructed survey with well-written survey questions. These questions will then provide data to support the aim of the study and to answer the research questions. The resulting data from the teacher survey would be useful for establishing causal relationships which was a desired outcome of the project.

The qualitative data from the teachers were collected by means of an anonymous on-line survey using a mix of open-ended, multiple-choice and ranking questions. The Teacher Survey was created using Google Forms (See Appendix D). The school is a 'Google' school so teachers were familiar with answering surveys on Google Forms.

The advantages of using Google forms for the researcher were the variety of question types available, the ease in sharing the survey with volunteers, the ability to keep their responses anonymous and as the surveys are mobile friendly they could be completed when and where the teachers wished. Many of the questions were open-ended to enable rich, personal data to be gathered.

Open-ended questions also allowed individuals to give spontaneous responses and avoided the bias that may result from close-ended questions which suggested responses to individuals (Reja, Manfreda, Hlebec & Vehovar, 2003). The teacher survey was focused and succinct and could be completed within 5 to 10 minutes, although this time frame was dependent upon responses and teacher choice as to how much they were willing to contribute.

The survey was in three parts. The first part focused on identifying teacher prior knowledge. The second part identified current knowledge and the third part was a reflection on changes in their teaching practices and their current professional learning needs. The survey was comprised of structured questions using the Likert response linear scale (with a scale of 1 — 5), dichotomous questions as filter questions, check boxes (Yes/No and multiple responses) open ended narrative responses that provided greater depth and description and one

checkbox question. The survey was designed to be quickly and easily completed by the teacher in their own time without it becoming a stressful requirement. Responses were anonymous and could not be traced to individual teachers.

Teacher responses were collated and analysed. The data analysis methodology was based on the Miles and Huberman interactive model (Punch & Oancea, 2014, p. 224).

Analysis of a large-scale split-ballot experiment using a Web survey in 2001 showed that while close-ended questions were answered more often than open-ended questions; open-ended questions provided more diverse answers than closed-ended questions (Reja et al., 2003). To guard against inadequate answers, the open-ended questions needed to be unambiguous, specific, and not allow respondents to interpret them differently from the way intended (Cohen et al., 2007). Steps were taken to address possible ethical issues. Research had identified four potential risks to research participants in qualitative investigations. These were anxiety and distress, exploitation, misrepresentation, and possible identification of the participant in published papers (Richards & Schwartz, 2002).

The survey was designed so that anxiety and distress were minimised through allowing participants to choose whether to participate, choosing when to complete the survey and ensuring responses remained confidential and untraceable. Care was taken in this study to obtain fully-informed consent, take steps to ensure confidentiality and anonymity and ensure scientific soundness in the research planning. As it was a small sample there was a need to ensure non-traceability within the data before and after analysis.

Cohen et al. (2007) points out that “questionnaires are an intrusion in terms of time, level of threat and possible invasion of privacy” (p. 317). It was appreciated that long and complicated questionnaires place an undue and unacceptable demand on respondents. There was also an ethical responsibility to ensure the questionnaires show methodological rigour, fairness and a need to avoid bias. It is a reasonable expectation for respondents to expect the survey to be valid and reliable in all aspects. Every effort was made to ensure the

questions did not offend, upset, or mislead respondents (Cohen et al., 2007). Administration procedures were also reviewed carefully as they can strongly affect the quality of data, including the response rates to the survey as a whole (Punch and Oancea, 2014). There was a consistent focus on clarity of wording and simplicity of design so the survey could be made as clear, un-ambiguous and uncomplicated as possible.

An inductive method, using a systematic procedure for analysing qualitative data “guided by specific evaluation objectives”, was used to analyse the teacher survey responses (Thomas, 2006, p. 238).

The approach primarily uses detailed readings of the data to derive themes or concepts; differing from deductive analysis which tests whether the data matches prior assumptions, theories, or hypotheses (Thomas, 2006).

All teachers who taught a Year 7, 8 or 9 class at the time of the research project (other than the teacher researcher) were invited to complete the survey. The research study was discussed so that the teachers understood the purpose and procedures of the study, the potential benefits of the study, that their participation was entirely their own choice, there was no coercion on them to participate and their privacy would be respected.

Teacher Information Sheets (See Appendix E) and the Teacher’s Consent Form (See Appendix F) were handed out to the teachers.

Only those who completed and returned the consent forms were sent the link to the survey. From that point on the responses in the survey were anonymous.

Part Two: Quantitative data from student results in reading and mathematics e-asTTle assessments.

In Term One the Year 7, Year 8 and Year 9 students sat beginning of year (BoY) assessments in reading and mathematics using the e-asTTle programme. Testing was supervised by the teachers and followed accepted exam testing conditions.

Data in the form of .csv files from the e-asTTle database for reading and mathematics were generated and saved. In Term Two students were tested again using e-asTTle with different (but similar) assessments. The teachers supervised testing, and there was a clear expectation that accepted exam testing conditions were to be followed. Year 7, Year 8 and

Year 9 mid-year (MidY) student data for reading and mathematics were generated and saved. The BoY and MidY reading data were then combined and 'cleaned' by removing all students who did not have two sets of data. The same procedure was carried out on the mathematics data. Groups in e-asTTle were then created containing only the students who had completed both a pre and a post-test in reading and/or both a pre and a post-test in mathematics. Not completing pre and post-tests in one subject did not preclude a student's data from being used in the other curriculum area if they had completed a pre and post-test in that subject. Reports were then generated within the e-asTTle programme to enable statistical analysis of these students' results.

Part Three: Qualitative data from recorded responses in student discussion groups.

Discussion groups were planned to enable data to be gathered that reflected a student perspective of e-asTTle assessments and their experience of formative assessment practices.

The groups did not take place because there were too few respondents to proceed. Only two students returned the parent consent forms and of those two, only one of the forms was correctly completed and signed.

DATA GATHERING TOOLS

Analysis of Qualitative and Quantitative data – Teacher Survey

Some responses on the Teacher Survey provided quantitative data and other questions yielded qualitative information. The quantitative data were analysed using Excel and conclusions drawn.

An 'inductive data analysis method' (Thomas, 2006, p. 238), incorporating the "Miles and Huberman framework" (Punch and Oancea, 2014, p. 223) was used to investigate the qualitative data collected. A systematic procedure, the inductive approach analyses qualitative data guided by specific evaluation objectives. By "primarily using detailed readings of raw data to derive concepts, themes or a model through interpretations made from the raw data by an evaluator or researcher" theory is allowed to emerge from the data without the restraints imposed by structured methodologies (Thomas, 2006, p. 238).

The first step was to read through the survey answers before starting the process of breaking down the texts to analyse, reduce and “interrogate them into summary form through the use of both pre-existing categories and emergent themes in order to generate or test a theory” (Cohen et al., p. 476). When teachers participated in the survey their answers were automatically added to a Google spreadsheet which continually updated as further responses were entered. The spreadsheet was .csv and excel compatible and easily manipulated to allow coding of the teacher’s responses.

The qualitative data were collated, coded and themes identified. The qualitative data findings were supported by quantitative data that were generated from different questions within the same survey.

Data reduction occurred initially using an open coding method. Due to the small number of teachers who responded (five) and the brevity of the written responses to questions, there was no need for the data to be reduced using an elaborate or complex system of codes and frequency counts (Coolican, 1999). Instead, each set of survey responses was read and notes made using short phrases or key words to sum up. The second stage was using the key words, which were retained in their original form, to create categories and then re-finishing them until a shorter list was created.

Teacher responses were then re-read and sorted into the categories. An initial interpretation was made before the data were re-read again, searching for any further emerging themes, and looking for any data that were different from or contrary to the main findings. This process continued until a clear understanding of the meaning was arrived at and a summary of the themes present in the responses was made. The three concurrent activities of the Miles and Huberman model were used interactively throughout the analysis.

In the early stages of the analysis, data reduction occurred through editing and summarising. In the later stages, conceptualising and explaining of the data occurred (Punch and Oancea, 2014). At this stage the data were displayed using a number of different graphs to support the proposition of possible conclusions. Based on the evidence “some explanations for the situation, some key elements and possibly even their causes” were posited (Cohen et al., 2007, p. 483).

Statistical Analysis of Quantitative data – Student Assessments

Quantifiable data can be analysed to develop statistical and numerical explanations to answer research questions (Arthur, Waring, Coe and Hedges, 2012). Quantitative research is based on the exploration of interaction between variables. The “essential idea that the effect of one independent variable on the dependent variable interacts with (or is influenced by ...) another independent variable” is the rationale for choosing this method (Punch & Oancea, 2014, p. 316).

Quantitative data enables testing of the hypothesis using facts and statistics. Large amounts of data can be efficiently captured from a reasonably big group of students and generate results that can be generalised to a large population.

The way the data were analysed was governed by the research question. The purpose of the study was to produce evidence that could be used to show if students had made progress in their learning and to what extent. It was therefore important to decide “what kind of data we have gathered” during the study before deciding what the most appropriate procedures were (Coolican, 2005, p.216). Cohen et al. (2010) stated that “parametric data assume(s) knowledge of the characteristics of population” (p. 503). Examination of the data appeared to show it followed known distribution but to test this a Shapiro-Wilk test for normal distribution was carried out using SPSS (see Appendix J).

Based on the Shapiro-Wilk test results an assumption was made that the data were normally distributed. Parametric data analysis was chosen because the measure of central tendency in parametric tests is the mean. This allowed for calculation of effect size and making comparisons using e-asTTle norms based on assessment mean data using the results of the study. Use of parametric data also enabled descriptive analysis of standard deviation, standard error, measures of association (Pearson’s correlations), and analysis of differences between sub-samples (T-tests) to be carried out. Two-tailed tests were used to support the hypothesis that the use of the e-asTTle tool and subsequent change to teacher practice improved students’ achievement levels. A p value of $\alpha = 0.01$ was used.

The null hypothesis was that Māori students’ progress and achievement would not increase despite the use of e-asTTle data and formative assessment/evidence-based practice by

teachers. If the p values from the paired samples test are less than or equal to the alpha value then the result is significant and the null hypothesis will be rejected. If the findings are not significant the null hypothesis will not be rejected. A variety of tables, charts and graphs were used to display data. Bar charts were used for discrete data and box plots for displaying the distribution of values with their range and median.

E-asTTle raw data were collected by way of on-line assessments comprising a mixture of multiple-choice and open questions. Multiple-choice answers were automatically marked within the programme.

Answers for multiple-choice questions which fell out of the programme’s pre-set answers and answers to open-ended questions were marked by the researcher at the conclusion of the testing period. A variety of reports were generated from within the programme. Pre and post test data were matched and only student data where there were both beginning of the year and mid-year test results were used.

Data for each year group were analysed (refer to Table 4 below) to provide the following information: the percentage of students who made progress within each year group, percentage of Māori students who made progress within each year group and percentage of Māori males as compared to Māori females who made progress within each year group. Also calculated were the BoY and MidY mean and standard deviation.

Descriptive Statistics for Student Sample Group

Year	Gender		Ethnicity		Reading	Reading	Mathematics	Mathematics
	M	F	M	NZE/O	Mean	Mean	Mean	Mean
					Pre Test	Post Test	Pre Test	Post Test
7	30	23	47	6	1354	1361	1390	1391
8	20	23	34	9	1399	1426	1425	1445
9	33	20	49	4	1414	1467	1453	1467

Table 4: Break down of Student Data for Year Groups by Ethnicity, Gender and Mean

The effect sizes for all year groups in reading and mathematics were calculated using EXCEL and double checked using an effect size calculator. SPSS t tests were carried out and Cohen's d was calculated providing further comparison data against which to check results. Progress between the year groups was compared using the national expected rate of shift.

ETHICAL CONSIDERATIONS

As the research project involved both adults and children aged 15 years and below, there were important ethical considerations to consider.

All activities carried out complied with the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants (2015), Massey University¹⁵.

An application was made to the Massey University Human Ethics Committee and the researcher was granted ethical consent to conduct the research investigation. At the beginning of the study access to the institution, teachers, students and use of the database was requested from and approved by the Board of Trustees of the school. (See Appendix G).

Principles

Procedures followed were appropriate to the participants involved in the project. Every effort was made 'to respect the social and cultural sensitivity of all participants' (Code, 2015, p. 4). The major ethical principles of respect, social and cultural sensitivity, minimisation of harm, informed and voluntary consent, respect for privacy and confidentiality, avoidance of deception and conflict of interest, and the principle of justice were all taken into account throughout the study.

Treaty of Waitangi

As a non-Māori researcher working with Māori students, priority was given to ensuring the principles of the Treaty of Waitangi were recognised and observed. Consideration was given to the principles of participation with full discussion and partnership with participants.

¹⁵ Unless specified otherwise 'Code' refers to the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants.

Māori ethical perspectives were identified and upheld as was the observation of tikanga Māori and the need to protect Māori participants (Code, 2015).

Several information meetings were held to which parents, whānau and the community were invited. Information sheets and consent forms were provided in both English and Māori and support and consent were obtained from local Kaumātua.

Informed Consent

Participant information sheets and consent forms were given to all teachers involved. Consent was sought from the teachers in terms of participation in the research and they all had the right to withdraw without penalty. As most of the children were aged 15 years or younger informed consent was also sought from the caregivers of the children in terms of participation in the research. As the majority of our students are Māori, cultural beliefs were acknowledged and respected and consent was requested in a way which met whanau and community needs. For example, information and consent forms were provided in both English and Māori. A letter of invitation and an accompanying assent¹⁶ form was written in language children could easily understand (Code, 2015).

Anonymity/Confidentiality

Most data were converted to percentages and graphs focused on the degree of progress and achievement and not individual results. Due to the small sample of teachers, care was taken to ensure displays of data or discussion of findings did not identify staff members. All data collected were kept confidential and no data were used that could identify any student, teacher or school manager.

Conflict of Interest

There is the potential for conflict of interest between the researcher's professional role within the school and that of researcher in carrying out the study. Bias in judgement is difficult to eliminate and can occur subtly through the choice of research questions, design, selection of participants and through the collection, analysis and interpretation of data. There is also a danger of important information being overlooked or mis-interpreted.

¹⁶ The assent form was used because the students were of an age where they could not give legally effective informed consent but they could express willingness to participate in the research.

To reduce the risk of bias and to improve objectivity within the study there was rigorous application of the scientific method.

Ownership of Research

It is intended that the analysed data will have mutual benefits for the research participants and the wider community.

Analysed report data will be shared with students and whanau, teachers and school managers, Board of Trustees and the community (Code, 2015). There has and will be openness and transparency about the introduction and use of e-asTTle and any accompanying changes to the way assessment data are used, and to teaching practice.

As it is part of the school assessment practice for students to sit the e-asTTle tests permission was not sought from parents for their child to undergo e-asTTle testing. Permission was sought from the Board of Trustees to include the resulting data in the research project. Care was taken to minimise harm to all persons involved in or affected by the research and at all times the researcher endeavoured to be sensitive to participant's needs.

Use of Control Group

The mixed-method approach used does not use a control group for ethical reasons (Coolican, 1999) but used a naturally occurring group (the students within the school) that was not set up for research purposes (Punch & Oancea, 2014). The use of a control group for "baseline comparison measure" is not always practical or ethical in some research situations (Coolican, 1999, p. 55). A large majority of students are below or well-below in their achievement standards. There was an urgent need for all students to receive interventions that result in accelerated progress. Denying this intervention to a control group within a school and the resulting professional development to the teacher would raise ethical questions, especially when there is very good reason to believe the intervention would be of benefit.

It was also impractical to have a control group as the introduction and use of the e-asTTle tool was carried out across the Junior Department with the intention of it providing

important school-wide data on a yearly basis. Withholding a control group would impact on this data to the detriment of the school's goal to start collecting and using a schoolwide set of valid, reliable data for longitudinal analysis.

Teacher as Researcher

The research was carried out by a teacher within the school and department being studied. This could cause a possible conflict of interest between the researcher's professional and research role resulting in biased judgement. A perception of lack of objectivity in the study could lead to a reluctance on the part of students or teachers to participate. To reduce these concerns the project was designed to protect participant's privacy. Teachers, parents and students were reassured that there would be no negative consequences if they chose not to consent, participate or withdrew.

Both teacher and student participation was entirely their own choice and there was no coercion to participate. The researcher had no actual or perceived position of power over the participants and had a positive relationship with the teachers and leaders within the school. The researcher was known to the students, parents, whanau and community and had a respectful and positive relationship with them. Use of the e-asTTle tool and Google Forms meant anonymity could be maintained and results analysed without issues of subjectivity from the researcher.

Implications of possible limitations on the design of the study, given the nature of the study community and its effects on the research design, are reviewed in greater detail in the Conclusions chapter. Comprehensive discussion of the findings, based on the outcomes of this data analysis process, are covered in the next chapter.

4. RESULTS

INTRODUCTION

In this chapter the results of the Teacher Survey and the students' pre and post tests are presented. The introduction of the e-asTTle tool was a significant change to the status-quo within the school. It was the impact that the use of the tool may have had on teaching and learning that was studied in this research. The qualitative aspect of the study sought to answer the first question "How does the introduction and use of the e-asTTle tool in a low decile school affect classroom practice?" The justification for the focus on teaching practice was the research and evidence that indicated if teachers changed the way they taught to include formative assessment practices it would have a positive effect on student achievement (Absolum, 2006; Bishop, Berryman, Tiakiwai and Richardson, 2003; Clarke, Timperley and Hattie, 2001; Timperley and Parr, 2004). The qualitative aspect of the study was focused on establishing the shift in student progress over the study period, to ascertain if a change in teacher practice had any impact on learner achievement.

TEACHER SURVEY RESULTS

The sample group comprised all teachers teaching Year 7, 8 and 9 students, excluding the researcher, at the time of the study. The survey sought to gather information that would answer three key questions: how familiar were the teachers with using e-asTTle and its data at the start of the study, how confident were the teachers with using e-asTTle to support their use of evidence-based practice at the end of the study and how much did they believe using the tool had changed their teaching practice? Five of the eight teachers eligible to

participate completed the survey. The results demonstrated shifts in teacher respondent understanding and expertise in using the e-asTTle tool, resulting in greater confidence and an increased understanding that the tool was useful in informing their teaching practice. This shift resulted in e-asTTle replacing earlier assessments as the primary source for supporting formative assessment practices.

Analysis of the survey data – Part One

The first section of the survey sought to establish the level of prior knowledge the teachers brought to the school around assessment in general and the e-asTTle tool specifically. The first question in the survey asked the teachers to identify how familiar they were with the e-asTTle tool on a Likert scale with five anchor points ranging from completely unfamiliar to very familiar and confident with all aspects. Of the responding teachers three were familiar with the e-asTTle tool when arriving at the study school with two of the teachers having little or no familiarity with any aspect (see Appendix D for a copy of the survey).

The next question sought to establish how familiar the teachers were with using evidence to inform their teaching practice. A five point Likert scale was used with anchor points ranging from completely unfamiliar to a mid-point descriptor of familiar to an end-point description of completely confident¹⁷. All the teachers identified themselves as familiar with evidence based practice with two teachers identifying themselves as completely confident users. When asked to identify what evidence or assessment data they used from a list of assessment tools available in the school, all responding teachers identified using Progressive Assessment Tests, STAR Reading, Probe and classwork. Individual conferencing with students was identified by four of the teachers and one other teacher indicated they also used other assessments but did not specify them. Similarly, two of the teachers indicated they found the assessments helpful with three stating they were very helpful. The teachers were not asked to specify how they were helpful.

