The Relationship between Student Engagement and Academic Achievement

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Abstract

Previous studies consistently demonstrate a positive relationship between different and separate student engagement domains (behavioural, emotional, and cognitive) and academic achievement. However, research examining the simultaneous causal effect of all three student engagement domains on academic achievement is sparse. Investigating the simultaneous impact of all three domains on academic achievement may provide a more complete and natural insight into the role of student engagement within the learning process, since these domains act together in real life.

The primary objective of this study was to identify the relationship between three domains of student engagement and academic achievement, controlled for selected potential confounders such as teacher support, peer support, school environment, and student demographic characteristics. The design of the second and main study, which examined the relationship between engagement and achievement, and whether the relationship suggests causal effect, included two points of data collection over one academic year (*before* and *after*), from student self-report questionnaires and students' achievement from the school database. The sample comprised three urban secondary schools (1,617 students from Year 7 to Year 9).

Contradictory to findings in the literature, the findings suggest that student engagement is positively associated with academic achievement, but they did not support evidence for causal effects. Those findings remained regardless of whether or not selected

potential confounders such as teacher support, peer support, school environment, and background variables of the student were considered. In addition, although school environment and gender had a small impact on the relationship between engagement and achievement, they are unlikely to be considered confounders of the association. The findings of the current study, which are contradictory to the literature, are discussed and several content and methodological explanations are offered. Implications of the findings for policy makers, school principals and teachers, and for future research are also discussed.

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Introduction

Previous studies have shown a positive relationship between different student engagement domains and academic achievement. Research examining the causal effect of all three student engagement domains – behavioural, emotional and cognitive – simultaneously on academic achievement, however, is sparse. The purpose of the thesis is to explore and identify the relationship between three domains of student engagement and academic achievement, while controlling for selected potential confounders such as teacher support, peer support, school environment, and student demographic characteristics.

The literature also reveals that the wide range of definitions and different conceptualisations of student engagement needs to be addressed (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004; Fredricks & McColskey, 2012; Hayam-Jonas & Friedman, 2000; Jimerson, Campos, & Greif, 2003; Skinner & Pitzer, 2012). The differences are wide-ranging – the various models include a different number of domains, and different definitions of the domains themselves. Furthermore, various definitions include different items within the same domains. Moreover, some research addresses each of the domains separately, while other research suggests that the three domains of behavioural, emotional, and cognitive engagement are interrelated rather than operating independently (Fredricks et al., 2004). Thus, engagement as a multi-domain[1] construct is more likely to allow examination of the antecedents and consequences of behaviour, emotion, and cognition.

[1] The term "multi-domain" refers to the term "multi-dimensional", which is commonly used in the literature in order to avoid overlap with the statistical meaning terminology.

Although there is more diversity than similarity in the literature, in recent years consensus has been growing that student engagement is most cogently thought of as a complex construct comprising multiple domains – behavioural engagement, emotional engagement, and cognitive engagement (Fredricks et al., 2004). The current study follows the conceptualisation of student engagement with learning versus student disengagement with learning, focusing on students' active participation in academic activities in the classroom (Connell & Wellborn, 1991; Deci & Ryan, 1985; Ryan, Connell, & Deci, 1985; Ryan & Deci, 2000; Skinner, Kindermann, & Furrer, 2009a; Skinner, Marchand, Furrer, & Kindermann, 2008b; Skinner & Wellborn, 1994). The assumption underlying this concept is that high-quality learning is the outcome of behaviours and emotions (Skinner et al., 2009a), while recent development of this conceptualisation includes the cognitive domain as well (Skinner & Pitzer, 2012). Overall, the literature suggests three different levels of association between student engagement and academic achievement ; yet whether that association implies causality is unclear.

The research question

The main research question arising from the current literature is: To what extent do the three major student engagement domains (behavioural, emotional and cognitive) associated with student academic achievement in secondary schools and whether the relationship suggests causal effect of engagement on achievement. A secondary research question is: To what extent do factors such as school environment, teacher support, peer support, and student background confound the association between student engagement and academic achievement?

Understanding the nature of the relationship between student engagement and academic achievement may help provide educators with more effective approaches to teaching and with learning strategies to improve educational outcomes.