Analysis of the survey data – Part Two

¹⁷ The description terms are discussed further in the limitations section of Chapter 5

The second section of the survey was focused on identifying teacher’s knowledge and expertise in using the e-asTTle tool and its data at the end of the study (See Appendix D for a copy of the survey). The first question in this section used a five point Likert scale with a beginning anchor point of ‘completely lacking in confidence and unsure’ and an end anchor point of ‘extremely confident and able’. The question asked teachers to identify how confident they were now (at the end of the study) in analysing and using the data on e-asTTle. All the responding teachers identified that they were confident users of the tool. This was a noticeable shift from the beginning of the study (as seen in Figure 1).

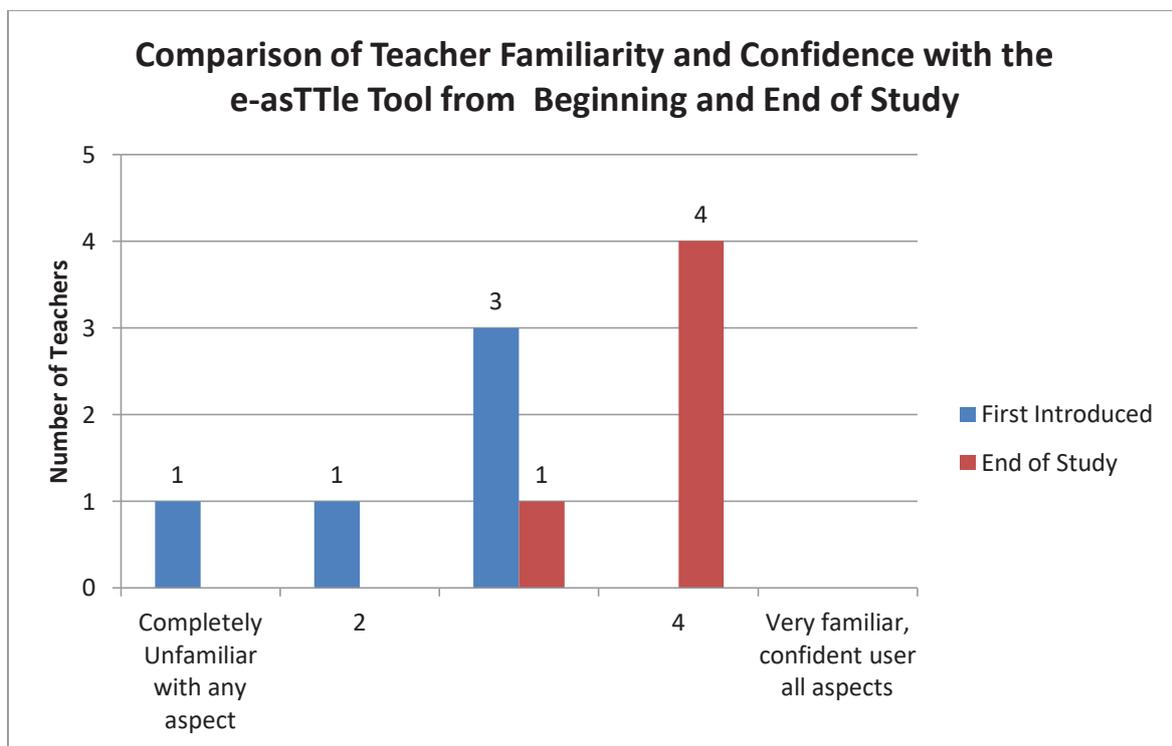


Figure 1: Comparison of teacher familiarity and confidence with the e-asTTle tool from when it was first introduced to the end of study

The next question in the survey, using a Likert five point scale with a beginning anchor point of ‘complete unhelpful with no useful data’ and an end-point anchor of ‘extremely useful and helpful’, asked how useful the tool had been in providing data to inform the teachers’ teaching practice. All teacher respondents indicated that the data provided by the tool to inform their teaching practice was useful with four finding it was very or extremely useful. In comparison with other assessment tools used by the teachers, the e-asTTle tool was

identified as being more useful for providing data to inform teaching practice (as seen in Figure 2).

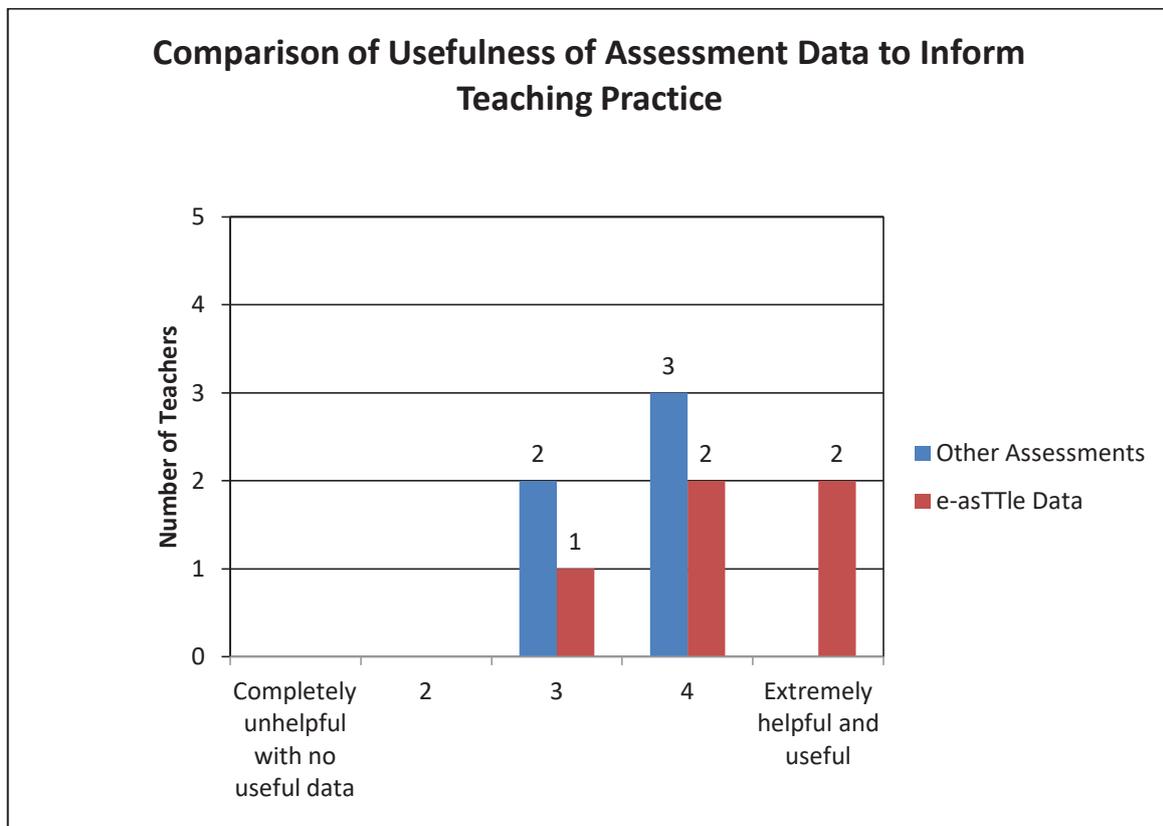


Figure 2: Comparison of usefulness of assessment data to inform teaching practice from beginning of the study to the end of study

Yes/No check boxes were used for the next question to determine if the tool had supported teachers in making changes to their practice. Four of the responding teachers said it had. Teachers who answered 'Yes' were prompted to respond to an open-ended question asking teachers to specify what those changes were. Of the teachers who had responded affirmatively, one said they now shared e-asTTle results with students and whanau. A further two teachers identified that the more specific individual data in the form of the Individual Learning Pathway (ILP) allowed them to group students for next learning steps. The use of data to inform teaching practice was a common theme identified with two of the teachers stating they could now better link their teaching to both curriculum and group learning needs through using the Group Learning Pathway (GLP).

Analysis of the survey data – Part Three

The third section of the survey was focused on teacher reflections on the changes that had occurred due to the introduction of the tool (See Appendix D for a copy of the survey). Yes/No check boxes were used to filter teacher participation by way of their responses.

An affirmative response prompted teachers to respond to an open-ended question which asked teachers to provide further specific detail. Teachers were asked if using the tool had firstly changed the way they planned and secondly changed the way they taught. Those who said yes to a change in planning or teaching style were asked to identify the changes that had occurred. Three teachers believed that they had changed the way they planned because of using the tool and the reports it produced. Recognized changes ranged from listing specific skills to be taught in their planning, to looking at the gaps in student's learning and in writing planning based on individual needs instead of core groups. The same three teachers also identified that using the tool had changed the way they taught with one of the teachers stating that their teaching was now more specific and targeted. The other two teachers did not provide further information.

Teachers were then questioned on their beliefs around the effect of the e-asTTle tool on student achievement and engagement. Those who said yes were asked to provide further specific detail. Of the teachers who responded to the survey, three believed that the changes they had made to their teaching practice through using the e-asTTle tool and its data had a positive effect on student engagement and achievement. They noted that some students were more engaged in their lessons and that some had taken ownership of their results. As a result, students were seen to be more engaged in the planning of learning activities that focused on their learning needs. Students were thought to be keen to master identified gaps in their learning and to address their learning needs. Teachers also noted that Term Two assessments were showing fewer gaps in student knowledge which they believed indicated targeted teaching at the beginning of the year had effectively addressed these areas. One teacher noted that through using the data they could create "greater add on value" to student learning. However, two of the teachers had not noticed any impact on student engagement.

One teacher felt that it was still “a work in progress” and another teacher believed that the Term Two testing was “too early to say” if the changes they had made to their teaching practice had had any impact on student achievement. Overall, there was a significant shift in teacher confidence around using the e-asTTle tool and the data produced.

All the teachers who responded to the survey now considered themselves confident users of most aspects of the tool. Of the teachers who responded to the survey, two now considered e-asTTle more helpful and useful than the more traditional assessments that were in use prior to the introduction of the e-asTTle tool. By the end of the study period, three of the teachers believed the use of the tool was having an impact on both student engagement and achievement because of the changes they had identified making to their teaching practice. However, two teachers believed the tool had not had any impact on student engagement, with one teacher also indicating that they did not believe it had had any impact on student achievement. A second teacher commented that they felt insufficient time had passed to identify any impact on student achievement because of the short time frame of the study (as seen in Figure 3).

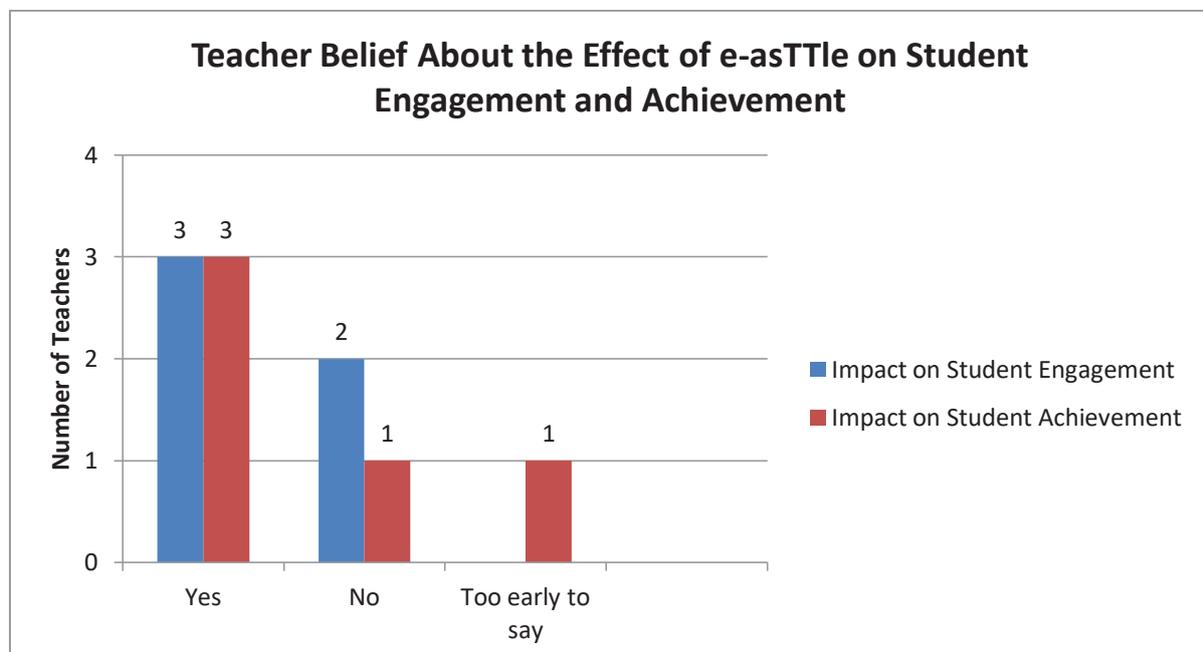


Figure 3: Teacher belief that the use of e-asTTle tool has had a positive impact on student engagement and achievement

STUDENT ASSESSMENT RESULTS

The sample group was all Year 7, 8 and 9 students in the Junior Department who had completed the beginning of the year and mid-year assessments for Reading and Mathematics in e-asTTle.

The study sought to gather information that would answer the final part of the research question “How does the introduction and use of the e-asTTle tool in a low decile school affect ... student achievement?” The levels and expected shifts discussed in this report relate to the e-asTTle levels and shifts. The points referred to come from the scores achieved by students in the assessment.

The average of an assessment can be calculated from all the students’ scores and can also be used to help calculate an effect size¹⁸. The national expected level referred to in this report is the e-asTTle expected level for all students. The point score shifts are calculated from the national norms published in 2010 (See Appendix H and I). The norms differ across year groups (Year 4 to Year 12), curriculum areas (reading, writing and mathematics) and the calendar year. In this study the norms and point score shift come from the first quarter in the year which corresponds to the study period, and from the Year 7, 8 and 9 e-asTTle Norms and Curriculum Expectations by Quarter in reading and mathematics. The point score shifts vary for each year group and subject and were calculated by finding the difference between the 1st and 2nd quarter mean scores. A point score shift which exceeded the difference between the two mean scores was considered to be demonstrating accelerated progress.

Hattie (2009d) stated that one of the benefits of using an effect-size measurement was that it was reasonably independent of the socio-economic status of students so that all learners could achieve a year’s growth regardless of their starting point. Hattie (2009d) showed that an average effect-size growth per year was “ $d = 0.40$ ”¹⁹ (p. 16).

¹⁸ Effect size is a simple measure for quantifying the difference between two groups or the same group over time, on a common scale. Effect size enables us to measure both the improvement (gain) in learner achievement for a group of learners AND the variation of student performances expressed on a standardised scale.

¹⁹ An effect size of $d = 0.4$ can be achieved over a shorter timeframe in the classroom, usually when a one-off unit of work is taught and assessed (that will not be revisited that year) rather than through on-going teaching of processes and strategies.

Effect sizes are not a linear measure; they are a measure of the effect of an intervention. However, as can be seen in Hattie's comment above, effect size growth is linked to a time period; in this case, a year. A minimum of eight to twelve weeks is needed to show effects, if any, to be detected using effect sizes (Hattie, 2009d). As the time frame of the study was three months (or a quarter of a year), the research period met this requirement.

Based on the average effect-size growth over one year being " $d = 0.40$ ", the researcher has calculated the average effect-size growth for the quarter as " $d = 0.10$ ". The researcher has come to this conclusion by assuming existing trends apply when inferring unknown values from known data. This decision was made in an effort to solve the issue arising when making a determination of the magnitude of the effect and providing a verbal description of said effect. An effect size of $d = 0.10$ for the year would usually be described as small. However, when comparing the effect size data with the normed expected point shift results, the effect for the quarter actually met the expected shift and therefore should more accurately be described as an average result (as shown on Figure 6). Therefore, throughout this report, the verbal descriptions of the magnitude of the effect size are based on an average effect size growth for the quarter being " $d = 0.10$ ".

In interpreting the standard deviation²⁰ a $SD \geq 1$ was taken as an indicator of a relatively high variation while a $SD < 1$ was considered low. All assessment data show high standard deviation indicating a wide spread of results. These higher values indicate the results have a low likelihood of being repeatable. A more precise (repeatable) result because of a lower standard deviation would have been desirable. When considering the data by ethnicity, the results for New Zealand European students and students of other ethnicity should be treated with caution as in the study school they are both minority groups and their results often come from only a few students.

Analysis of Reading Data – Year 7, 8 and 9

The following procedure was used to analyse the reading data gathered from the assessments in e-asTTle. To determine average point score shifts the following calculations were carried out in EXCEL for Year 7, 8 and 9 students.

²⁰ SD = standard deviation / mean

1. Individual student scores were calculated by subtracting each student's beginning of the year e-asTTle score from their mid-year e-asTTle score. This produced a point score shift for each student.
2. The individual student's shift scores were averaged by dividing the total by the number of participating students. This produced a group mean student shift score to compare against the national shift score.
3. To double check for accuracy student beginning of the year (BoY) and mid-year (MidY) scores were totalled and then the BoY and MidY totals were subtracted to determine a point score shift. This total sum was then divided by the number of participating students producing a mean student shift score. The resulting mean student shift score was compared to the mean student shift score from the individual student calculations. In all cases the two mean student shift scores were identical.
4. To determine if the pre and post tests were significantly different from each other a one tailed t-test on SPSS was used. Standard deviation and standard error mean were calculated on SPSS using the frequencies procedure. Paired sample correlations were made and the average difference between the pro and post tests were calculated. There was a 95% confidence interval of the difference.
5. Effect size calculations which measured the difference between means were carried out manually using EXCEL as well as inputting mean and standard deviation data from the paired samples data from SPSS into an effect size calculator to ensure the calculations of Cohen's *d* were accurate (See Appendix J). However, Cohen's *d* verbal description of effect size was not used, instead a value of $d = 0.075$ for a small effect, $d = 0.10$ for an average effect and $d = 0.15$ for a large effect (for the quarter) were used based on Hattie's effect sizes as discussed previously²¹.

Year 7 Reading Assessment Results

The Year 7 sample group comprised 50 students. Data were analysed to show average point score shifts. These were compared to the expected mean shifts as shown on the e-asTTle norms and curriculum expectations by quarter table for reading (See Appendix H).

²¹ Hattie (2009) for educational outcomes uses these effects sizes: $d = 0.2$ is small, $d = 0.4$ is medium and $d = 0.6$ is large.

The students' progress in their reading from Term One to Term Two was slightly higher than the expected national shift score of 6 for that quarter by one point (7). The extent of the score shift varied by both gender and ethnicity. Year 7 males achieved a mean score shift (11) that was almost four times greater (as seen in Figure 4) than the females (3).

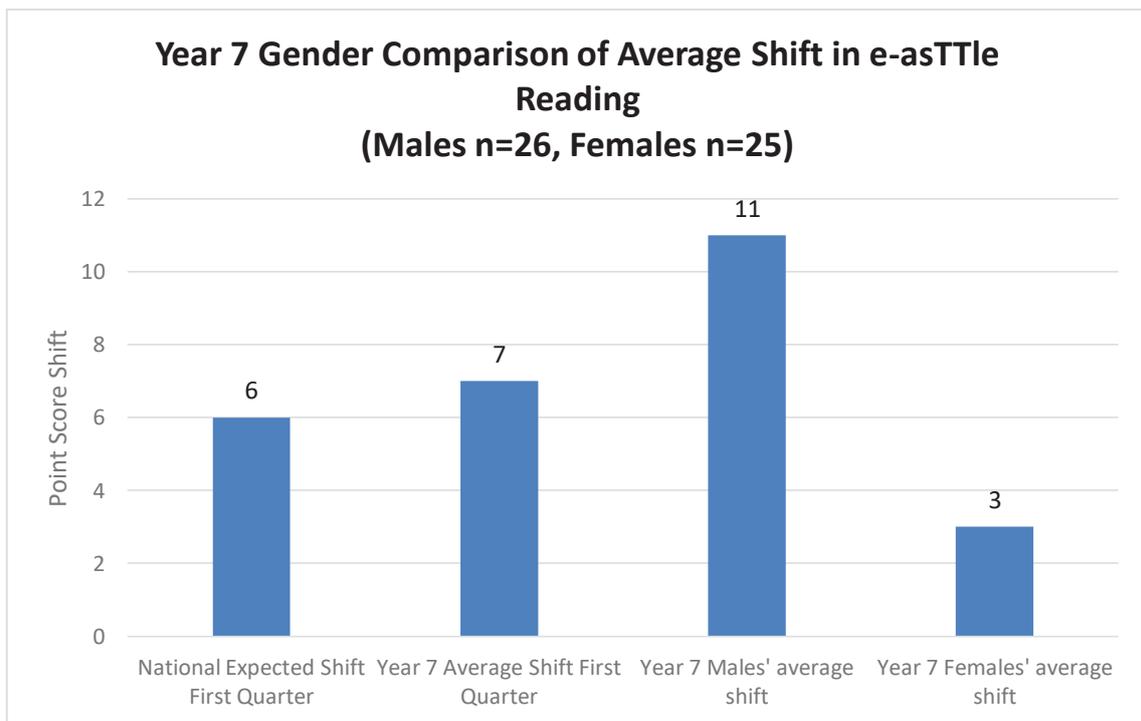
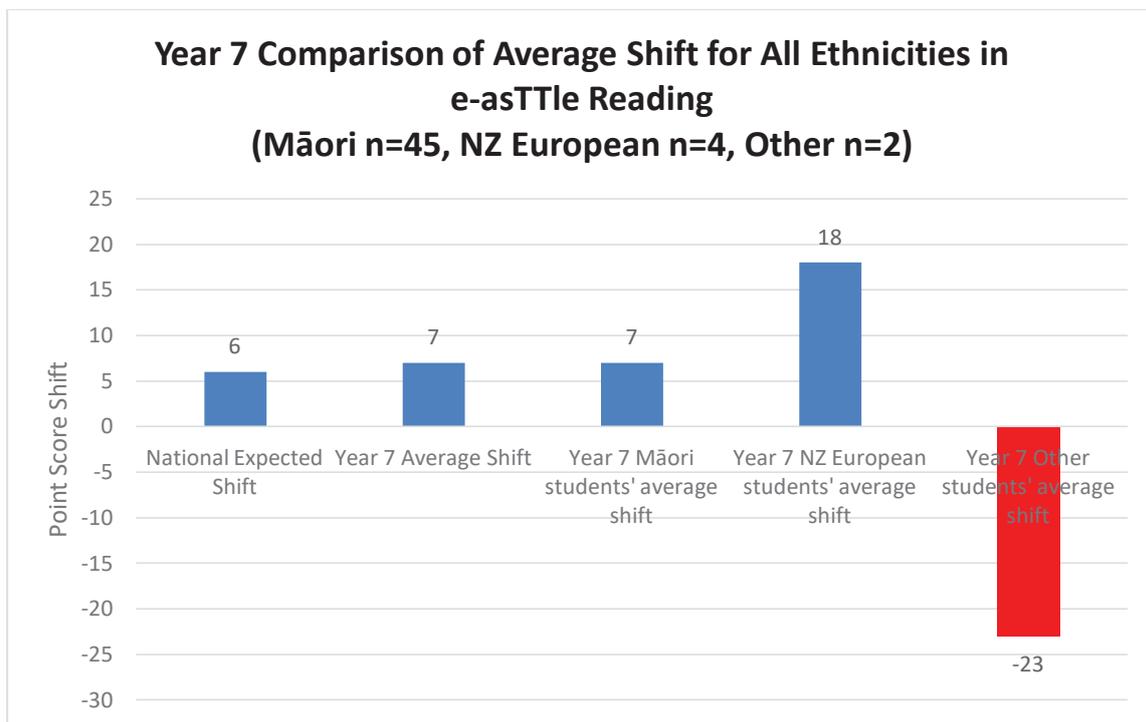


Figure 4: Year 7 average point score shift in reading by gender

Māori students achieved one point higher than the national expected score shift (7) compared to New Zealand Europeans (NZE) who achieved a mean score shift three times higher than the national score shift (18) as seen in Figure 5.

Figure 5: Year 7 average point score shift in reading by ethnicity



From the Year 7 pre and post reading assessment results it can be said:

- The Year 7 effect size of $d = 0.12$ was indicative of an average effect for the quarter.
- A Pearson product-moment correlation coefficient was computed to assess the relationship between the Year 7 reading pre test results and the Year 7 post test results. There was a positive correlation between the two variables, $r = 0.690$, $n = 51$, $p = 0.000$.
- A paired-samples t-test was conducted to compare the Year 7 reading pre test results and the Year 7 post test results. There was not a significant difference in the scores for the Year 7 reading pre test results ($M = 1354.20$, $SD = 54.57$) and the Year 7 post test results ($M = 1361.00$, $SD = 57.05$) conditions; $t(50) = -1.11$, $p = 0.274$.
- On average, the Y7 post test reading scores were 7 points higher than the Y7 pre test reading scores. The Confidence Interval has zero in it, indicating that the difference was not statistically significant (95% $CI [-5.56, 19.20]$).

Year 8 Reading Assessment Results

The Year 8 sample group comprised 40 students. Data were analysed to show average point score shifts. These were compared to the expected mean shifts as shown on the e-asTTle norms and curriculum expectations by quarter table for reading (See Appendix H).

Year 8 showed progress with a mean score shift of 27 points against the national mean point score shift of 12. This equated to an effect size of $d = 0.44$ ²² for the Year 8 group, which indicated a large effect size²³ (as seen in Figure 6), demonstrating 12 month's growth achieved over one term.

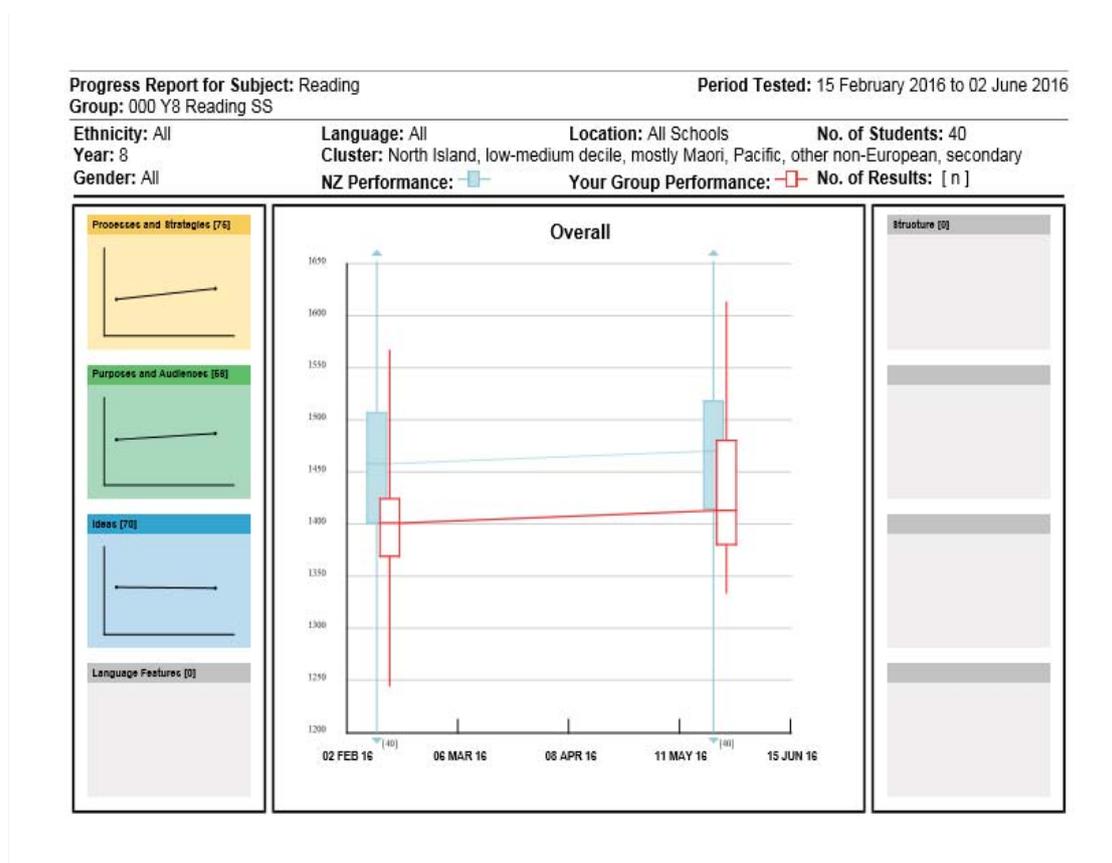


Figure 6: Year 8 rate of progress in reading as compared to Year 8 results from similar schools

²² Over a quarter (three months), less than 0.075 is a small effect, 0.075 – 0.15 is a medium effect and more than 0.15 is a large effect (Hattie, 2009).

²³ Hattie (2009), in his analysis of hundreds of international and national educational interventions and data, determined that for students moving from one year to the next, the medium effect size across all students is 0.40 over 12 months which equates to 0.10 over three months.

The score shift again varied by gender and ethnicity. Year 8 boys achieved a bigger score shift (30) than the girls (23) compared to the national average shift as seen in Figure 7.

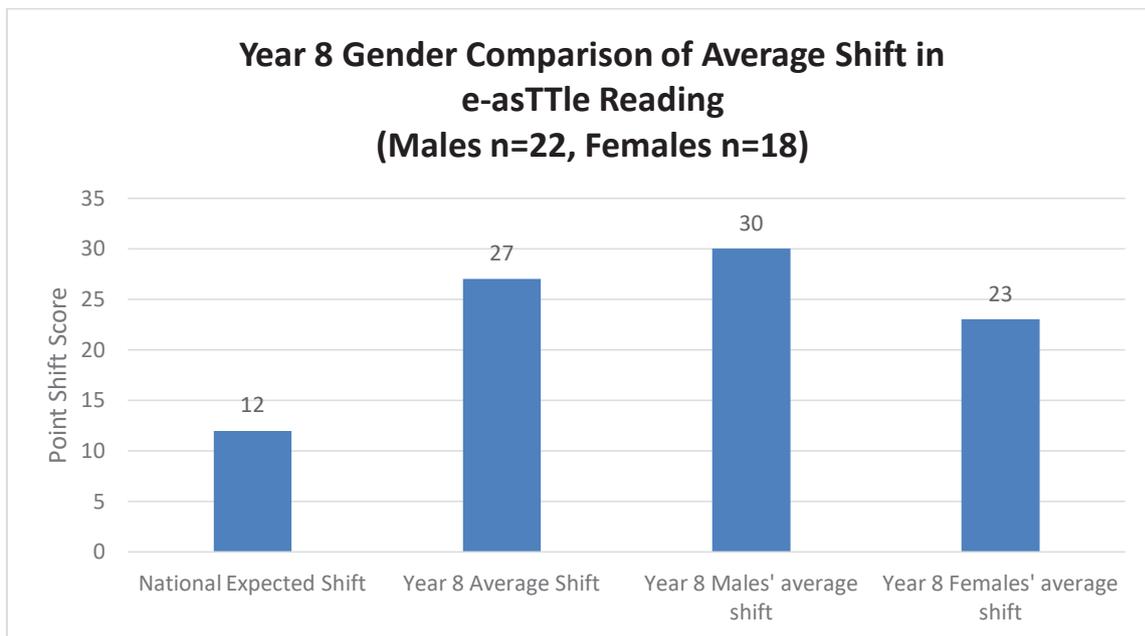


Figure 7: Year 8 average point score shift in reading by gender

Māori students achieved a rate of shift that was over three times higher than NZE students as seen in Figure 8.

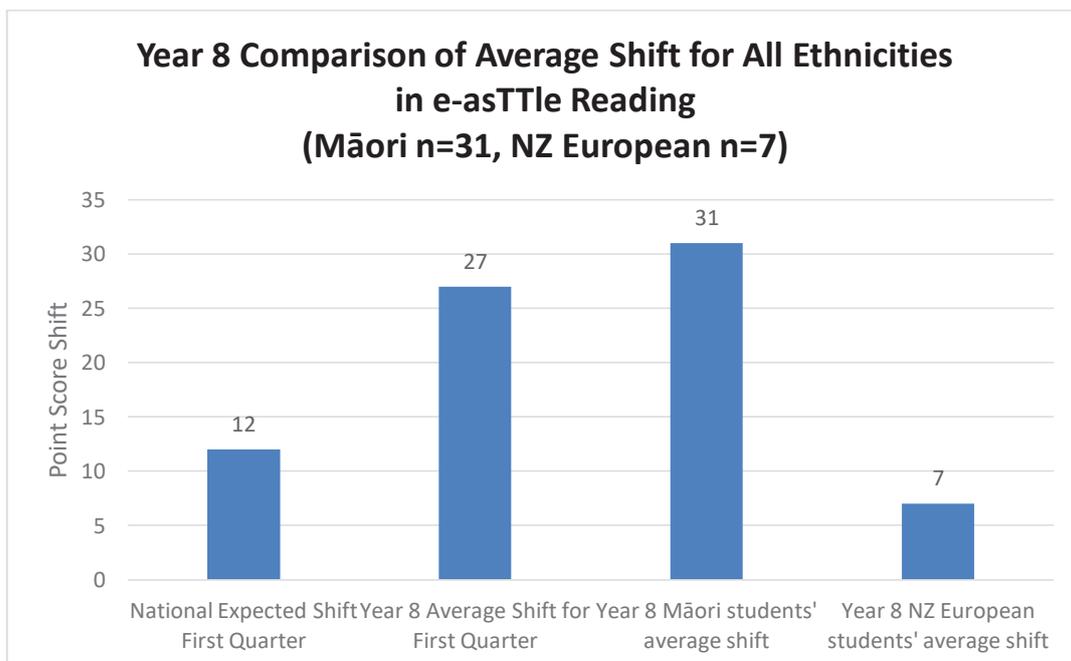


Figure 8: Year 8 average point score shift in reading by ethnicity

From the Year 8 pre and post reading assessment results it can be said:

- A Pearson product-moment correlation coefficient was computed to assess the relationship between the Year 8 reading pre test results and the Year 8 post test results. There was a positive correlation between the two variables, $r = 0.688$, $n = 40$, $p = 0.000$.
- A paired-samples t-test was conducted to compare the Year 8 reading pre test results and the Year 8 post test results. There was a significant difference in the scores for the Year 8 reading pre test results ($M = 1399.80$, $SD = 58.35$) and the Year 8 post test results ($M = 1426.40$, $SD = 60.99$) conditions; $t(39) = -3.56$, $p = 0.001$.
- On average, the Y8 post test reading scores were 27 points higher than the Y8 pre test reading scores. The Confidence Interval was statistically significant (95% CI [11.51, 41.68]).

Year 9 Reading Assessment Results

The Year 9 sample group comprised 33 students. The total Year 9 student group consisted of 70 students at mid-year. Cleaning of the data by removing the results of students who had completed only one assessment reduced the number of eligible students to 45.

At this stage the researcher identified an anomaly with the data involving twelve students whose results did not stand up to scrutiny. The students all showed an improvement from Level 2 to Level 4. This group were all special needs learners and had the assistance of a teacher aide during the assessment. After seeking clarification about the circumstances of the assessment and likelihood that the results were a fair and reasonable reflection of the students' knowledge and ability, a decision was made to exclude the data from the study on the grounds that it was untrue and would skew the results for the whole sample group. This action resulted in the final number of students for the study group being effectively less than half the students (33/70) in this year group. However, the number of students was still greater than the number accepted as a small sample (30) in e-asTTle. Having to collect data from a smaller group is a factor that by itself does not undermine the validity of the analysis.

However, the makeup of the resultant group was a concerning factor, and this is discussed further in the next chapter. Data were analysed to show average point score shifts. These were compared to the expected mean shifts as shown on the e-asTTle norms and curriculum expectations by quarter table for reading (See Appendix H).

The national expected shift for Year 9 is two point scores for the first quarter and 22 points for the entire Year 9. The curriculum levels tested were Levels 3, 4 and 5. The average point score shift for the Year 9 students was an extraordinary 53 mean point score. This is over twenty-six times the national expected shift. This equated to an effect size of $d = 1.06$ which exceeds not only the criteria for a large effect over a quarter ($d \geq 0.15$) but also over a year ($d \geq 0.80$). The extent of the score shift varied by both gender and ethnicity. The Year 9 boys had an average score shift (58) that exceeded the Year 9 mean point shift (53) and the Year 9 girls (46) as seen in Figure 9.

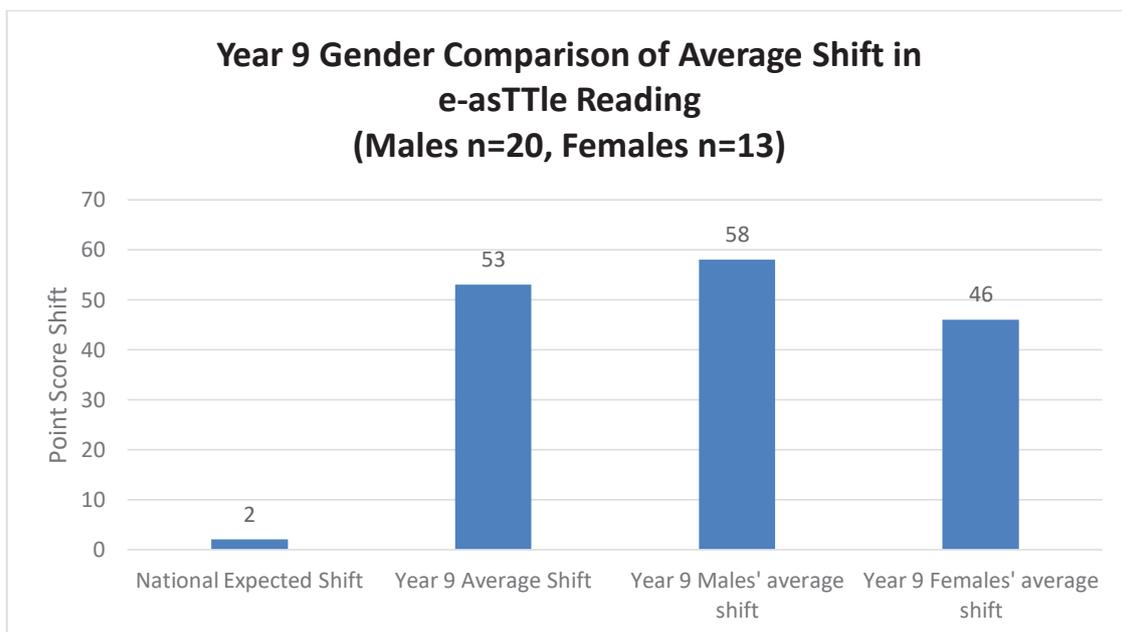


Figure 9: Year 9 average point score shift in reading by gender

The point shift for Māori students (55) was slightly less than the average score shift and below the NZ European mean point shift (88) as seen below in Figure 10.

As stated previously, when considering data by ethnicity for New Zealand European students and students of other ethnicity at the study school, the results should be treated with caution as their results often come from only a few students.