Outline of the thesis

Chapter 1 introduces the literature review and focuses on the strengths, limitations, and gaps in previous research that examined student engagement, measurement tools for student engagement, the three domains of student engagement, the relationship between student engagement and academic achievement and conceptual models for this topic.

Chapter 2 covers the development of the new measurement tool for student engagement, the ASE Scale, based on previous literature and two measurement tools: (1) The Engagement versus Disaffection Scale (EvD) (Skinner et al., 2008b); and (2) The School Engagement Measurement (SEM) (Fredricks, Blumenfeld, Friedel, & Paris, 2005). All 41 items of the ASE Scale were administered using a 6-point self-report frequency scale. The questionnaire also included demographic and background information about the ethnicity, country of birth, and languages spoken at home, along with socio-economic status (SES) (the questionnaire is attached in Appendix A).

A sample of 250 students from two urban secondary schools (Years 8 and 10) responded to the questionnaire. The new ASE Scale includes 21 items by five subscales; all had sufficiently high estimates of reliability (alpha estimates of reliability for each scale range were 0.79 to 0.90) and the final model (Figure 2.2, Chapter 2) has an acceptable fit. The five-factor model explains 60.5% of the variance.

Chapter 3 describes the second and main study, aimed at identifying the relationship between three domains of student engagement and academic achievement,

and whether the relationship suggests causal effect of engagement on achievement; controlled for selected potential confounders such as teacher support, peer support, school environment, and student demographic characteristics. The design of the main study included two points of data collection over one academic year (*before* and *after*) from student self-report questionnaires, and the students' achievement from the school database. The sample comprised three urban secondary schools (1,617 students from Year 7 to Year 9).

A series of three hierarchical multiple linear regressions models were conducted in order to examine the main goal of the current research. Unexpectedly, the overall and main findings from the second study were that although student engagement was positively associated with academic achievement, no supporting evidence for causal relationship was found. Those findings remained regardless of whether or not selected potential confounders such as teacher support, peer support, school environment, and background variables of the student were considered. Results also indicate that although school environment and gender have a small impact on the relationship between engagement and achievement, they are unlikely to be considered as confounders of the association.

In Chapter 4 the third study was undertaken, aimed at improving the ASE Scale by expanding each of the reduced factors. Results of the first and second studies (Chapters 2 and 3) suggested the new measurement tool for student engagement – the ASE Scale – would benefit from an improvement, by adding more items in four of the five factors. This process was based on new items that were added to the last wave of the data collection (a total of 44 items).

A sample of 1,945 students (Year 7 to Year 9) from four urban intermediate and secondary schools were participants in the third study. The final and improved ASE Scale includes 33 items, and shows the three domains demonstrated by five clear factors, with high-factor loadings on each, minimal cross-factor loadings, and no deviant items from the expected factors. In addition, each factor includes 5 to 8 items compared to 3 to 5 items before the scale was finalised. Furthermore, the final model (Figure 4.2, Chapter 4) has a good fit. These five subscales indicate high estimates of reliability, and provide evidence for meaningfully interpreting a sum of the items for each scale. Hence, the final and improved ASE Scale is ready for use and can contribute in future research. The main limitation of the current final ASE Scale is the lack of cognitive disengagement subscale in accordance with the two other domains. Thus, future work may consider further expansion of the Cognitive Engagement scale and Cognitive Disengagement scale by distinguishing them into two subscales that are more specific and defined.

The discussion in ***Chapter 5*** discusses the main findings of the research and the implications for theory and future research. As stated above, in contrast to the existing literature, the findings suggest that student engagement is positively associated with academic achievement, but no evidence supporting causal relationship was found. The discussion includes several suggested explanations for the contradictory findings – content and methodological.

Finally, the concluding comments deal with implications of the findings for policy makers, school principals and teachers, and for future research.

Chapter 1

Literature Review

There has been a growing interest in recent years, in the phenomenon of student engagement and the effect it has on academic achievement. It has been suggested that student engagement is a precursor to several key factors in a student's life and school performance, such as academic achievement, dropout rate, motivation in learning, student boredom, and disaffection (Appleton et al., 2008; Connell & Wellborn, 1991; Finn, 1989; Finn & Zimmer, 2012; Fredricks et al., 2004; Fredricks & McColskey, 2012; Goodenow, 1993b; Jimerson et al., 2003; Marks, 2000; Martin, 2009; Skinner, Kindermann, Connell, & Wellborn, 2009b; Skinner & Pitzer, 2012; Yazzie-Mintz, 2010). Moreover, engagement is considered a primary theoretical model for understanding the process of school dropout and is critically involved in promoting school completion with sufficient academic and social skills to partake in tertiary enrolment options and future employment options (Christenson & Thurlow, 2004; Christenson, Reschly, & Wylie, 2012; Finn & Zimmer, 2012).

The literature suggests that engagement decreases while disengagement increases throughout the school years (Fredricks et al., 2004; Hayam-Jonas & Friedman, 2000; Jimerson et al., 2003). It is important to note that disengagement is not only the opposite of engagement, as it refers to different actions and there is an added value in conceptualising and measuring disengagement (Furrer & Skinner, 2003), as will be

discussed extensively later in this chapter. According to these researchers, it is possible to identify negative feelings towards different subjects as early as the first year right through to the last year in secondary school, or until the student leaves school or drops out. The most notable changes appear to occur during the transitions from primary to intermediate school and from intermediate to high school (Wigfield et al., 2008), with 25% to 40% of students showing signs of disengagement (for example: uninvolved, apathetic, not trying very hard, and not paying attention) (National Research Council and the Institute of Medicine, 2003).

Substantial research has shown that different domains of engagement – behavioural, cognitive, and emotional – are positively associated with students' learning, grades, and academic achievement test scores. Such positive associations are also evident in patterns of attendance, retention, graduation, and academic resilience over the long term (Connell, Spencer, & Aber, 1994; Finn & Rock, 1997; Finn & Zimmer, 2012; Jimerson et al., 2003; Skinner et al., 2009b). Studies have also suggested that academic engagement serves as a protective factor against risky activities such as substance abuse, risky sexual behaviour, and delinquency (O'Farrell & Morrison, 2003). Thus, students who are engaged in school are both more successful academically and more likely to avoid some of the pitfalls of adolescence (Skinner et al., 2008b). Previous literature showed that student engagement has different positive outcomes, and the current study focused on the relationship between engagement and academic achievement, and whether the relationship suggests causal effect. There is no need to expand about the importance of academic achievement in the eyes of stakeholders and development policymakers from a wide range from educators through economist and other sectors (Fredricks et al., 2004; Glewwe & Kremer, 2006; Skinner et al., 2008b).

Hence, the following literature review will focus on the definitions of student engagement and its three domains – behavioural, emotional and cognitive – and the associations with academic achievement.

The definitions of engagement

Scholars have used a broad range of terms to define engagement, including: student engagement; school engagement; student engagement in school; academic engagement; engagement in class; engagement in schoolwork, and engagement in learning (Appleton et al., 2008; Fredricks et al., 2004; Fredricks & McColskey, 2012; Hayam-Jonas & Friedman, 2000; Jimerson et al., 2003; Skinner & Pitzer, 2012).

Over the years, many different conceptualisations and assumptions of what engagement is and what model can explain how it operates have arisen, as have the terms and different definitions used (Finn & Zimmer, 2012; Fredricks & McColskey, 2012; Skinner & Pitzer, 2012). Although there is more diversity than similarity, in recent years there has been a growing consensus that student engagement is most cogently thought of as a complex construct comprising multiple domains – behavioural engagement, emotional engagement, and cognitive engagement (Fredricks et al., 2004). At its most general, "engagement refers to the quality of a student's sense of connection or involvement with the endeavour of schooling and hence with the people, activities, goals, values, and place that compose it" (Skinner et al., 2009a, p. 494). Student engagement with academic work is defined, as part of the motivational conceptualisation, as constructive, enthusiastic, willing, emotionally positive, and cognitively focused participation in learning activities in school (Connell & Wellborn, 1991; Skinner et al., 2009b; Skinner et al., 2009a; Skinner & Pitzer, 2012). Engagement is also perceived as a set of relationships between: the student and the school

community; the student and adults at school; the student and peers; the student and instruction, and the student and the curriculum (Yazzie-Mintz, 2010). The combination of behaviour, emotion, and cognition with respect to the notion of engagement provides a richer characterisation of children's concepts and behaviours than is possible by examining these engagement domains individually or as dual components.