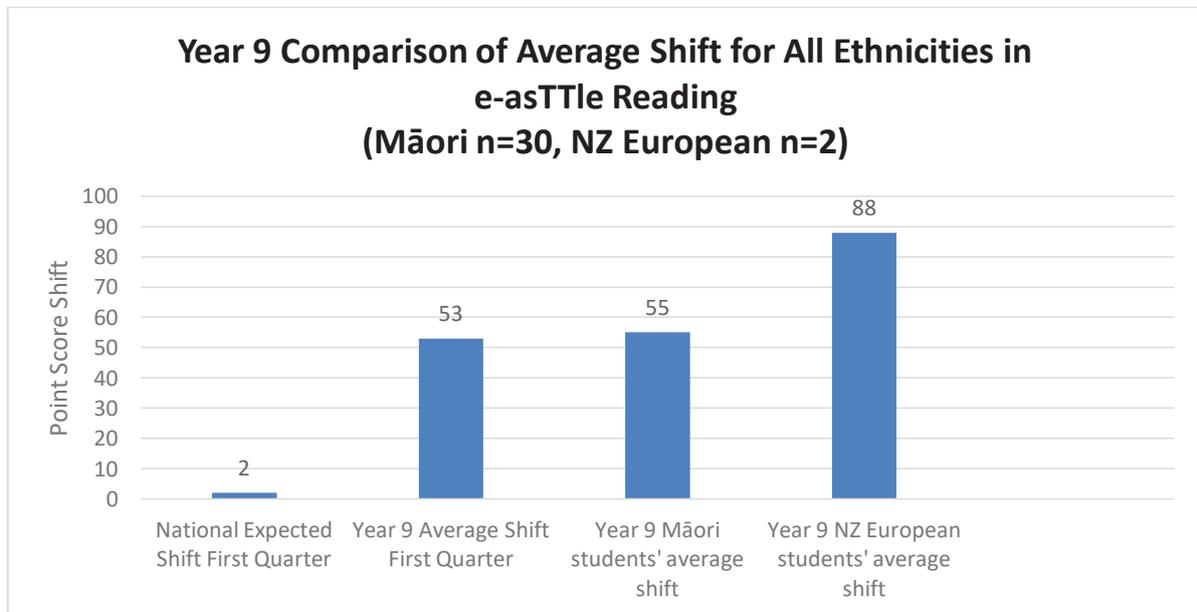


Figure 10: Year 9 average point score shift in reading by ethnicity

From the Year 9 pre and post reading assessment results it can be said:

- A Pearson product-moment correlation coefficient was computed to assess the relationship between the Year 9 reading pre test results and the Year 9 post test results. There was a positive correlation between the two variables, $r = 0.536$, $n = 33$, $p = 0.001$.
- A paired-samples t-test was conducted to compare the Year 9 reading pre test results and the Year 9 post test results. There was a significant difference in the scores for the Year 9 reading pre test results ($M = 1414.70$, $SD = 56.63$) and the Year 9 post test results ($M = 1467.90$, $SD = 42.01$) conditions; $t(32) = -6.21$, $p = 0.000$.
- On average, the Y9 post test reading scores were 53 points higher than the Y9 pre test reading scores. The Confidence Interval was statistically significant (95% CI [35.75, 70.66]).

Overall summary of Year 7, 8 and 9 reading data

A review of the Year 7,8 and 9 data compared to national data for similar schools showed that although all year groups made progress over the quarter, overall, the students were performing at a lower level.

As shown in Figure 11, almost all the students' results at the end of the study period either matched or were lower than the lower quartile results of similar schools. While over half of the Year 8 students matched the national lower quartile results, some students achieved higher than the national mean, the only year group to do so.

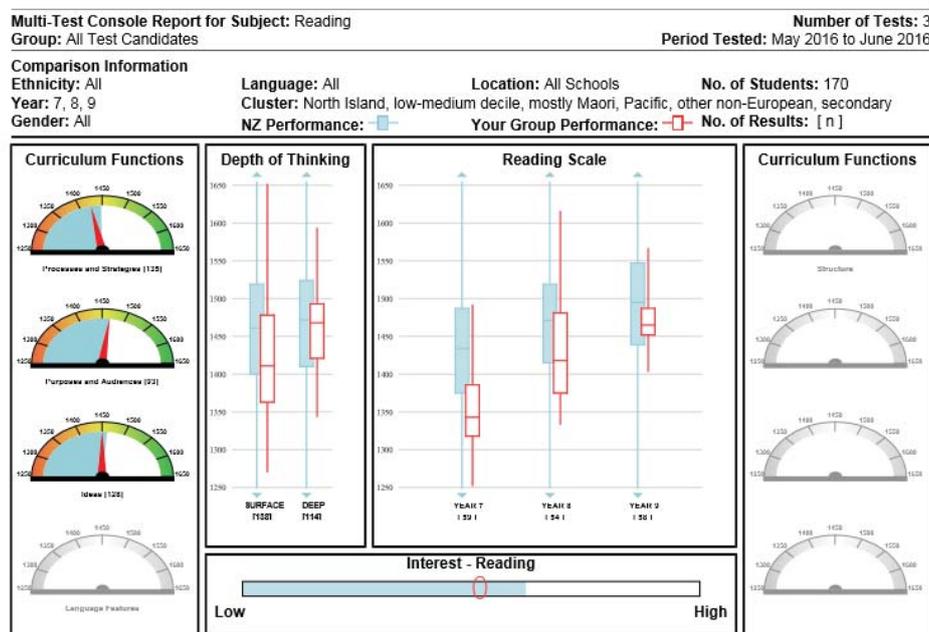


Figure 11: Study School Year 7, 8 and 9 achievement in reading compared to Year 7, 8 and 9 results from similar schools for the quarter

A summary of Year 7, 8 and 9 average shift scores in reading compared to the national mean shift scores show not only accelerated progress but an unexpected variation of progress across the year levels (as shown below in Figure 12) which will be discussed in the next chapter.

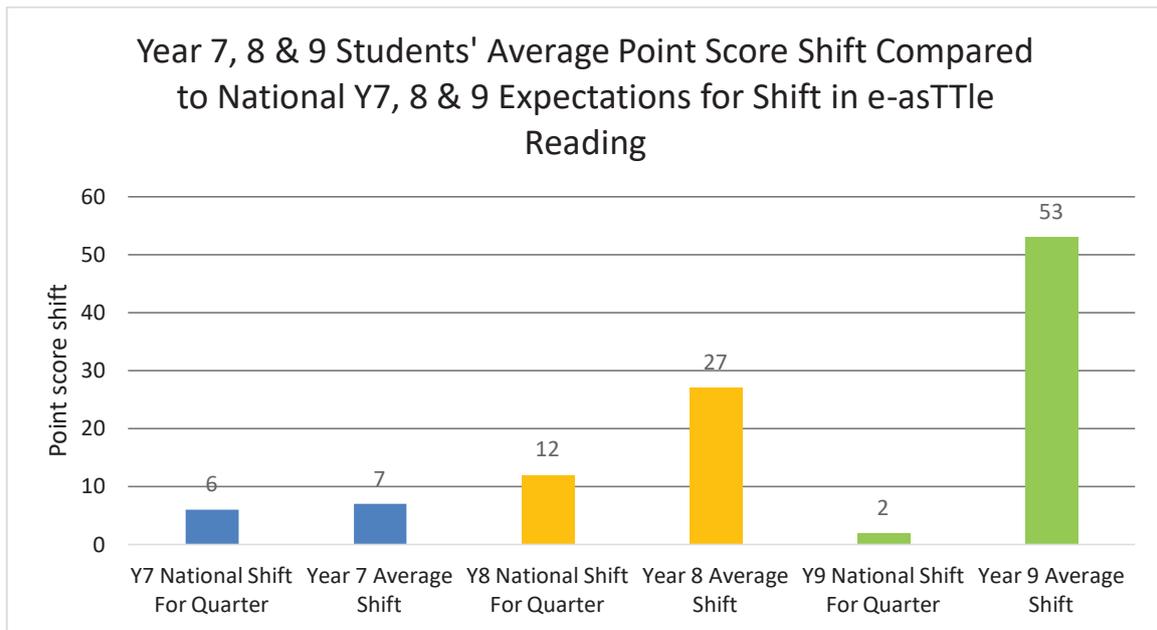


Figure 12: Comparison of Year 7, 8 and 9 national average point score shifts and the average point score shifts for the study school in reading

Analysis of Mathematics Data – Year 7, 8 and 9

The procedure used to analyse the mathematics assessment data was the same procedure used to analyse the reading data, explained in detail earlier. The mathematics data for year 7,8 and 9 were analysed to show average point shifts to allow comparison against the e-asTTle expected mean shifts (See Appendix I). Effect sizes were also calculated from the data.

Year 7 Mathematics Assessment Results

The Year 7 sample group comprised 53 students. Data were analysed to show average point score shifts. These were compared to the expected mean shifts as shown on the e-asTTle norms and curriculum expectations by quarter table for mathematics (See Appendix I).

The national expectation for shift in the first quarter for mathematics at Year 7 was a 7 point score. The sample group's point score shift was one point (1), significantly less than was expected. The extent of the shift varied by ethnicity and gender.

Results for the boys' mean point score (16) was considerably different to the average point score achieved by the girls (-20). Whereas it is generally accepted that a particularly low score can greatly reduce the average of a group, a large number of students with higher scores should have a greater impact on the average score. From the data, it seems that the larger population of boys with an average score shift nine points above expectation could not mitigate against the effect of the girls' result with an average score shift twenty seven points below expectation as shown on Figure 13 below. The negative result will be considered and discussed later in the report.

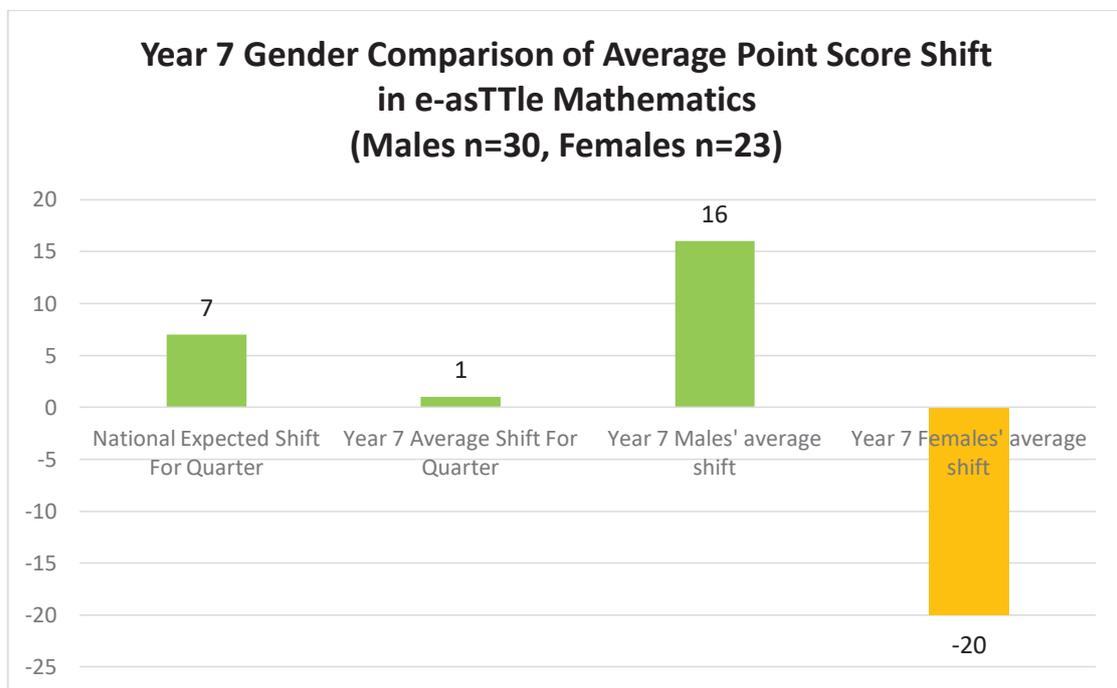


Figure 13. Year 7 average point score shift in mathematics by gender

Analysis of the data by ethnicity showed Māori students achieved an average point score shift of 6, one point below expectations in Year 7 mathematics. NZ European students' average point score was 4 and other ethnicities' mean point score was 2 (as seen in Figure 14 below). Again, when viewing data by ethnicity for New Zealand European students and students of other ethnicity at the study school, the results should be treated with caution as the results come from only a few students and are unlikely to be representative.

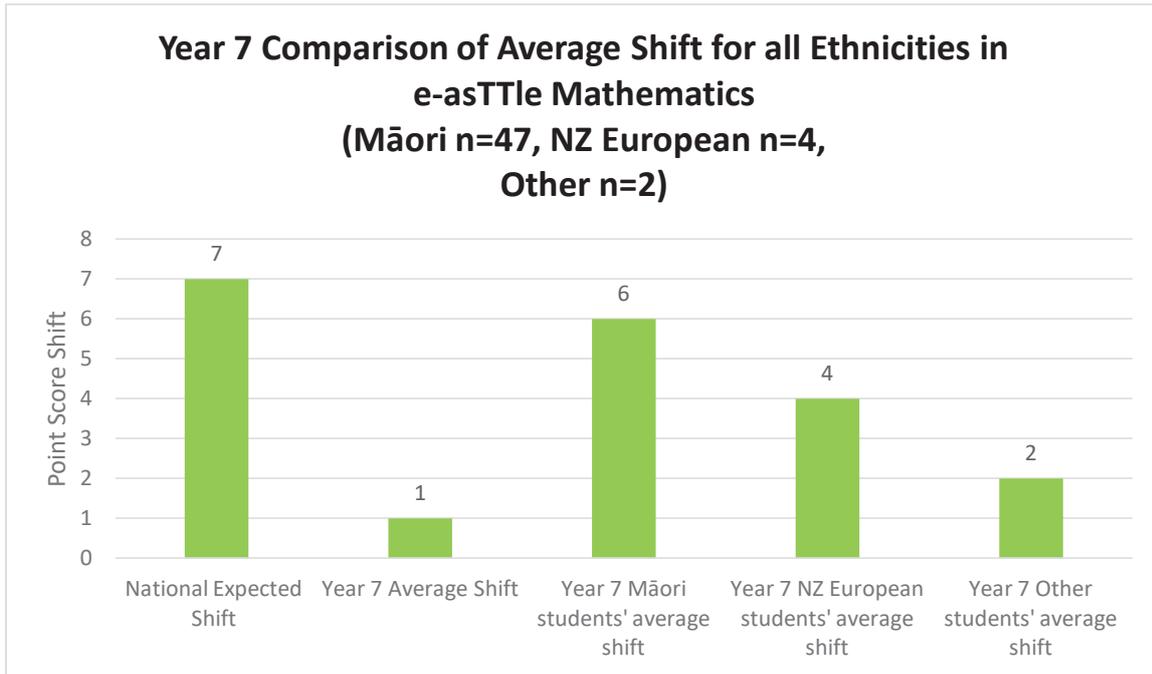


Figure 14. Year 7 average point score shift in mathematics by ethnicity

From the Year 7 pre and post mathematics assessment results it can be said:

- The Year 7 effect size of $d = 0.007$ for the quarter was so small it can be considered negligible.
- A Pearson product-moment correlation coefficient was computed to assess the relationship between the Year 7 mathematics pre test results and the Year 7 post test results. There was a positive correlation between the two variables, $r = 0.982$, $n = 53$, $p = 0.000$.
- A paired-samples t-test was conducted to compare the Year 7 mathematics pre test results and the Year 7 post test results. There was not a significant difference in the scores for the Year 7 mathematic pre test results ($M = 1390.60$, $SD = 58.95$) and the Year 7 post test results ($M = 1391.00$, $SD = 64.63$) conditions; $t(52) = -0.26$, $p = 0.791$.
- On average, the Y7 post test mathematic scores were 1 point higher than the Y7 pre test mathematic scores. The Confidence Interval has zero in it, indicating that the difference was not statistically significant (95% $CI [-3.08, 4.03]$).

Year 8 Mathematics Assessment Results

The Year 8 sample group comprised 43 students. Data were analysed to show average point score shifts. These were compared to the expected mean shifts as shown on the e-asTTle norms and curriculum expectations by quarter table for mathematics (See Appendix I).

The national expected shift for Year 8 mathematics was 9. The average point shift for Year 8 students was 20, more than twice the expected shift in one term. The effect size was $d = 0.29$ which usually equates to 9 month's growth across a 12-month period, but was achieved in Year 8 over one quarter, three times greater than expected. The score shift variation for the year 8 boys and girls was also quite large. The girls achieved a score shift (29) three times greater than the boys (9), outperforming the boys as seen in Figure 15.

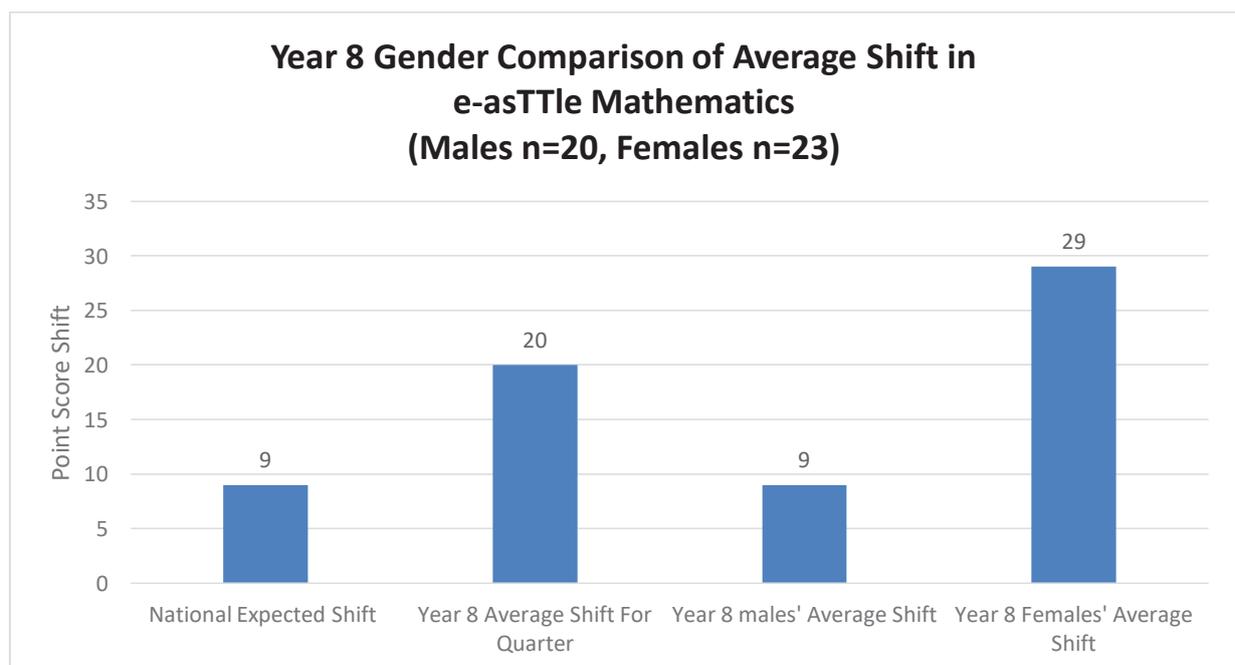


Figure 15. Year 8 average score shift in mathematics by gender

In Year 8 mathematics Māori students achieved a bigger mean point score shift (22) than all other Year 8 ethnicities within the school and twice as much as the national expected shift of 9. NZ European students achieving an average point score shift of 13, achieving above the national quarterly shift as seen below in Figure 16.