Behavioural engagement

There are several definitions for behavioural engagement. Some definitions focus on positive conduct, such as following the rules, adhering to classroom norms, and the absence of disruptive behaviour, such as truancy from school and classes or getting into trouble (Finn, Pannozzo, & Voelkl, 1995; Finn & Rock, 1997). Other definitions focus on participation in classroom learning and academic activities, and include behaviours such as effort, persistence, concentration, attention, asking questions, and contributing to class discussion (Birch & Ladd, 1997; Finn & Rock, 1997; Skinner & Belmont, 1993; Skinner et al., 2009a). A less common definition involves participation in a variety of extra-curricular school activities, such as sports or school governance (Finn, 1993; Finn et al., 1995).

Most definitions do not make distinctions between various types of behaviour such as participation in academic and non-academic activities at school. Research regarding classroom participation, however, found evidence of differences in classroom behaviour typology (Fredricks et al., 2004). For example, Finn (1989) defined participation using four levels, which range from responding to the teacher's directions to activities that require student initiative, such as involvement in extracurricular activities and student council. The assumption is that participation at the upper levels indicates a qualitative difference in engagement in terms of greater commitment to the

institution. Birch and Ladd (1997) separated cooperative participation, or maintaining classroom rules, from autonomy participation, or self-directed academic behaviours.

Emotional engagement

Emotional engagement primarily refers to students' affective reactions and feelings in the classroom, including interest, boredom, happiness, sadness, and anxiety (Connell & Wellborn, 1991; Skinner & Belmont, 1993). Some definitions refer to emotional reactions to the school and the teacher (Appleton, Christenson, Kim, & Reschly, 2006; Lee & Smith, 1995) while others conceptualise it as identification with school (Finn, 1989; Voelkl, 1997), or as belonging (that is, a feeling of being important to the school), and valuing it (that is, an appreciation of success in school outcomes). The definitions of emotional engagement emerge from earlier bodies of work on students' attitudes, which examined feelings toward school: liking or disliking school, the teacher, or the work; feeling happy or sad in school; or being bored or interested in the work (Fredricks et al., 2004). In addition, previous studies into students' motivation included similar constructs of emotions such as interest and value. Clearly, an overlap exists with the constructs used in research into motivation and into valuing and belonging, and the constructs used in emotional engagement definitions and research. While the definitions used in motivational and values literature outline finer distinctions between different types of the emotional component, the definitions used in engagement studies are less detailed and elaborate. For example, motivational studies of interest distinguish between situational and personal interest, and assume that interest is directed toward a particular activity or situation; while in contrast, the definitions in the engagement literature tend to be more general and not differentiated by domain or activity. Thus, the source of emotional reactions is not clear (Fredricks et al., 2004).

Cognitive engagement

The definitions of cognitive engagement emerged from two main bodies of literature. One is the psychological investment in learning, a desire to go beyond the requirements of school and showing a preference for challenge (Connell & Wellborn, 1991; Newman, 1989). This conceptualisation of cognitive engagement includes flexibility in problem solving, preference for hard work, and positive coping in the face of failure. Similar definitions of cognitive engagement encompass attention, concentration, focus, absorption, "head-on", mentally involved, participation, and a willingness to go beyond what is required (Skinner & Pitzer, 2012).

The learning literature, however, views cognitive engagement in terms of being strategic or self-regulating, and using meta-cognitive strategies to plan, monitor, and evaluate cognition when accomplishing tasks (Pintrich & De Groot, 1990; Zimmerman, 1990). In addition, the psychological investment in learning definitions are quite similar to constructs in the motivation literature, such as motivation to learn, learning goals, and intrinsic motivation (Fredricks et al., 2004; Harter, 1981). The motivation construct describes a student who is motivated to learn as valuing learning, and striving for knowledge and mastery in learning situations. Similarly, students who adopt mastery goals rather than performance goals are focused on learning, understanding, mastering the task, and trying to accomplish something that is challenging. Intrinsically motivated students prefer challenge and are persistent when faced with difficulty (Anderman & Maehr, 1994). Each of these concepts emphasises the degree to which students are invested in and value learning, and assume that the investment is related to, but separate from, learning strategies (Fredricks et al., 2004).