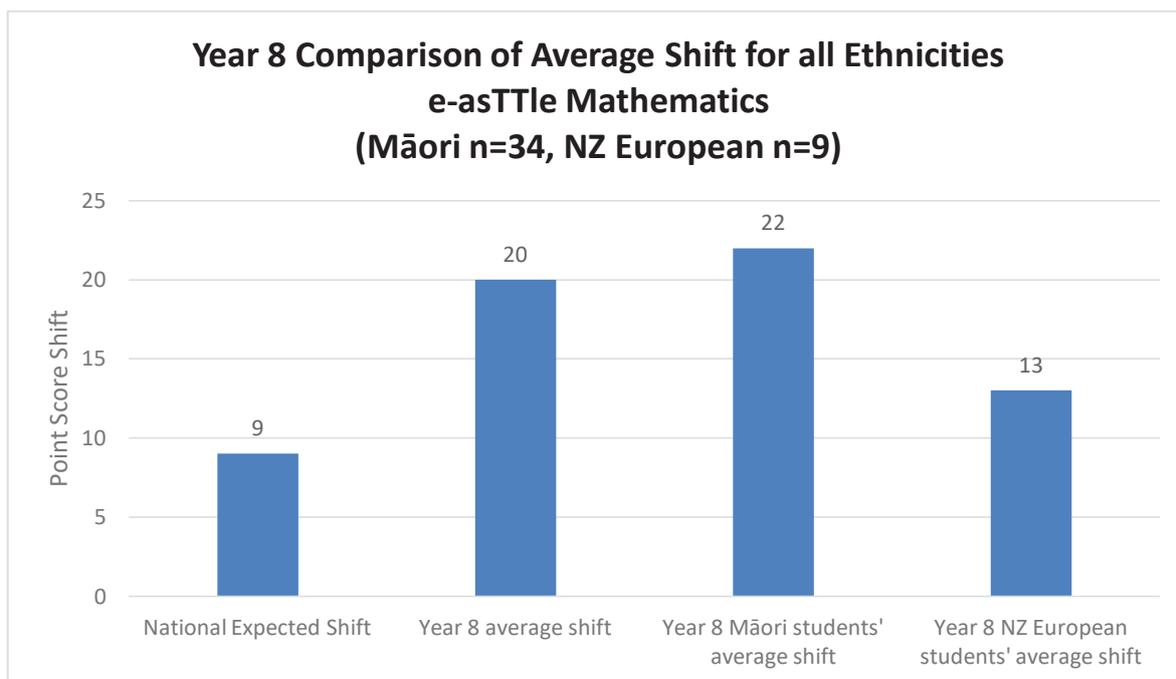


Figure 16. Year 8 average score shift in mathematics by ethnicity

From the Year 8 pre and post mathematics assessment results it can be said:

- A Pearson product-moment correlation coefficient was computed to assess the relationship between the Year 8 mathematic pre test results and the Year 8 post test results. There was a positive correlation between the two variables, $r = 0.709$, $n = 43$, $p = 0.000$.
- A paired-samples t-test was conducted to compare the Year 8 mathematic pre test results and the Year 8 post test results. There was a significant difference in the scores for the Year 8 mathematic pre test results ($M = 1425.80$, $SD = 66.45$) and the Year 8 post test results ($M = 1445.60$, $SD = 67.07$) conditions; $t(42) = -2.55$, $p = 0.015$.
- On average, the Y8 post test mathematic scores were 20 points higher than the Y8 pre test mathematic scores. The Confidence Interval was statistically significant (95% $CI [4.11, 35.46]$).

Year 9 Mathematics Assessment Results

The Year 9 mathematics sample group comprised 53 students. This figure is larger than the sample group for reading for two reasons.

Firstly, the students whose data was excluded in reading did not have the same issue in mathematics and secondly, a larger number of students had been at school and completed both the BoY and MidY mathematics assessments. Data were analysed to show average point score shifts. These were compared to the expected mean shifts as shown on the e-asTTle norms and curriculum expectations by quarter table for mathematics (See Appendix I).

The national average score point shift was 5 and the Year 9 mean score point shift was almost three times this at 14. Again, there were significant variations in results according to ethnicity and gender. Analysis of the Year 9 data by gender (as seen in Figure 17), showed the girls achieved a mean point shift of 20 (four times the national expected shift) which was approximately twice that of the boys.

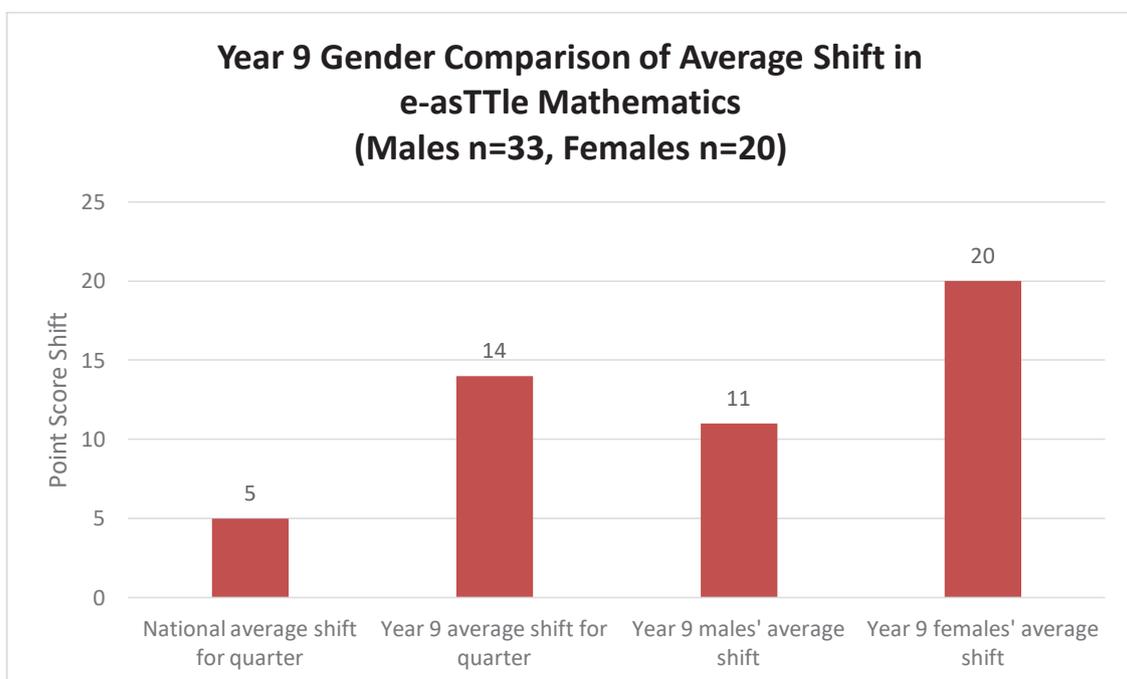


Figure 17: Year 9 average score shift in mathematics by gender

In Year 9 mathematics the non-Māori students performed poorly (NZE, -1, Other, -16) compared to the Māori students' average point shift of 15, three times that of the national expected shift as seen on Figure 18.

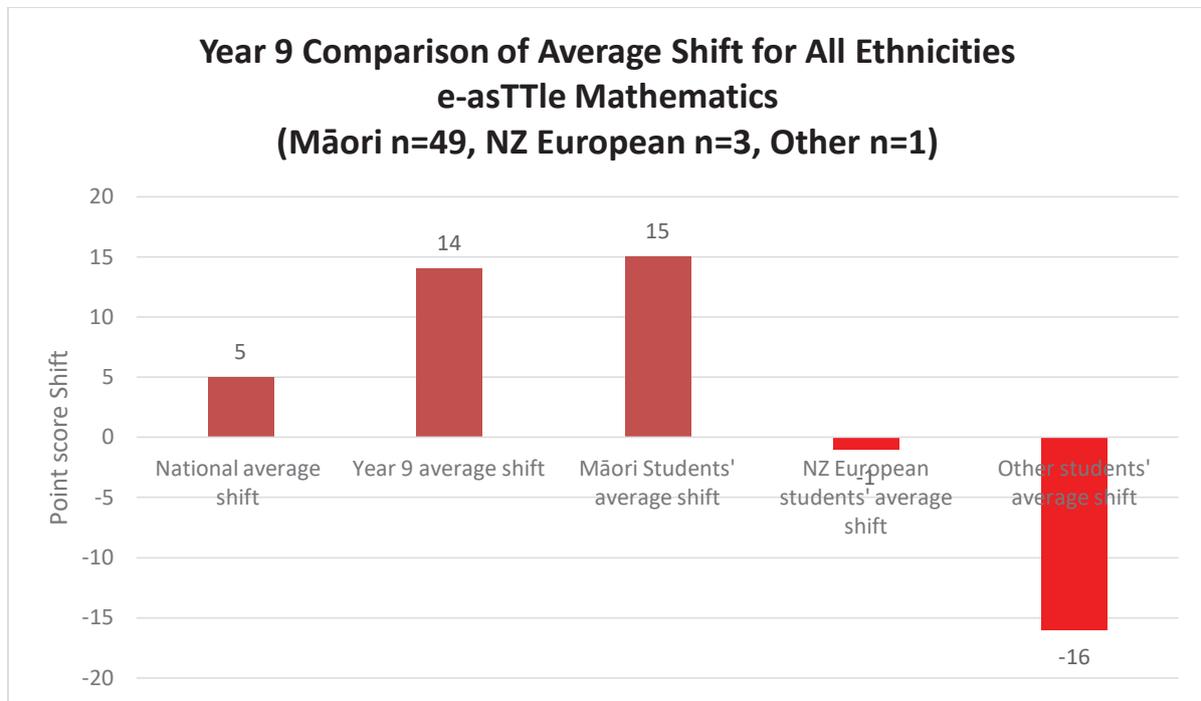


Figure 18: Year 9 average score shift in mathematics by ethnicity

From the Year 9 pre and post mathematics assessment results it can be said:

- The Year 9 effect size of $d = 0.20$ can be considered large. It is greater than $d = 0.15$ which illustrates a large effect for the quarter and shows students achieved six months' growth in that time.
- A Pearson product-moment correlation coefficient was computed to assess the relationship between the Year 9 mathematic pre test results and the Year 9 post test results. There was a positive correlation between the two variables, $r = 0.973$, $n = 53$, $p = 0.000$.
- A paired-samples t-test was conducted to compare the Year 9 mathematic pre test results and the Year 9 post test results. There was a significant difference in the scores for the Year 9 mathematic pre test results ($M = 1453.50$, $SD = 48.66$) and the Year 9 post test results ($M = 1467.50$, $SD = 52.38$) conditions; $t(52) = -8.31$, $p = 0.000$.

- On average, the Y9 post test mathematic scores were 14 points higher than the Y9 pre test mathematic scores. The Confidence Interval was statistically significant (95% CI [10.61, 17.38]).

Overall summary of Year 7, 8 and 9 mathematics data

A review of the Year 7, 8 and 9 data in mathematics showed that all year groups made progress over the quarter. However, compared to national data for all schools like the study school the students were all performing at a much lower level than similar schools.

Overall all the students in the top quartile for the study school were achieving at the commensurate level of the bottom of the national lower quartile spread. The study school mean for each year group were well below the lower quartile of the matching year group data as shown in Figure 19.

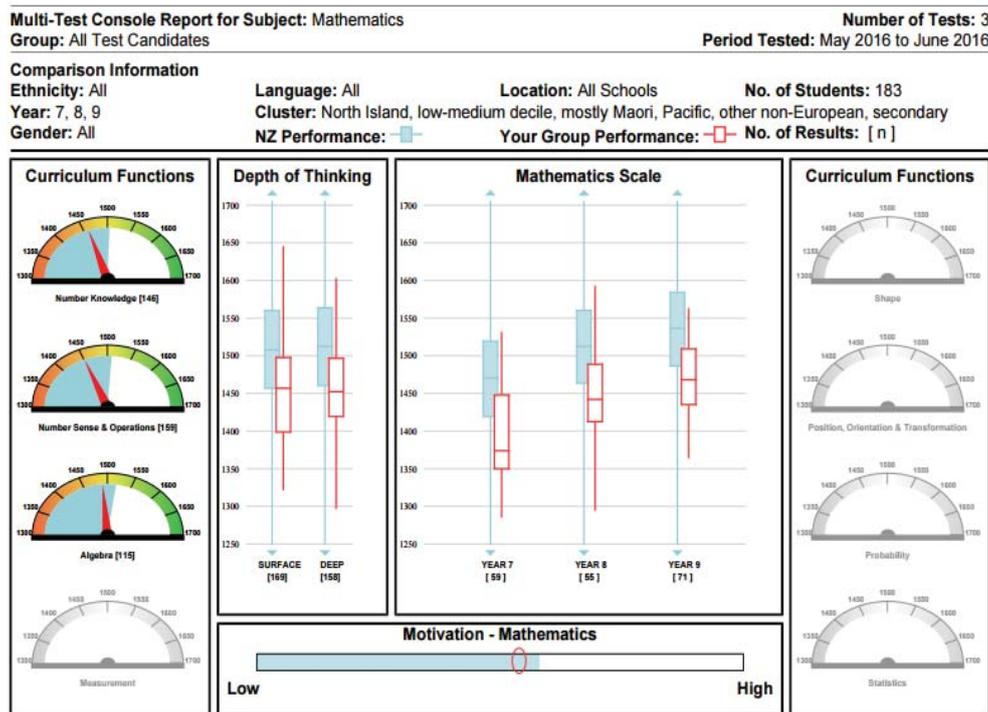


Figure 19: Study School Year 7, 8 and 9 achievements in mathematics compared to Year 7, 8 and 9 results from similar schools for the quarter

A summary of Year 7, 8 and 9 average shift scores in mathematics compared to the national mean shift scores show pleasing progress for only Year 8 and 9 (as seen below in Figure 20). These results will be discussed in the next chapter.

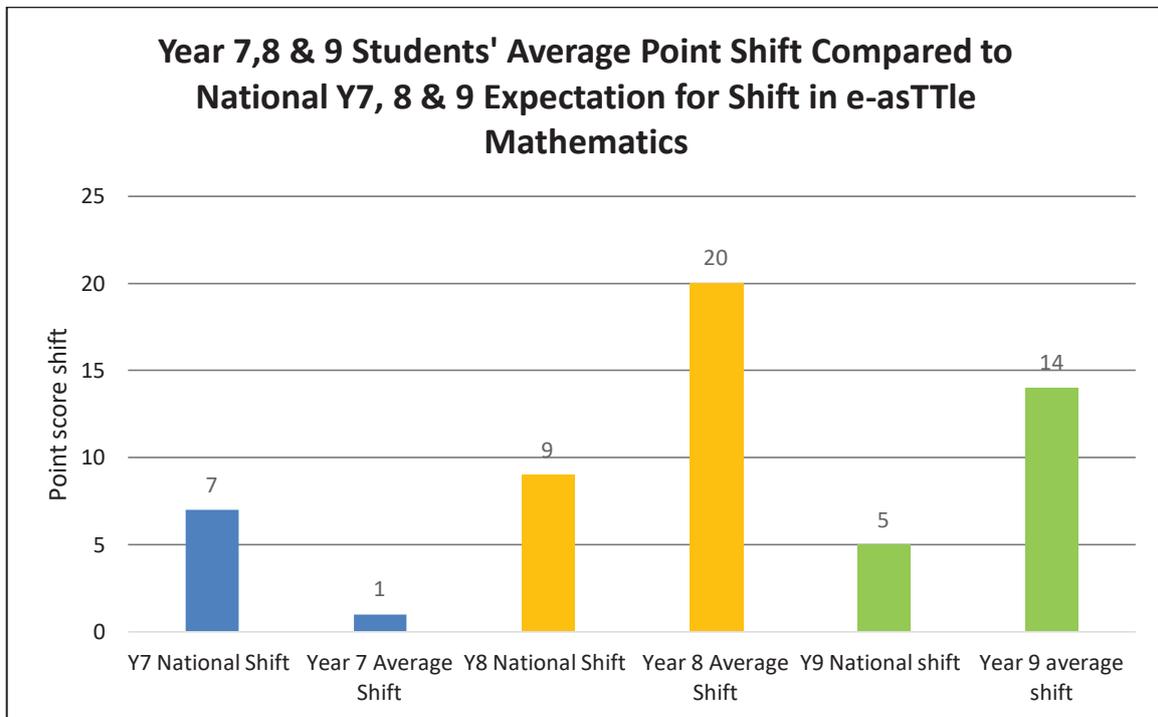


Figure 20: Comparison of Year 7, 8 and 9 national average point score shifts and the average point score shifts for the study school in mathematics

The following chapter is a discussion of the results presented in this section. These results will be interpreted and used to describe the significance of the study's findings. The findings will be compared to current research conclusions and any new insights will be explained.

5. DISCUSSION

INTRODUCTION

The purpose of this study was to determine the relationship between the introduction of the formative assessment e-asTTle tool on teacher practice and Māori student achievement in low socio-economic schools and thereby provide an answer to the research question “How does the introduction and use of the e-asTTle tool into a low decile school affect classroom practice and student achievement?” This study focused on the teachers of Year 7, 8 and 9 students and the progress of those students in the curriculum areas of reading and mathematics. The study was set up to examine whether student achievement would be accelerated through a change in teaching practice to incorporate more formative assessment practices through teachers learning to use the e-asTTle programme effectively.

The first part of this chapter asks the question “What other factors could have had an impact on student progress and achievement?” and considers the likelihood and possible impact the identified factors could have had.

The second part discusses the introduction of the e-asTTle assessment tool and considers whether the evidence collected during the study supports the proposal that some teachers changed the way they taught and either started or increased their use of formative teaching practices in the classroom.

The third part of the chapter considers the reading data gathered from students’ e-asTTle pre and post test results to identify if there was an increase in student achievement, and if so, to what extent.

The fourth part of the chapter will consider the mathematics data gathered from the pre and post e-asTTle assessments and will seek to identify if an increase in student achievement has occurred and to what extent.

Throughout the chapter the discussion of results will be linked to the available literature, introduced in the literature review, to critically evaluate the value and worth of the findings in light of current knowledge. Information gathered from the results of this study can assist the study school to explore the findings and consider implications for future research to find ways to improve student academic achievement.

IMPACT OF OTHER FACTORS ON STUDENT PROGRESS

What other factors may have impacted on student progress?

There are a number of factors that could possibly have had some impact on student achievement over the study period. For most of these factors the effect, if any, would have been a negative and lessened the rate of progress. The impact of the students coming from a low socio-economic background was discussed in the previous chapter, as was the tentative link made to the possible impact of transitioning from primary to secondary school on Year 7 learning. Significant changes in the learning environment for the students during the time of the study was another variable. Teachers and students were no longer in single cell classroom. Instead the whole school was divided between two large Whare Ako²⁴ comprised of three large open plan learning commons in each.

How much of an impact could these factors have had on student progress?

While studies consistently showed improvements in the quality of physical spaces (light, sound, temperature) improved educational outcomes and although there was some evidence to show student achievement increased following a rebuild; there was no consistent evidence that the use of open learning spaces made any positive difference to student achievement (Ministry of Education, n.d.(b); Wilson, 2015). Hattie's (2009d) research on effect sizes shows class environment has a minor role in raising student achievement. It is therefore unlikely that the improvement in student learning can be attributed to the change of learning environment.

With the innovative learning environments came the expectation that the teaching practice would also change to be innovative, future-focused and transformative. Such expectations raised concerns that proven effective pedagogies were being discarded for "new ideological practices based on what a 21st Century Learner might potentially benefit from" (Wilson, 2015, p. 5). Hattie (2003) came to a similar conclusion, stating that "decisions about the adoption of new teaching programmes ... are hardly ever made on the basis of scientific evidence about their effectiveness" (p. 12).

²⁴ Houses of Learning

Teacher responses to the survey provide evidence that for some teachers effective teaching practices prevailed and they continued to use formative assessment practices and targeted teaching.

Park (2003) stated that “students who actively engage with what they are studying tend to understand more, learn more, remember more, enjoy it more and be more able to appreciate the relevance of what they have learned” (p. 1). Some of the teachers who responded to the survey clearly identified greater student engagement in their learning. It is possible that the reported improvement in learner focus by teachers was not due to the use of formative teaching practices but instead was the result of increased use of digital devices. However, the use of digital technology has an effect size of $d = 0.32$ which is only a small effect and would have had little impact on accelerated student achievement (Hattie, 2009d).

USE OF E-ASTTLE

How does the introduction and use of the e-asTTle tool into a low decile school affect classroom practice and student achievement?