In the cognitive engagement definitions, an overlap with other domains can also be seen. Some of the definitions use the term "effort" and this is problematic in that both cognitive and behavioural engagement definitions include that term. Fredricks and colleagues (2004) signal the importance of the distinction that needs to be made between effort that is primarily behavioural, a matter of simply doing the work, and effort that is focused on learning and mastering the material.

It is important that no definition adequately deals with the entire qualitative aspects of engagement (Fredricks et al., 2004). Students may be both highly strategic and highly invested in learning; they may be strategic only when it is necessary to get good grades, not because they are motivated to learn; or they may be motivated to learn but lack the skills or knowledge as to how or when to use strategies. Thus, a more accurate and comprehensive definition would result if scholars integrated the specificity of cognitive processes provided by the self-regulated learning literature with definitions of psychological investment found in the motivational literature. Alternatively, another option is to build two subscales of the cognitive engagement domain: one including the psychological investment; the other including the self-regulated learning aspect in order to cover both aspects of cognitive engagement.

Student engagement and motivation

Like the engagement, motivation theories and definitions at times complement each other but some theories present contradicting concepts. Moreover, the concepts included in the three engagement domains overlap with some motivational constructs that have been studied previously (Fredricks et al., 2004).

Recent studies, suggest that engagement has considerable potential as a multi-domain construct that unites the three components in a meaningful way. In this sense,

engagement can be thought of as a "meta" construct. Moreover, a number of authors suggest that the term engagement should be reserved specifically for work where multiple components are present (Guthrie & Wigfield, 2000; Guthrie, Wigfield, & VonSecker, 2000; Wigfield et al., 2008).

From the very basic and simplest point of view, the Latin root of the word "motivation" means "to move"; hence, in this basic sense the study of motivation is the study of action (Eccles & Wigfield, 2002). On the other hand, at its most general, "engagement refers to the quality of a student's sense of connection or involvement with the endeavour of schooling and hence with the people, activities, goals, values, and place that compose it" (Skinner et al., 2009a, p. 494). Hence, the study of engagement is about commitment, or investment in learning in way that is more general.

Modern theories of motivation focus more specifically on the relation of beliefs, values, and goals with action. In the developmental and educational psychology theories, it has a unique and particular emphasis on achievement motivation. It becomes more complicated when the relationship between motivation and engagement are being examined.

Briefly, this complexity of definitions include scholars who consider motivation and engagement as synonyms and use the words interchangeably (for example, National Research Council and the Institute of Medicine, 2003). While other, that make an overlap definitions (for example, Harter, 1981), between engagement and motivation, or that measure motivation and engagement in the same scale (for example, Martin, 2007, 2008; Martin, 2009). Other theories differ between them and showing different associations between them (Skinner & Pitzer, 2012) .

As noted above, the difference in the definition, also reflect on the items of the measurement scales. It seems to be that motivational studies outline finer distinctions between different types of the equivalent construct of behavioural, emotional and cognitive domains, and other domains as attitude and belief. While the definitions used in engagement studies are broader and less detailed. For example, motivational studies of interest distinguish between situational and personal interest, and assume that interest is leads toward a particular activity or situation; while in contrast, the definitions in the engagement literature tend to be more general (Fredricks et al., 2004).

This complexity of associations between engagement and motivation is beyond the scope of the current study, which focuses on the investigation of the associations between engagement and academic achievement.

The conceptualisation of engagement and disengagement

Engagement and disengagement conceptualisation is based on the argument that the opposite of engagement, that is, alienation, seems to reflect more than a lack of engagement (Jimerson et al., 2003). Hence, disengagement refers to the occurrence of behaviours and emotions that reflect maladaptive learning states and signifies more than the absence of engagement. Disengagement has both a behavioural component, including passivity and withdrawal from participation in learning activities; and an emotional component, including boredom, anxiety, and frustration in the classroom. Previous psychometric works have suggested that a construct of four factors of classroom engagement, namely, behavioural and emotional engagement and behavioural and emotional disengagement, are structurally distinguishable and provide more meaningful interpretation of this phenomenon (Furrer, Skinner, Marchand, & Kindermann, 2006, March; Skinner et al., 2009a).

The current study combines two ways of conceptualising student engagement. The first is based on the definition of student engagement as a meta-construct that includes three domains – behavioural, emotional and cognitive engagement (Fredricks et al., 2004). The second one is derived from the conceptualisation of engagement versus disengagement, which focuses on students' active participation in academic activities in the classroom (Connell & Wellborn, 1991; Deci & Ryan, 1985; Ryan et al., 1985; Ryan & Deci, 2000; Skinner et al., 2009a; Skinner et al., 2008b; Skinner & Wellborn, 1994). The assumption underlying this theory is that high-quality learning is the outcome of behaviours and emotions[2] (Skinner et al., 2009a). Thus, the current study conceptualisation of engagement (Table 1.1) based on two different tools – engagement and disengagement in the classroom, based on Skinner and Pitzer (2012, p. 25) and cognitive engagement from Fredricks and her colleagues (2005, p. 319).

The complexity of the engagement model definition

There are many different definitions of the engagement model, each of which includes a different number of domains, and sometimes even different definitions of the domains themselves. Moreover, some research addresses each of the domains separately, while other research suggests that the three domains of behavioural engagement, emotional engagement, and cognitive engagement are interrelated rather than operating independently (Fredricks et al., 2004). At best, most agree that engagement as a meta-construct of three domains is more likely to allow examination of the antecedents and consequences of behaviour, emotion, and cognition.

[2] At the time that the current study was designed and conducted, the construct of Skinner and her team included only the behavioural and emotional domains. Later on, they developed and published a full model which includes the cognitive domain as well (Skinner & Pitzer, 2012).

Table 1.1

The conceptualisation of student engagement with learning in the classroom

The dimension	Engagement	Disengagement
Behaviour	Action initiation	Passivity, procrastination
	Effort, exertion	Giving up
	Working hard	Restlessness
	Focus, attention	Unfocused, inattentive
	Intensity	Distracted
	Persistence	Mentally withdrawn
	Concentration	Burned out, exhausted
	Involvement	Absent
Emotion	Enjoyment	Feeling bad
	Satisfaction	Sadness
	Feel welcome	Uncomfortable
	Enthusiasm	Boredom
	Interest	Disinterest
	Involvement	Unattached, disconnected
	Pride	Worry, anxiety
Cognition	Desire to go beyond the requirements	
	flexibility in problem solving	
	Preference for hard work	
	Mentally involved	
	Purposeful approach	
	Goal striving	
	Strategy search	
	Willing participation	
	Preference for challenge	
	Thoroughness	

* Based on Skinner et al (2008b) and Fredricks et al. (2005).

In previous years, some scholars defined a two-domain model of engagement that includes behaviour (for example, participation, effort, positive conduct) and emotion (for example, interest, belonging, value, positive emotions) (Finn, 1989; Marks, 2000; Skinner et al., 2009b), while others outlined a two-domain model that includes cognitive and psychological domains (Appleton et al., 2006). Some studies conceptualised a four-domain model: academic, behavioural, cognitive, and psychological engagement (subsequently referred to as affective or emotional) (Appleton et al., 2008; Reschly, Huebner, Appleton, & Antaramian, 2008). In the four-domain model, aspects of behavioural engagement are divided into two different components: academic (which as cognitive engagement includes time on task, credits earned, and homework completion); and school behaviour (which includes attendance, class participation, and extracurricular participation).

Emerging from these different approaches, in recent years there has been a growing consensus regarding a three-domain concept of student engagement that includes behavioural, emotional, and cognitive domains (Fredricks et al., 2004; Fredricks & McColskey, 2012; Jimerson et al., 2003; Wang & Eccles, 2011a; Wang & Holcombe, 2010; Wigfield et al., 2008; Yazzie-Mintz, 2010). This model has emerged from different lines of theory and practices, however. These include research on participation and motivation for learning (Connell, Halpem-Felsher, Clifford, Crichlow, & Usinger, 1995; Martin, 2009; Skinner et al., 2009b). Other research has emerged from behavioural practice and includes a focus on student achievement (Finn, 1989; Finn & Rock, 1997; Finn & Voelkl, 1993) or a sense of relatedness to school (Finn & Voelkl, 1993; Voelkl, 1997).

Such variation in approach has led to differences in how the three domains have been conceptualised over time (Appleton et al., 2008; Fredricks et al., 2004; Jimerson et al., 2003). As a result, there is little consistency across definitions, theories and methodologies related to engagement (Appleton et al., 2008; Finlay, 2006; Fredricks et al., 2004; Fredricks & McColskey, 2012; Jimerson et al., 2003; Skinner et al., 2009b).