The introduction and use of the e-asTTle tool to the study school provided teachers in Year 7, 8 and 9 access to a wealth of data that could be used for formative assessment purposes and to inform evidence based practice in reading and mathematics. Targeted teaching and feedback to students helped increase student engagement. Data gathered during the study showed changes in teacher practice as well as accelerated shifts in student learning in both reading and mathematics. However, although students achieved accelerated progress in reading (as shown in Figure 12) and mathematics (as shown in Figure 20), the reality is that many students are still achieving well below the national mean. This difference in achievement increases when the data is compared to all schools in New Zealand and not just other low-decile, Māori schools as shown on the table.

What changes to teaching practice were identified after the introduction of e-asTTle?

It is proposed that the introduction of the e-asTTle tool changed the way some teachers taught.

This occurred through the use of the tool and the data it produced which increased the use of formative assessment and evidence-based practices by the teachers in their teaching.

Survey results provided clear evidence of the learning journey most of the teachers in the Junior Department had undertaken with the introduction of the e-asTTle tool. Four of the five teachers who responded to the survey said they had changed their teaching practice in response to learning how to use the e-asTTle tool.

Although three of the five teachers reported being familiar with the tool and being confident with using evidence based practice, by the end of the study four of the five responding teachers identified that their teaching practice had changed because of the impact of using the tool. This change extended to the way they taught, planned and engaged with students. Hattie (2007) showed that the adoption of formative assessment practices improved teacher quality and effectiveness. The National Commission on Teaching and America's Future (1996) found the research indicated that teacher quality directly affects student achievement and identified the teacher as the single most important factor that impacts student learning. They stated that not only do "the best teachers know their subjects deeply, understand how people learn, and have mastered a range of teaching methods" but the better prepared the teachers are, the "more effective (they are) in developing higher-order thinking skills and in meeting the needs of diverse students through different learning approaches" (p. 54). The issue of teacher quality is central to raising achievement, particularly in low socio-economic schools and for diverse students.

However, as Alton-Lee, Hunter, Sinnema, and Pulegoota-Diggins (2012) and Bishop, Berryman, Tiakiwai and Richardson (2003) found, effective teaching practice must include a culturally responsive element if teachers are to reach and engage with their students. Teachers were not asked specifically, as part of the study, how culturally responsive they were in their teaching; but they did identify elements of Ako²⁵ and Kōtahitanga²⁶ in their practice (Bishop, Berryman, Tiakiwai and Richardson, 2003). These components of culturally responsive practice are also the essential foundations of good practice for all students.

²⁵ Ako – They can use strategies that promote effective teaching interactions and relationships with their learners.

²⁶ Kōtahitanga – They promote, monitor, and reflect on outcomes that lead to improvements in achievement for Māori.

The basic elements the teachers spoke of were giving feedback, sharing the results of the assessments and identifying gaps and next learning steps jointly with the student, resulting in students owning their learning and taking responsibility to address their own learning needs.

Hattie (2003) identified the dimensions of excellent teachers as being able to identify essential representations of their subject, guiding learning through classroom interactions, monitoring learning and providing feedback, attending to affective attributes and influencing student outcomes.

It was these attributes the study teachers identified as being practices they were using a part of their teaching. Shanker (1996) stated "you don't know a theory is worth anything until you grapple with the details of putting it into practice" (as cited by Grossen, 1996, p. 22). Certainly, by the end of the study many of the teachers had 'grappled' with the theory of evidence-based practice, had adopted formative assessment practices and applied them. Research literature clearly shows that the use of formative assessment (or assessment for learning) leads to higher quality learning (Hattie, 2007, 2007; Spiller, 2009; William, Lee, Harrison & Black, 2004). Phillips, McNaughton and McDonald (2003) state that "with more focussed and modified ways of teaching, markedly better outcomes can be achieved" (p. 723). William (n.d.) unequivocally states "that focusing on the use of day-to-day formative assessment is one of the most powerful ways of improving learning" (p. 33).

Summary

Four of the teachers in the department can be identified as using formative assessment practice from their responses to the survey. Because not all teachers completed the survey a more definitive figure cannot be arrived at. Of those using assessment for learning practices, their expertise in using the e-asTTle tool to provide data to inform their teaching practice has increased. Most teachers know of and are using effective teaching practices. These teachers, by using formative assessment practices, have created the ideal learning environment that supports Māori students to make accelerated progress.

Hattie and Timperley (2007) state that "the highest effect sizes involved students receiving information feedback about a task and how to do it more effectively" (p. 84).

Focused professional development would support teachers who lack the knowledge or confidence to use formative assessment practices effectively.

Effective teaching not only involves imparting information and understandings to students (or providing constructive tasks, environments, and learning) but also involves assessing and evaluating students' understanding of this information, so that the next teaching act can be matched to the present understanding of the students (Hattie & Timperley, 2007, p. 89).

Teachers also need to be able to provide learning goals for students that are specific, challenging and fitting for the task at hand. It is important that teachers understand that when giving feedback it should be focused on what the student needs to do to improve. "Feedback is formative only if the information fed back to the learner is used by the learner in improving performance" (Wiliam, n.d., p. 27).

Through goal clarification student engagement can be enhanced and increased student effort encouraged towards reaching their goals through feedback (Hattie & Timperley, 2007). Professional development would ensure teachers have the knowledge and skills to use formative assessment practices and the e-asTTle tool to support evidence based practice. Feedback, when used correctly, reduces poor teaching practices that cause students to disengage from their learning. Provision of 'where to next' focused tasks rather than 'more of the same' learning activities can be used to specifically address this problem. Feedforward enables improved possibilities for student engagement and "can have some of the most powerful impacts on learning" (Hattie & Timperley, 2007, p. 90).

FORMATIVE ASSESSMENT TEACHING PRACTICES IN READING

Use of formative assessment teaching practices to raise student achievement in reading

It is proposed that the use of formative assessment practices by some teachers was instrumental in raising Year 7, 8 and 9 student achievement in reading.

The use of data and reports from the e-asTTle tool provided information to the teachers to support the teaching of gaps in student learning as well as identified learning needs.

The data from the beginning of the year and midyear assessments for the Year 7, 8 and 9 students in reading showed that students made progress in their learning over the study period. In reading, all year groups exceed the national expected shift. Year 7 students showed the smallest shift in learning, just 1 point above the expected national shift. Although the shift was a modest one compared to the 20 point shift in Year 8 (11 points about expectation) and the 53 point shift in Year 9 (51 points above expectation) it was still higher than expected national shift. Interpretation of the Year 9 shift should be done with caution for reasons outlined in the Results Chapter.

Future in-school analysis of the Year 9 results for the year would be wise to use end of year data for comparison before making any final conclusions about how much the students have shifted in their learning.

However, despite the concerns discussed above about some of the results, there is no doubt that across the year groups there was not just progress in learning, but a level of progress which exceeded the national expectations.

An unanticipated finding of the study was the 'role reversal' of student achievement in reading where the boys' rate of progress was greater than the girls in Year 7, 8 and 9. The boys' accelerated progress is contrary to research findings which tend to view boys' achievement in literacy as an "issue of boys' failure and under-achievement relative to girls on literacy benchmarked testing measures" (Martino & Kehler, 2007, p. 407). The boys' results are interesting as nationally and internationally girls tend to outperform boys in reading (Education Review Office, 2008; Ministry of Education, 2007).

The high rate of progress of the boys is possibly supported by several interventions trialled by the teachers during the study period. Year 8 teachers in the study school identified at the start of the year that the boys in the Year 8 cohort were disinterested and disengaged with reading. To counteract this disinterest the Year 8 teachers had endeavoured to provide resources and a reading programme that comprised of high interest materials and learning contexts specifically developed for boys.

The Year 9 teachers, having also identified the same issue, used a culturally relevant and high interest reading text, matched with an audio book, which helped engage the boys in that year group.

The Ministry of Education (2007) stated “there is converging evidence that girls perform better than boys, across all ethnic groupings, on all measures of reading and writing at all levels of schooling” and “in most other countries girls also significantly outperform boys in reading, so this is not just an issue for New Zealand” (p. 4). This is a thought-provoking development because only four years earlier Crooks (2003) had stated that there was strong evidence²⁷ that boys and girls were achieving quite similarly in primary schooling in New Zealand.

Summary

Achievement of accelerated progress in reading is unlikely to have happened spontaneously. Such large shifts in student learning requires concerted effort from both teachers and students. The teacher survey responses clearly showed that some teachers were implementing culturally responsive, effective teaching practices; practices that incorporated evidence based teaching using explicit instruction of identified learning needs to students. Tunmer, Chapman, Greaney, Prochnow and Arrow (2013) noted strong evidence based support for explicit instruction in literacy. Key aspects of this practice were differentiated, scaffolded instruction with small-group, brief, hands-on activities supported by warm, responsive interactions with the teacher. This model is a good fit to the classroom practice and environment identified by some of the teachers in their responses to questions in the survey. Differentiated instruction, identified as the most effective strategy for reducing the literacy achievement gap (Tunmer et al., 2013) was identified as being used by some teachers in the study.

It is interesting to note research has identified the common characteristic of schools in which boys are achieving in literacy is where the focus on the gender of the student is not highlighted.

²⁷ This evidence was based on the NEMP assessment results in 15 different subject areas over an eight-year period.

Instead, studies showed that it is the strategies which reduce the creation of gender differences in the classroom which are the most effective in facilitating achievement for boys (Martino, 2008). The accelerated results of the boys across the Junior Department may, in part, be supported by teachers using evidence based strategies, focusing on the student's learning needs and not their gender.

Research has also shown that children from more advantaged, affluent backgrounds arrive at schools with considerably more 'literate cultural capital' than children who come from low-income and/or culturally diverse backgrounds (Tunmer et al., 2013, p. 21). Lack of exposure to early literacy experience leaves children from low-income backgrounds "particularly susceptible to early reading difficulties because they often have not had the preschool exposure to the kinds of language play activities ... that promote the development of crucial literacy-related skills" (Tunmer et al., 2013, p. 21). Many of the students at the study school come from low-income background and most students enter the study school with low levels of literacy skills.

Although all year groups in the study showed accelerated progress in reading, the school's results when compared to other low-decile, diverse student schools were still behind. Despite using "good pedagogy, relevant, intellectually demanding and engaging curriculum, and develop(ing) respectful relationships" (Martino, 2008, p.3) the "long tail of under achievement"²⁸ persists in the study school as an unwelcome reminder that more needs to be done to raise student literacy achievement in the school to more acceptable levels (See Appendix A).

FORMATIVE ASSESSMENT TEACHING PRACTICES IN MATHEMATICS

Use of formative assessment teaching practices to raise student achievement in mathematics

It is proposed that the use of formative assessment practices by some teachers was instrumental in raising Year 7, 8 and 9 student achievement in mathematics.

²⁸ New Zealand's best students perform with the best in other countries but there is a group at the bottom, perhaps as large as 20 percent, who are currently failing in the education system. New Zealand has a disproportionate number of students who underachieve, the majority being Māori or Pasifika. ERO (2005).

The use of data and reports from the e-asTTle tool provided information to the teachers to support the teaching of gaps in student learning as well as identified learning needs.

The data from the beginning of the year and midyear assessments for the Year 7, 8 and 9 students in mathematics showed that students made progress in their learning over the study period and in some cases, exceed the national expected shift in learning.

Year 7 students showed the smallest shift in learning (mathematics) for the whole study, 6 points below the expected national shift.

Year 8 and 9's higher than expected gains in mathematics above the national expected shift (NES) are clear indications of accelerated progress in the students' mathematical learning. The data also identified that the girls outperformed the boys in mathematics. This was as much a surprise as the finding, discussed earlier in the report on student achievement in reading, where the boys outperformed the girls in Year 7, 8 and 9. Current literature states there are no systematic gender differences in achievement of any educational significance in mathematics (Cuttance & Thompson, 2008; Ministry of Education, 2007).

Sheehan and Nillas (2010) found that students who were more engaged attained higher levels of mathematical understanding. There was increased use of online mathematics programmes (Mathletics, IXL and Studyladder) during the study period with greater engagement of students in their learning. The programmes also allowed the teachers who used them to differentiate the learning programmes for individual students. This increased engagement through the use of technology may, in some way, partly explain the increased progress in mathematics.

Analysis of the Year 7 reading and mathematics data showed this year group achieved the two smallest shifts in achievement within the Junior Department. In reading the students made a one point shift greater than the national expected shift (NES: 6 and year 7 average shift: 7). In mathematics, the shift of one point was insignificant and the likelihood that it was the result of chance could not be ruled out (NES: 7 and year 7 average shift: 1). The students were new to the school, many coming from Year 6 at the local primary schools. Transitioning has an effect size of $d = -0.34$ and is known to have a significant negative impact on student learning.

Although no conclusion as to why Year 7 students' progress was so low can be drawn from this data alone, research on the effect of transitioning from one school to another provides evidence that the change from primary to secondary school can have a negative effect on student learning and achievement, particularly for Māori students (Anderman, 1998; Cox & Kennedy, 2008; Education Review Office, 2012; Office of the Auditor General, 2012).

As stated previously when reviewing student achievement in reading; students with fewer resources at home have lower achievement, on average, than those with more resources. TIMMS (2010) found

mathematics achievement was higher for students in schools with more affluent student than those in schools with more economically disadvantaged students. The difference in mathematics achievement between these two groupings within New Zealand was higher than most other countries in the TIMSS study (p. 78).

While socio-economic conditions might explain why the study school is achieving at a much lower rate than higher decile schools, it does not explain why the study school is achieving at a much lower rate than other low decile schools. Even taking in account that the study school draws students from a community known to be the poorest and most disadvantaged in New Zealand the breadth of the gap between the study school's results and those of similar schools is still a concern.

Summary

Research shows that while not all boys are at risk or underachieving in their learning, a concerning number of boys are (Martino, 2008; Ministry of Education, 2006b, 2007, 2008). The National Education Monitoring Project (NEMP) findings for 2009 indicate continuing disparities for Māori in achievement in mathematics (Alton-Lee, Hunter, Sinnema & Pulegatoa-Diggins, 2012). This finding links to socio-economic status and geographical location which are all recognized factors that affect educational performance and participation (Martino, 2008). Although the study school showed pleasing progress in Year 8 and 9, the students still fall below the level where other schools are achieving.

Martino warns against a blanket approach to the problem and labelling all boys as underachievers. He suggests that if educators can identify which boys and which girls need assistance then “the most productive kinds of intervention for struggling readers and at-risk students” can be determined (Martino, 2008, p. 1).

Recent research is very clear that it is teachers, and more specifically, quality teaching which is critical to improving student outcomes (Alton-Lee, Hunter, Sinnema & Pulegatoa-Diggins, 2012; Hattie, 2003). The Ministry of Education (2008) identified eight dimensions for quality teaching in mathematics – inclusive classroom climate, focused planning, problem-centered activities, responsive lessons, connections, high expectations and equity. Many of these dimensions were evident in the teachers’ responses to the survey questions. From the responding teacher’s answers in the survey there was a reported awareness of student diversity, academically, socially, and culturally as being crucial to the development of positive relationships between students and teachers (Bishop, Berryman, Richardson & Tiakiwai, 2003). Responding teachers also reported the use of focused planning, responsive lessons, high expectations, and equity in teaching practices.

However, despite the reported use of quality teaching practices and although accelerated progress in Year 8 and 9 mathematics was achieved, further interventions are required to close the gap between where the study school is achieving and where students in other school similar in decile standard and diversity are achieving.

The following chapter will be a statement of the conclusions drawn from the research, discussed in the context of the main arguments of the study, framed by the research problem.

6. CONCLUSION

This study provides a timely contribution to current discussions in New Zealand focused on raising Māori student achievement. The research is important because it is an opportunity to demonstrate that teachers can improve and accelerate academic outcomes for Māori students, even those who live in low-socio economic areas.

Having considered other possible reasons for the accelerated progress identified in the study and having discounted them for the reasons given in the Discussion chapter; the researcher therefore asserts it is reasonable to conclude it was the impact of the introduction and use of the e-asTTle tool that caused some teachers to change to a formative, evidence-based practice creating a learning environment which resulted in the accelerated academic achievement of the Māori students within the study school.

A study of this nature is important. It adds another layer of understanding to a problem that has proven already to be complex and difficult to solve and provides a possible solution to the issue of inequality of school achievement.

Despite Ministry of Education interventions ranging from the Te Kōtahitanga Programme (2001), the introduction of Charter Schools (2012) and the Investing in Educational Success Initiative (2014) Māori students are still over-represented in the 'long tail of underachievement' (Hattie, 2003).

RESEARCH LIMITATIONS

Although the study was well prepared there were still shortcomings and limitations within the research design that had to be addressed.

Synopsis of limitations and their importance

The sample used was drawn from the student population of one school and that school may not be typical of other schools in the country. The limitation of most concern at the planning stage of the project was the transient nature of the school population.

Anecdotally there was evidence of a 50% turnover of students in the Junior Department. True figures were difficult to measure as some students come and go several times in a year.

Another important limitation was the poor attendance rate of students. Attendance rates were improving from figures below 70% overall but non-attendance rates at the beginning and end of terms are much higher, more so at the beginning of the year.

Parental involvement and obtaining parental consent was also a concern and may have limited the study. Part of the qualitative research could not happen because of lack of written consent.

The effect of a teacher aide's assistance that provided a higher level of support than was intended to a group of students, during the Term Two assessments, was a limitation that may have had an impact on the data by inflating student results.

The short time frame between the Term One and Term Two assessments meant students had only twelve weeks in which to make gains in their learning and this may have limited the ability of the study to demonstrate progress. A single sub-level²⁹ shift as measured within the e-asTTle tool usually takes eight months to occur.

Another limitation to the study was the small sample size of the teachers. The small number of eligible teachers meant that non-participation affected the number of responses as did the low number of written responses.

On completion of the analysis of the survey responses it was discovered that an opportunity had been missed to gather more detailed information about how teachers used other assessments. This may have limited the study by not providing a more in-depth picture of teacher's use of assessments other than e-asTTle.

Implications of possible limitations on the study

Although the sample used was drawn from the student population of only one school, the school is part of a specific demographic, namely low decile, high Māori schools.

²⁹ Sub-level shifts are from basic to proficient to advanced within a curriculum level.

Although the study school may not be typical of all schools in the country, the results could be compared or contrasted with some confidence against other schools who share the same characteristics. The study group of Māori students in low decile schools was clearly defined and the use of all students in Years 7, 8 and 9 provided a sample that had all the important characteristics of the population which it represented, thus allowing findings to be generalized to the whole study population. Furthermore, the choice to include everyone was one of social judgement as it ensured no student felt excluded or labelled because of the research.

The concerns about transience and the poor attendance rate, and the potential impact they would have on the validity and reliability of the results, was the reason a decision was made to not work with just a sampling group within the school but to include all students in Year 7, 8 and 9. The loss of many students from a smaller sample group would have been a threat to the internal validity of that group.

The low return of consent forms is an on-going problem within the school. The common practice of phoning parents to get verbal permission was not an option for this study as written consent was required. The difficulty in contacting parents and getting signed consent forms returned to school, along with the assent³⁰ forms from the students was addressed in a number of ways. The information evening was held at the same time as a Meet the Teacher Barbecue to increase the likelihood of parents attending the meeting. The information hui³¹ was publicised in the school newsletter and on invitations sent home to all parents. Students were reminded to bring back all the forms if they wanted to be involved. Replacement forms for parents and students were handed out. After a number of weeks only two forms had been returned, one of which was not fully completed nor signed.

Despite all these efforts, as a result of the extremely low consent response the third part of the study, the student focus groups, could not go ahead which resulted in student voice not being collected and removed a large part of the planned qualitative study.

³⁰ As the research involved adolescents whose capacity to understand resembled that of adults and pre-adolescents whose age and maturity level limited their ability to fully comprehend the nature of the research activity but who were still capable of being consulted about participation in research, their affirmative agreement to participate was sought.