Although the degree of agreement regarding the meta-structure of student engagement has been growing in recent years, there is still little research that includes all three domains of behavioural, emotional and cognitive engagement. Thus, it was suggested that further theoretical and empirical work is needed to investigate this meta-construct and the extent to which these three domains affect academic achievement – henceforth referred to as "achievement" – in a comprehensive model that considers the internal interactions within the three domains (Fredricks et al., 2004; Skinner & Pitzer, 2012). Moreover, even when scholars have similar conceptualisations of engagement or the domains, there has been considerable variability in the subscales and in the variability of the content of items used in instruments to measure engagement. Thus, the ability to learn and develop a coherent theory leading to an agreed practice becomes very difficult (Appleton et al., 2008; Eccles & Wang, 2012; Fredricks et al., 2004; Fredricks & McColskey, 2012; Jimerson et al., 2003).

The classification of engagement into three domains is not intended to imply a definitive separation, because *"these factors are dynamically interrelated … they are not isolated processes"* (Fredricks et. al, 2004, p. 61). Instead, the classification aims to conceptualise "engagement" as a whole as a multi-faceted construct. Although it might be expected that these components would be highly associated with each other, they may also be related to student academic achievement.

The relationship between the three domains of engagement and academic achievement

A plethora of research reports different kinds of relationships between the three engagement domains (behavioural, emotional, and cognitive) and academic achievement. This section will outline what is reported in the literature, distinguishing three levels of relationship – correlations, prediction, and causality – for each engagement domain and academic achievement. Table 1.2 summarises the main findings from the literature and shows that the current literature suggests associations do exist between student engagement and academic achievement; however, whether that association suggests causality is unclear.

The relationship between behavioural engagement and academic achievement. Behavioural engagement has been found to be a strong predictor of student learning, grades, achievement, and school retention; while disengagement has been found to be a strong predictor of poor grades, low achievement test scores, and eventual dropout (Fredricks et al., 2004; Skinner et al., 2009a; Skinner et al., 2008b).

As described in Table 1.2, several studies have demonstrated a positive correlation between *behavioural engagement* and achievement (for example, standardised tests, grades) for elementary[3], middle, and high school students (range r .13 to .59, $p < .01$) (Connell et al., 1994; Connell & Wellborn, 1991; Furrer & Skinner, 2003; Marks, 2000; Skinner & Belmont, 1993; Wang & Holcombe, 2010). Discipline problems, which were identified as behavioural disengagement, have also been

[3] The terms *elementary* and *primary*, both refer to the earlier school years – the first is more common in the USA and the second is more common in New Zealand.

Table 1.2

Summary of engagement domain association with academic achievement in the literature

Engagement domain	Academic achievement	Association with achievement	Population	Reference
Total engagement				
Combined measurement of behavioural and emotional engagement	Positive outcomes (combined variable of attendance , reading and maths standardised test	r = 0.23***, 0.18**, 0.51***	3 samples of African–American at risk in Y6 to Y8, age 12–16 (215, 399, 140 students)	(Connell et al., 1994)
Combined measurement of behavioural and emotional engagement	Educational risk behaviour (combined variable of attendance, reading, maths, age and academic success)	T1 vs T2 and Gender r = –0.14* Male, –0.15* Female r = –0.19** Male, –0.20** Female	443 African-American students, Grade 7–9	(Connell et al., 1995)
Combined measurement of behavioural and emotional engagement	Grade Point Average (GPA) (average of English and maths)	r = 0.28**	641 students of elementary school, Y3–Y6	(Furrer & Skinner, 2003)
Combined measurement of behavioural and emotional engagement	Positive outcomes (combined variable of attendance, reading, maths, age and academic success)	Beta 0.18**, R^2 = 0.08 Beta 0.13*, R^2 = 0.09 Beta 0.55**, R^2 = 0.32	3 samples of African-American students at risk in Y6 to Y8, age 12–16 (215, 399, 140 students)	(Connell et al., 1994)
Behavioural engagement				
Behavioural	Student achievement (reading and maths)	Effort r = 0.54*** , 0.53*** Initiative r = 0.55*** , 0.57*** Disruptive r = –0.25*** , –0.24*** Inattentive r = –0.47***, –0.49***	1,013 students of elementary school, Y4	(Finn et al., 1995)
Behavioural	GPA (average of English and maths)	r = 0.33**	641 students of elementary school, Y3–Y6	(Furrer & Skinner, 2003)
Behavioural (school participation)	GPA (average of English, maths, science, social sciences)	r = 0.17**	1,046 students of Grade 8	(Wang & Holcombe, 2010)
Behavioural	Student achievement (reading and maths)	Compliant-Noncompliant Effect size d = 0.66*** , 0.72*** Disruptive-Inattentive Effect size d = 0.52*** , 0.47***	1,013 elementary school, Y4	(Finn et al., 1995)