³¹ Meeting and presentation

Not having access to the rich, descriptive information this part of the study was intended to supply meant that student voice was missing to balance and compliment the information from the teachers.

The Year 9 reading data results were limited because they cannot be generalized to another Year 9 group and could not be included in any longitudinal studies. The limitation could not be overcome as the issue with the data only became evident at the analysis stage after the assessments had been given. Prior to the assessments testing procedures were reviewed with the teachers. Written instructions were also provided to all teachers. Most low level Year 9 student results had to be excluded as the results could not be verified as being the students' own answers³². This produced a data set that was not representative of the whole year group as it comprised only 40% of the total year group student numbers. However, the data it contained was valid and reliable for the remaining Year 9 students whose results were used. These students did make significant progress from the beginning of the year to the middle of the year. There is a need for any future researcher to ensure that test administration procedures are followed closely and that there is consistency in test conditions for all year groups.

The short time frame of the study meant it was more difficult to identify shifts in learning from the e-asTTle data than if the study had been for a longer period. As a result of this a number of different measures were used to identify if progress had occurred. National norms for quarterly shifts were available for comparative purposes, effect sizes were also calculated. The brief time span was due to the scheduling of the beginning of the year and mid-year assessments on the school assessment timetable to meet reporting requirements to parents.

Another limitation to the study was the small sample size of the teachers.

The small number of eligible teachers meant that non-participation affected the number of responses as did the low number of written responses. Teachers also offered little in the way of information to explain their practice, thinking or feeling.

³² For more detailed information refer to the Results Chapter. In brief, the results were affected by the interactions of a teacher aide assigned to work with the low-level students.

The limitation could not be overcome as it only became evident after the surveys had been completed. There is a need for any future researcher to ensure a better response rate and richer more detailed information, perhaps by forgoing the survey and instead interviewing each teacher who consented individually. However, the teachers may not consent if being interviewed is the only way they can take part. The small response means the results cannot be generalized to a bigger sample group of teachers.

On completion of the analysis of the survey responses it was discovered that an opportunity had been missed to gather more detailed information about how teachers used other assessments which would have helped provide a more in-depth picture of teacher's use of assessments other than e-asTTle. Teachers identified using PAT reading and mathematics results to inform their teaching practice but were not given the opportunity to provide detailed explanations of what data they used from the assessments and how they used that data to inform their teaching practice. The limitation could not be overcome as the issue with the data only became evident at the analysis stage after the survey had been completed. There is a need for any future researcher to ensure that a question relating to either how the alternative assessments were helpful in providing evidence to improve teaching practice or inquire what they did with data once they had it. The study results are also limited because after completing the analysis of the survey responses it was discovered that small inconsistencies in the wording of the Likert scale for one question made it difficult to compare data gathered. There is a need for any future researcher to ensure wording is the same for all increments of the scale.

Some of the issues identified reduced the validity and reliability of the results. This was evident in the Year 9 results for reading. However, there were no issues with the collection of the Year 7 and 8 reading data or with the gathering of the mathematics data so for this reason those results should be considered sound and trustworthy. The Year 9 results do not diminish the value of the other year groups' results and the conclusions drawn from them.

RECOMMENDATIONS

The short time frame of the study was not ideal. There is a need for any future researcher to carry out a longitudinal study that would deliver data over a longer time frame. A three-year study would be optimal, allowing for data collection from Year 7 to 9 and allow for the researcher to put in place short and long term interventions and monitor the effect. This could address the issues of the short-time frame for data collection and inconsistencies in data. It could help address the issues of transience by capturing data from 'boomerang'³³ students, allowing their results to be considered instead of being excluded as happens in a shorter study.

Scheduling of assessments later in the day would also help to include students who are habitually late. A longer timeframe would allow teachers to become more familiar with formative, evidence based practice so that there is more likelihood of different practices becoming embedded in day to day teaching. Familiarity with e-asTTle assessments means administration of the tests could become more reliable with teachers following administration guidelines.

Although the accelerated progress of students in reading is a positive outcome, their continued achievement well below the national mean is still a cause for concern. This shortfall in achievement indicates that the accelerated progress achieved through current teaching practice is not enough and that there is a need for additional interventions to raise reading achievement. To continue with the status quo will result in many students not achieving the required reading ability to be successful at NCEA and beyond.

A sustained focus on literacy skills within the study school is recommended. Cross-curriculum learning floats on a 'sea of text' and students struggle to access learning in subject-specific context without adequate reading skills.

³³ Students who leave the school and then return, sometimes several times within a year

Tunmer, Chapman, Greaney, Prochnow and Arrow (2013) recommend that students from poor socio-economic backgrounds would benefit from

beginning reading instruction that includes explicit, systematic teaching of phonological awareness and alphabetic coding skills outside the context of reading text in combination with plenty of opportunities to practice and receive feedback on using these skills during text reading ... with explicit instruction in word analysis skills outside the context of reading text helps to ensure that these children see the importance of focusing on word-level cues as the most useful source of information in identifying words (p.31).

The importance of instruction in raising achievement is endorsed by Hattie and Timperley (2007) who assert “under particular circumstances, instruction is more effective than feedback. Feedback can only build on something; it is of little use when there is no initial learning or surface information” (p. 90). Tunmer et al., (2013) also identified “enhancing the quality of teacher preparation and professional development [as] ... an important aspect of increasing the effectiveness of reading instruction” (p.32). The study school would do well to make this a priority too. It is possible that the introduction of ‘reciprocal teaching’³⁴ practice may support even greater acceleration of learning.

The Ministry of Education (2008), when researching raising achievement in mathematics, identified that “students in high-performing countries spend a large proportion of their class time solving problems” (p. 4). Problem-centered activities support individual as well as co-operative learning leading to the development of student understanding that “the responsibility for knowledge creation lies with the students (Clark & Hoon, 2005, as cited by the Ministry of Education, 2008, p. 4). What was not evident from the teachers’ survey responses, when asked to identify teaching methods and practices, was the use of problem-centered activities or any appreciation of how important this is when teaching mathematics.

³⁴ Reciprocal teaching refers to an instructional activity in which students become the teacher in small group reading sessions. Teachers model, then help students learn to guide group discussions using four strategies: summarizing, question generating, clarifying, and predicting.

Martino (2008) supports “maintaining a focus on developing their higher-order and analytic thinking skills” when teaching mathematics to raise achievement (p. 3). William (n.d) stresses the importance of feedback in mathematics to support student progress. He identified that “the timing of feedback is also crucial. If it is given too early, before students have had a chance to work on a problem, then they will learn less. Those given the ‘scaffolded’ response learnt more, and retained their learning longer than those given full solutions (p. 26). It is therefore a recommendation of this report, based on the research referred to, that the study school make problem-centered activities a key part of the mathematics programme in the Junior Department as it is likely to make a further desired improvement in students’ mathematical knowledge, skills, processes, and mathematical literacy.

The data from Year 7 in both reading and mathematics indicates a much lower rate of progress than that achieved in Years 8 and 9. Nationwide research of students’ achievement over the transition period from primary school to secondary school has revealed a number of issues which need to be addressed within secondary schools if particular groups of students, specifically Māori, low achieving students, are to make a successful transition and remain engaged in their learning at secondary school (Anderman, 1998; Cox & Kennedy, 2008; ERO, 2012; Office of the Auditor General, 2012).

Investing in Educational Success (IES) is a government initiative aimed at lifting student achievement. The establishment of communities of learners (COLs) is a result of this initiative in an attempt to encourage collaboration between schools to improve outcomes for learners. The issue identified in this study, related to primary-secondary school transition, is one of the intentions behind IES (or COLs) implementation in New Zealand. Collaboration with the local contributing primary schools, with a focus on the transition of students from Year 6 at the local primary schools to Year 7 at the study school, would provide data on what effect this move between schools may be having on student learning, achievement, engagement, and general student wellbeing. Analysis of the data would mean the school would be well placed to identify student needs and to put into place an appropriate plan of action to assist students in making a successful transition.

The programmes would need to go beyond strategies that simply deal with the more immediate aspects of the transition, such as familiarising students with their new school environment, as research has shown that these are not enough.

It is possible that student achievement in Year 7 would then improve and match that of Year 8 and 9. Teachers are not oblivious to the issues. Many actively seek interventions that will make a difference in their student's learning and achievement. The call to implement innovative teaching programmes that have few elements of effective teaching practice is a cause of disquiet for some teachers, unlike the implementation of the e-asTTle programme which provided teachers with "a resource that has the power to improve the quality of their teaching and students' learning" (Brown & Hattie, 2003, p. 9). With vulnerable students, their learning is too important to compromise.

The study school draws its school population from a community where "particular features of children's lives ... adversely affect their school achievement. (These) beyond-school factors ... have a marked tendency to be those with the greatest impact" (Clark, 2013, p. 3). The success of the study means that if the introduction of the e-asTTle tool with resulting change in teacher practice can accelerate achievement in the study school despite the impact of significant beyond-school factors, there is reason to believe it may be just as successful in other low socio-economic, high Māori schools who face the same challenges. It is a recommendation of this study that use of the e-asTTle tool and formative assessment practices continue and are supported within the school. Innovative teaching programmes need to be based on effective pedagogy and provide ample opportunity for targeted teaching, differentiation, and delivery of high-quality feedback.

SUGGESTIONS FOR FURTHER RESEARCH

Cox and Kennedy (2008) "found that over the transition (from primary to secondary school) average student achievement in mathematics dropped, while in reading and writing it tended to plateau" (p. 121). What is not known is whether the fall in achievement in mathematics is short-term or whether it endures for some or all students over the longer-term (Cox & Kennedy, 2008).

Ministry of Education (2010) research “showed that during the middle years of schooling (Years 7 to 10) more vulnerable students in terms of their progress and well-being at school tend to become increasingly disengaged from learning and from school generally” which put them at risk of failing academically or dropping out of school altogether (p. 8).

Future research on Year 6 students transitioning from local primary schools to the high school may be able to shed more light on this through comparison of students’ year 6 data against the results recorded in Year 7 from the beginning to the end of the year. This may go some way to explaining the Year 7 data or it may be able to rule out transitioning to school as a factor that is having a negative effect on Year 7 student progress and achievement in learning, particularly in mathematics. National research transitioning data (Education Review Office, 2012; Ministry of Education, 2010) however, showed that for most students, after a dip early in the year, they achieved sound or good achievement in mathematics. A longitudinal study of student achievement in mathematics from Year 7 to Year 10 would provide information as to whether the fall in achievement is short-term, continues for several years, or remains as an enduring result of transitioning between schools with long term negative consequences.

The study school provides a modern research context through state-of-the-art learning practices in a fully digital innovative learning environment. This up-to-date learning context supports further research into how the use of the e-asTTle tool and effective pedagogical practices fit with the new e-learning teaching practices being introduced that espouse an any time, any place, any pace learning focus with students ‘knowing what they don’t know’ and taking the lead in their learning. A qualitative study of both teachers and students would provide rich, descriptive information on how these changes affect teaching practice, teacher roles and efficacy, as well as student views on their learning needs and effectiveness in meeting them. Delivery of curriculum contexts and resources through websites and blogs with teachers facilitating the learning could provide a timely study on how culturally responsive pedagogy is met and supported through digital learning in on-line environments for low-achieving Māori students.

This study provides a counterpoint to what would be an interesting opportunity for a comparative study focused on the effectiveness of the new programmes to not just raise student achievement in reading and mathematics but hopefully close the achievement gap between the study school and other schools in New Zealand.

REFLECTIONS

This study identified that through the introduction and use of e-asTTle formative assessment tool some teachers responded to the data and reports it provided and through doing so, moved to more effective pedagogical practices.

The outcome of these shifts in practice was to not just increase student achievement in reading and mathematics but to achieve accelerated progress. However, even the accelerated progress attained did not close the gap between the Māori students in the study school and the students in other low-decile, high Māori schools. These findings engendered a response similar to this quote from *A Tale of Two Cities*, “It was the best of times, it was the worst of times, ... it was the spring of hope, it was the winter of despair...” (Dickens, 1859, p. 4) To achieve accelerated progress exceeded the aim of the study and for the teachers was a cause for celebration. For the students’ results to not close the achievement gap was a disappointing outcome.

The use of the e-asTTle tool and effective teaching practices can mitigate to some extent the impact of societal issues on student achievement. However, they cannot be ignored. Rothstein (2008) stated that without social and economic reforms, coupled with school improvements, the achievement gap will remain. School leaders and teachers need to work together to focus on why and how improvements can be made in the school to support improvements. Monitoring and evaluating the educational progress of students is essential in identifying where the academic breakdown is occurring. This then allows for intervention strategies to be put in place to address the specific issues associated with Māori students who come from low-socio economic background.

The findings of this study will alert the school to the valuable role the e-asTTle tool has in providing formative assessment data to inform teaching and learning.

The study also provides an example of how effective pedagogical practice doesn't just raise student achievement but can accelerate it. Although highlighting the gap in achievement which still exists, the results are still a message of hope and evidence that if the practices identified in this study are adopted and used effectively by all the teachers then the learning of Māori students in low decile schools can be accelerated.

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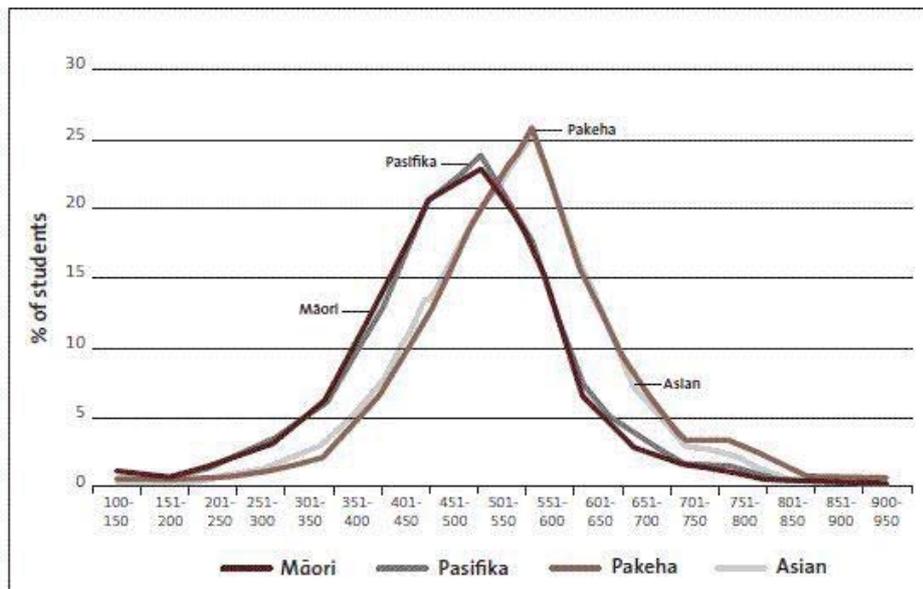
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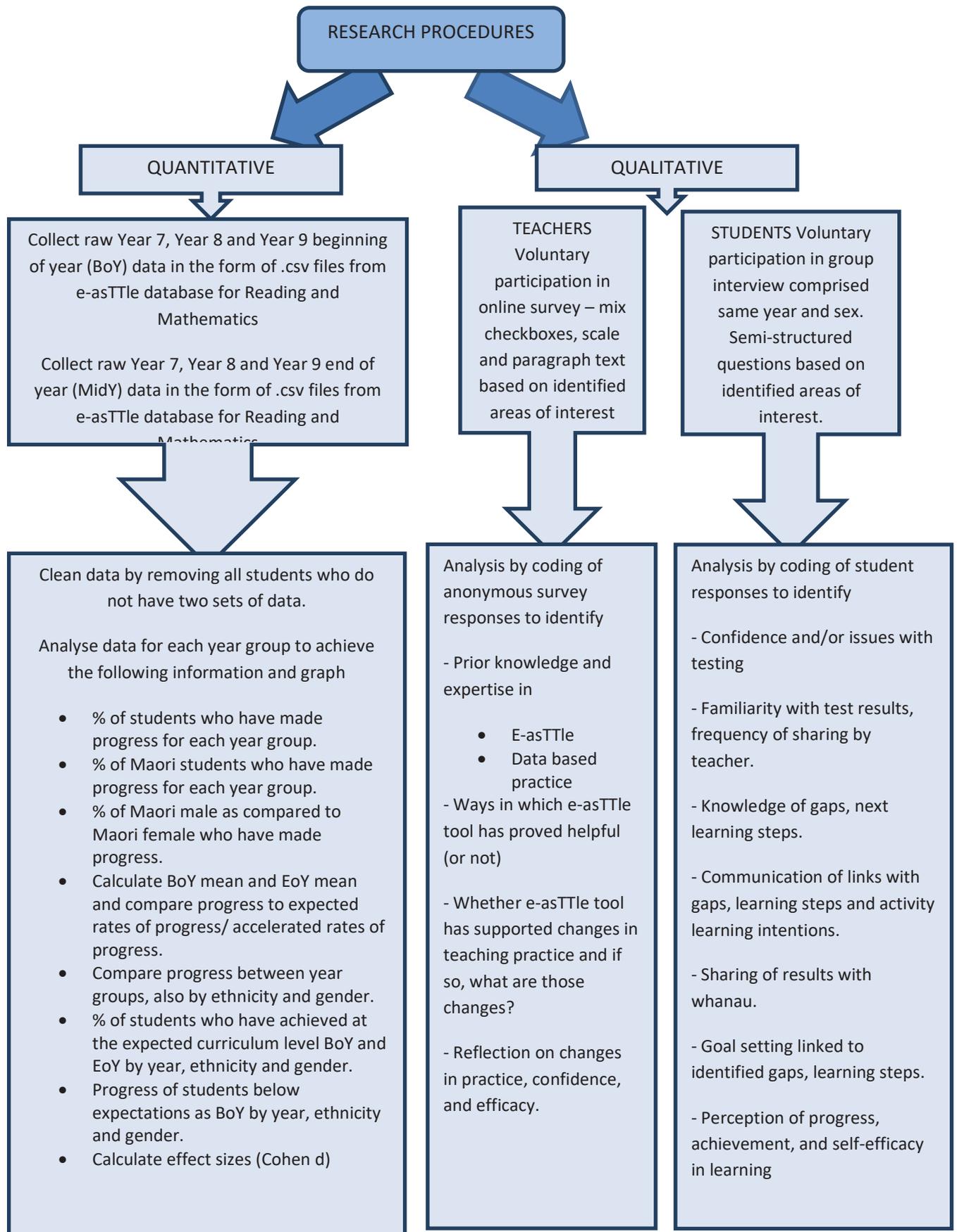
APPENDIX A: The “Long Tail of Underachievement”

Distribution of 90,000 students' assessed achievement in reading, by ethnicity, 2001-04

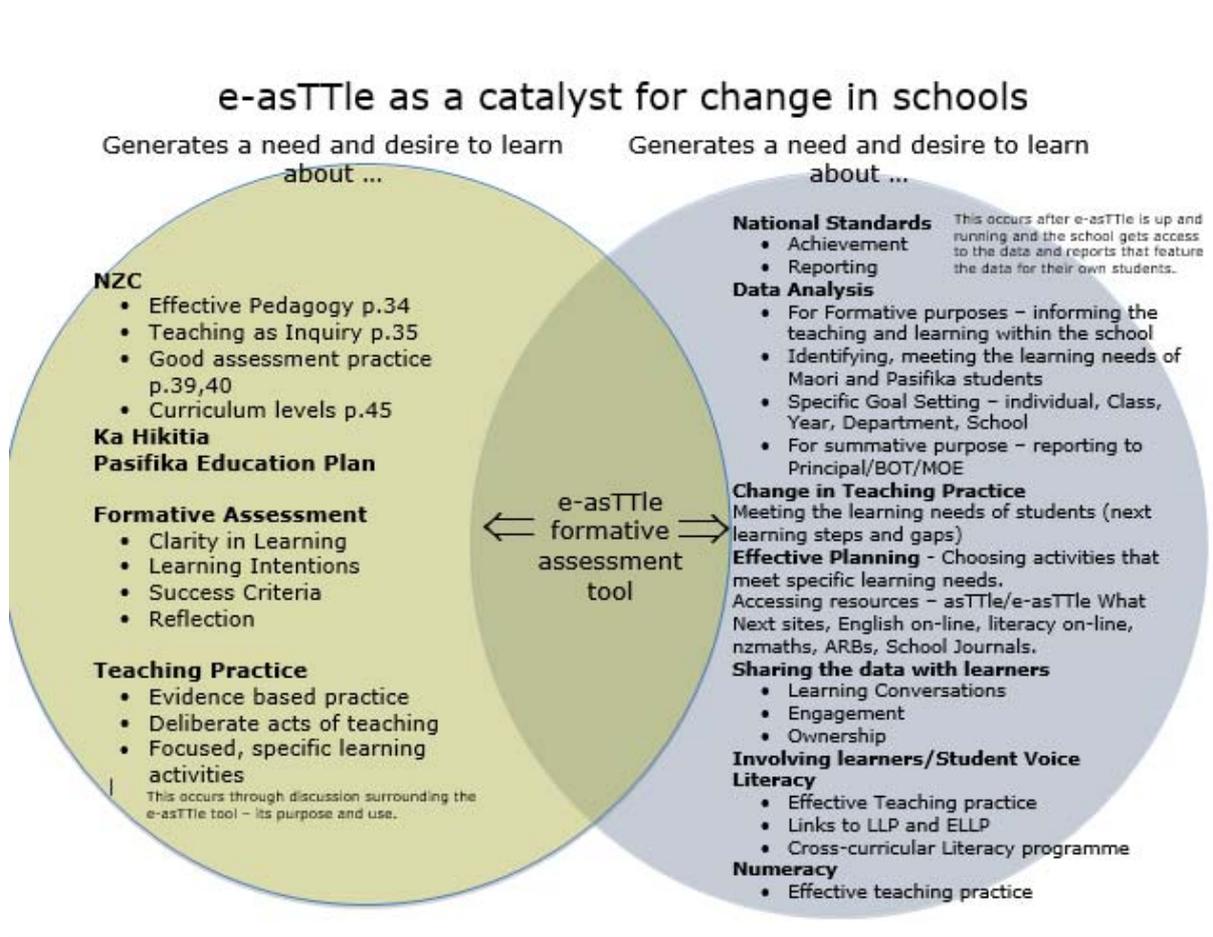


Source: Hattie, J (2008), "Narrow the Gap, Fix the Tail, or Close the Curves: The Power of Words", in Rubie-Davies, C M, and Rawlinson, C, *Challenging Thinking about Teaching And Learning*, Nova Science Publishers, New York, page 21.

APPENDIX B: Research Procedures Flow Chart



APPENDIX C: e-asTTle as a catalyst for change – effect of introduction of tool into school.



APPENDIX D: Teacher Survey

PART ONE

Identifying prior knowledge.

How familiar were you with the e-asTTle programme when you started teaching at Tarawera High School?

	1	2	3	4	5	
Completely unfamiliar with any aspect	<input type="radio"/>	Very confident user of all aspects				

How familiar were you with using evidence to inform your teaching practice before you started using e-asTTle?

	1	2	3	4	5	
Completely unfamiliar with evidence based practice	<input type="radio"/>	Confident, consistent user of evidence based practice				

What evidence or assessment data did you use to inform your teaching practice before e-asTTle?

If you check 'Other' please specify in the space provided.

- PAT Reading Comprehension
- PAT Reading Vocabulary
- STAR Reading Assessment
- PROBE Testing
- Running Records
- Individual conferencing with student
- Classwork
- Other: _____

How useful did you find these assessments in providing data to inform your teaching practice?

	1	2	3	4	5	
Completely unhelpful with no useful data	<input type="radio"/>	Extremely helpful and useful				

NEXT

Teacher Reflection on e-asTTle

PART TWO

Identifying current knowledge and expertise.

How confident are you now, in analysing and using the data collected from the e-asTTle tool?

	1	2	3	4	5	
Completely lacking in confidence and unsure	<input type="radio"/>	Extremely confident and able				

How useful do you find the e-asTTle tool in providing data to inform your teaching practice?

	1	2	3	4	5	
Completely unhelpful with no useful data	<input type="radio"/>	Extremely useful and helpful				

Has using the e-asTTle data supported you in making any changes to your teaching practice?

Yes

No

If you answered YES to the previous question, please specify what changes you have made.

Your answer

BACK

NEXT

Teacher Reflection on e-asTTle

PART THREE

Reflections on changes and learning needs

Has the use of the e-asTTle tool changed the way you plan?

Yes

No

If you answered YES to the previous question can you please identify what changes you have made to your planning.

Your answer

Has the use of the e-asTTle tool changed the way that you teach?

Yes

No

If you answered YES to the previous question can you please identify what changes you have made to the way you now teach.

Your answer

If you have answered YES to any of the TWO PREVIOUS QUESTIONS can you please answer the following two questions.

Do you think the changes you have identified making to your teaching practice had any impact on student engagement with the learning?

Yes

No

If you answered YES to the previous question, what changes have you noticed/identified?

Your answer

Do you think the changes you have identified making to your teaching practice had any impact on student achievement?

Yes

No

If you answered YES to the previous question, what changes have you noticed/identified?

Your answer

Thank you very much for taking the time to participate in this survey. Your contribution to my thesis study is very much appreciated. I acknowledge your support for the treasure that it is. He taonga rongonui te aroha ki te tangata

BACK

SUBMIT

APPENDIX E: Teacher Information Sheet

e-asTTle as a catalyst for change.

INFORMATION SHEET FOR TEACHERS

Tēnā koe. My name is Sue Smith. This project forms the basis of my thesis which will be submitted as part fulfilment of a Masters in Education at Massey University. I will be closely supervised by a senior lecturer with considerable experience in undertaking research in comparable, complementary fields and who is currently engaged in carrying out research of a similar nature. If you have any concerns you can contact my supervising lecturer Dr. Jenny Poskitt by email J.M.Poskitt@massey.ac.nz or by phoning her on 063569099 extn. 83070.

The research problem I intend to explore is the effect the introduction of e-asTTle has on student achievement and teacher practice; with a specific focus on its efficacy in raising student achievement in a low decile, predominantly Māori school.

This part of the research project focusses on the role of the e-asTTle tool as a catalyst for change in teacher practice resulting in an increase in student achievement. I wish to extend an invitation to you to participate in the research.

The gathering of data takes place in the form of a Google survey that will take approximately five to 10 minutes. Survey responses are anonymous and every effort will be made to ensure data and information pertaining directly to participants or the school will be protected and kept confidential when reported in publications or disseminated in any other form. The school, teachers or students will not be identified in any way.

I would like to make it clear that I am not here to pass any judgement on your teaching or professional practice. The reason for this research is to test the veracity of a claim made by Brown and Hattie (2003) that e-asTTle was developed specifically to *'be a curriculum-based, teacher-managed approach to national assessment as the best means of improving achievement, reporting to teachers, schools, and systems, and generating confidence in schooling'*

I am passionate raising the achievement of Māori students in low decile schools and I am both curious and hopeful to see if the introduction of the e- asTTle tool has helped to achieve this, as Hattie and Brown claim.

If you are happy to take part in this research, please complete the enclosed consent form. Once I have received your signed consent form I will share the google survey form with you as it is an online survey.

Again, I would like to thank you for your time and support.

Nāku noa, nā

Sue Smith

APPENDIX F: Teacher Consent Form

Teacher Consent Form

Research Project Title: e-asTTle as a catalyst for change

Researcher: Sue Smith

I confirm that I have been informed about the nature of the project and I have had the opportunity to ask questions about the research.

I understand that it is my choice to take part in the study and if I choose not to, there are no negative consequences.

I understand that I have the right to withdraw at any time without giving a reason and without negative consequences.

I understand the survey responses will be anonymous and confidential. I have the right to withdraw my data up until the point in which I submit my survey responses online.

I understand that all data will be stored securely and will not be used in any other research.

I understand that the report will not identify the school or teachers. It will not include my name or that I was in the study.

I understand that there is zero tolerance for any disrespectful and/or harmful communication and the right of removal of any participant whose communications are considered harmful to others or themselves.

I understand that the information will be used for the research part of the researcher's study.

I, (Full Name) _____ consent to being part of the research project.

_____ Date _____

(Signature)

Disclaimer: Please note that while every effort will be made to ensure confidentiality, this cannot be guaranteed.

APPENDIX G: Letter to Board of Trustees

The Chairman

Board of Trustees

XXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXX

Dear Mr XXXXXXXXXXX and Board Members

Re: Application for consent to carry out research for a Master's Thesis

I am writing to you to ask for permission to carry out a research project in the school. I require permission to access Year 7, 8 and 9 student data held within the e-asTTle programme that relates to pre and post assessment data in reading.

I also require permission to access a group of at least five students from each year level, to be interviewed once, in two small groups, for no more than fifteen to twenty minutes. Should I have more volunteers than the number requested above, I will respect their desire to participate and will therefore interview all those who volunteer to participate. Participation would entail questions about their views on how helpful they have found the e-asTTle reports. Written consent would be sought from the parents/caregivers of the students.

I also require permission to access the teachers of the Year 7, 8 and 9 cohort. Participation would be voluntary and anonymous and would entail completion of a questionnaire if they were willing. Written consent would be sought from the teachers.

I am currently a permanent staff member employed within the school. My role is primarily as a teacher of Year XX students with additional responsibility as Head of Learning and e-Learning within the Junior Department.

In 2014 when I joined the school I set up and introduced a Ministry of Education funded online assessment tool known as e-asTTle. AsTTle was developed by John Hattie as an assessment tool for teaching and learning. The programme can generate a number of reports for students, teachers and school management. The purpose of these reports are to inform students and whanau about what they are good at, have learnt, need to learn and where they have gaps that could be affecting their understanding. It also provides information that enables teachers to create teaching programmes that are targeted towards meeting whole class and individual student's learning needs. Through evidence based practice and the use of targeted teaching using feedback and feedforward to the students, accelerated learning can occur.

I am currently working with my Supervising Lecturer Jenny Poskitt from Massey University on putting together a Thesis and Human Ethics Application proposal focused on e-asTTle as a catalyst for change within a school¹. If you have any queries or concerns about this application please phone Jenny on xxxxxxxxxxx extn. xxxxxxxx or email her at xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx .

The research will look at whether there has been a change in student achievement since the introduction of e-asTTle; whether students feel they now know where they are with their learning, where they should be and what they need to do to achieve this. It also looks at the impact the introduction of the e-asTTle tool has had on changing teacher practise to facilitate accelerated learning.

Most of the research will be based on quantitative data that is already collected and to some extent analysed as part of the normal assessment practice within the school. The focus timeframe is this year. The data will not be used in a way that identifies any student, teacher, class or the school.

Some qualitative data will be gathered from teachers and a small group of randomly selected students. The sample group of teachers will be asked to participate in an anonymous questionnaire that looks at identifying how they view the e-asTTle programme and the data produced, how much they use the report data to inform their teaching, whether they believe their teaching practice has changed since being able to access the reports and if they now feel their teaching is more effective in raising student progress and achievement, and if not, why not. The small group of students will be interviewed in year groups, with boys and girls interviewed separately. They will be asked if they are familiar with the individual learning pathway report on themselves from e-asTTle, if they know where they are with their learning, if they know what their next learning steps are and how to achieve it. I will also ask if they have shared this information with their whanau.

I will provide an information sheet and consent letter in both Maori and English to be sent home to all students who fit into the survey group prior to the start of the study. At this time I would be happy to hold an information evening at the school for parents/whanau/community to introduce and explain the e-asTTle tool and how its purpose is to empower students and whanau around their learning and next learning steps. I would introduce the student Individual Learning Pathway report and explain how it can be understood to celebrate their child's successes and to identify areas their child needs support in.

Students will self-select to be interviewed by ticking a box on the consent form indicating they are happy to be interviewed. Only data from students who have parental/caregiver consent will be used. Participation by both teachers and students in the questionnaire or interviews will be purely voluntary. Choosing not to participate will in no way have any negative consequences. All costs of the study will be borne by myself. I will seek unpaid leave of absence for the day that I carry out student interviews. The interviews will be no longer than twenty minutes, and will be carried out on a normal school day with as little disruption as possible.

The benefits to the school are twofold. Firstly, the school will benefit from a report focused on student achievement and progress in Years 7, 8 and 9 carried out at a statistical level of analysis not usually done at school level, overseen by a recognised, reputable researcher and lecturer from Massey University who has herself carried out published research on raising student achievement. Secondly the school will benefit from a report based on student and teacher voice on how effectively the e-asTTle reports and data is being used in the classroom and shared with students and whanau, as it is designed to be.

The report produced will provide benchmark data for the school against which comparisons can be confidently made in the ensuing years. Should the school management or the Board choose to act on the data or the recommendations drawn from the study, they will be able to do so confident in the knowledge that the conclusions drawn are of academic quality.

I look forward to receiving your approval for my research.

Yours sincerely

**APPENDIX H: e-asTTle Norms and Curriculum Expectation by Quarter:
Reading**

Quarter	Year	Mean Score	Difference between Mean Scores	Mean Curriculum Level	Curriculum Expectation
1	4	1301		2P	2P
2	4	1306		2P	2P
3	4	1317		2P	2P
4	4	1333		2P	2P
1	5	1346		2P	2P
2	5	1360		2A	2A
3	5	1372		2A	2A
4	5	1390		3B	3B
1	6	1403		3P	3B
2	6	1416		3P	3P
3	6	1425		3A	3P
4	6	1426		3A	3P
1	7	1430		3A	3P
2	7	1436	6	3A	3A
3	7	1447		4B	3A
4	7	1453		4B	4B
1	8	1462		4B	4B
2	8	1474	12	4P	4P
3	8	1489		4P	4P
4	8	1494		4P	4P
1	9	1497		4P	4P
2	9	1499	2	4P	4A
3	9	1507		4A	4A
4	9	1519		4A	5B
1	10	1529		4A	5B
2	10	1539		4A	5P
3	10	1545		4A	5P
4	10	1567		5B	5A
1	11	1590		5P	5A
2	11	1612		5P	6B
3	11	1621		5A	6B
4	11	1628		5A	6P
1	12	1636		5A	6P
2	12	1643		6B	6P
3	12	1652		6B	6A
4	12	1657		6B	6A

**APPENDIX I: e-asTTle Norms and Curriculum Expectation by Quarter:
Mathematics**

Quarter	Year	Mean Score	Difference between Mean Scores	Mean Curriculum Level	Curriculum Expectation
1	4	1358		2P	2P
2	4	1364		2P	2P
3	4	1375		2P	2P
4	4	1389		2P	2P
1	5	1400		2P	2P
2	5	1410		2A	2A
3	5	1420		2A	2A
4	5	1430		3B	3B
1	6	1441		3P	3B
2	6	1451		3P	3P
3	6	1460		3A	3P
4	6	1466		3A	3P
1	7	1472		3A	3P
2	7	1479	7	3A	3A
3	7	1489		4B	3A
4	7	1500		4B	4B
1	8	1512		4B	4B
2	8	1521	9	4P	4P
3	8	1529		4P	4P
4	8	1535		4P	4P
1	9	1540		4P	4P
2	9	1545	5	4P	4A
3	9	1554		4A	4A
4	9	1567		4A	5B
1	10	1579		4A	5B
2	10	1590		4A	5P
3	10	1593		4A	5P
4	10	1601		5B	5A
1	11	1608		5P	5A
2	11	1622		5P	6B
3	11	1636		5A	6B
4	11	1650		5A	6P
1	12	1664		5A	6P
2	12	1678		6B	6P
3	12	1692		6B	6A
4	12	1699		6B	6A

APPENDIX J: SPSS T-Test Paired Samples Data

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Y7PostRead	1361.0588	51	57.05836	7.98977
	Y7PreRead	1354.2353	51	54.57567	7.64212
Pair 2	Y8PostRead	1426.4000	40	60.99340	9.64390
	Y8PreRead	1399.8000	40	58.35225	9.22630
Pair 3	Y9PostRead	1467.9697	33	42.01003	7.31301
	Y9PreRead	1414.7576	33	56.63647	9.85914
Pair 4	Y7PostMaths	1391.0755	53	64.63443	8.87822
	Y7PreMaths	1390.6038	53	58.95152	8.09761
Pair 5	Y8PostMaths	1445.6512	43	67.07809	10.22931
	Y8PreMaths	1425.8605	43	66.45607	10.13445
Pair 6	Y9PostMaths	1467.5094	53	52.38563	7.19572
	Y9PreMaths	1453.5094	53	48.66116	6.68412

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Y7PostRead & Y7PreRead	51	.690	.000
Pair 2	Y8PostRead & Y8PreRead	40	.688	.000
Pair 3	Y9PostRead & Y9PreRead	33	.536	.001
Pair 4	Y7PostMaths & Y7PreMaths	53	.982	.000
Pair 5	Y8PostMaths & Y8PreMaths	43	.709	.000
Pair 6	Y9PostMaths & Y9PreMaths	53	.973	.000

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Y7PostRead - Y7PreRead	6.82353	44.03213	6.16573	-5.56071	19.20776	1.107	50	.274
Pair 2 Y8PostRead - Y8PreRead	26.60000	47.16300	7.45713	11.51654	41.68346	3.567	39	.001
Pair 3 Y9PostRead - Y9PreRead	53.21212	49.22192	8.56844	35.75879	70.66545	6.210	32	.000
Pair 4 Y7PostMaths - Y7PreMaths	.47170	12.91035	1.77337	-3.08683	4.03023	.266	52	.791
Pair 5 Y8PostMaths - Y8PreMaths	19.79070	50.92738	7.76635	4.11756	35.46383	2.548	42	.015
Pair 6 Y9PostMaths - Y9PreMaths	14.00000	12.26314	1.68447	10.61986	17.38014	8.311	52	.000

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Y7PostRead	.093	33	.200*	.969	33	.449
Y7PreRead	.139	33	.106	.937	33	.056
Y8PostRead	.133	33	.146	.945	33	.092
Y9PostRead	.201	33	.002	.918	33	.016
Y8PreRead	.081	33	.200*	.979	33	.753
Y9PreRead	.088	33	.200*	.968	33	.430

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Y7PostMath	.120	43	.129	.953	43	.080
Y7PreMath	.119	43	.135	.960	43	.141
Y8PostMath	.070	43	.200 [*]	.988	43	.932
Y8PreMath	.067	43	.200 [*]	.975	43	.464
Y9PostMath	.099	43	.200 [*]	.945	43	.040
Y9PreMath	.093	43	.200 [*]	.962	43	.161

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

ABBREVIATIONS

AsTTle	Assessment Tool for Teaching and Learning
BECTA	British Educational Communications and Technology Agency
COL	Community of Learners
CRP	Culturally Responsive Practice
e-AsTTle	Electronic version of the original Assessment Tool for Teaching and Learning
ERO	Education Review Office
ETP	Effective Teaching Profile
HoDs	Heads of Departments
ICT	Information and Communication Technologies
IES	Investing in Educational Success
ILS	Innovative Learning Spaces
ITP	Innovative Teaching Practice
LOL	Leader of Learning
MLE	Modern Learning Environment
NZE	New Zealand European
OECD	The Organization for Economic Cooperation and Development (OECD) is a group of 34 member countries that discuss and develop economic and social policy.
PTC	Practising Teacher Criteria
TIC	Teacher in Charge
TKI	Te Kete Ipurangi