Table 1.2 continued

Engagement domain	Academic achievement	Association with achievement	Population	Reference
Behavioural (school participation)	GPA (average of English, maths, Science, and social sciences	Beta 0.13* R^2 = 0.35	1,046 students of Grade 8	(Wang & Holcombe, 2010)
Emotional engagement				
Emotional	GPA (average of English and maths)	r = 0.19**	641 students of elementary school, Y3–Y6	(Furrer & Skinner, 2003)
Emotional	GPA	r = 0.27***, 0.33***	454 middle school Y6–Y8	(Goodenow, 1993b)
Emotional (school identification)	GPA (average of English, maths, science, and social sciences	r = 0.23**	1,046 students of Grade 8	(Wang & Holcombe, 2010)
Emotional (school identification)	GPA (average of English, maths, science, and social sciences	Beta 0.32** , R^2 = 0.64	1,046 students of Grade 8	(Wang & Holcombe, 2010)
Cognitive engagement				
Cognitive	Student achievement (calculated measurement includes several components)	Study I & Study II: r = 0.40** , 0.28** self-regulation r = 0.26** , 0.18 deep processing r = 0.17 , 0.16 shallow process r = 0.36**, 0.40** persistence	297 students of one High school	(Miller, Greene, Montalvo, Ravindran, & Nichols, 1996)
Cognitive (self-regulation strategies)	GPA (average of English, maths, science, and social sciences	r = 0.18**	1,046 students of Grade 8	(Wang & Holcombe, 2010)
Cognitive (self-regulation strategies)	GPA (average of English, maths, science, and social sciences	Beta 0.17** , R^2 = 0.42**	1,046 students of Grade 8	(Wang & Holcombe, 2010)

associated with lower school performance across grade[4] levels (Alexander, Entwisle, & Horsey, 1997; Finn et al., 1995; Finn & Rock, 1997); Behaviour (effort and initiative) was found to be significantly correlated with achievement (range r .18 to .59) (Finn et al., 1995). It is important to note that in some of the studies, behavioural engagement was measured as part of a measurement of behavioural and emotional engagement combined into one factor. Previous studies also identified associations between suggested student engagement and academic achievement (range R^2 .08 to .32, f^2 .09 to .47, β –.17 to .55, $p < .01$) (Connell et al., 1994; Fredricks et al., 2004; Wang & Holcombe, 2010). Yet, little is known about the causal effects of behavioural engagement on academic achievement (Connell et al., 1995; Fredricks et al., 2004). The limitations with these findings are that although there is much evidence of the association and the prediction between behavioural engagement and achievement, there is a gap in the knowledge regarding the causal effects of behavioural engagement on achievement (Connell et al., 1995; Finn & Rock, 1997; Marks, 2000).

The relationship between emotional engagement and academic achievement. Less evidence has been found about the relationship between *emotional engagement* and academic achievement (Appleton et al., 2006; Connell et al., 1994; Skinner et al., 2008b; Skinner, Wellborn, & Connell, 1990; Wang & Holcombe, 2010). Several works based on motivational theories suggest links between individuals' psychological needs for social connection and their achievement motives (Goodenow, 1993b). In addition, some studies show positive correlations between achievement and a combined measure of emotional and behavioural engagement (range r .18 to .51, $p <$ .01) (Connell et al., 1994; Skinner et al., 1990; Wentzel, 1998). However, because the

[4] The terms *Grade* and *Year level* are used in accordance with the original report of the research – usually, the term *grade* is used in USA schools and the term *Year level* in New Zealand schools.

different types of engagement – behavioural and emotional – have been combined it is difficult to understand the discrete contribution of emotional engagement to academic outcomes. Some researchers defined emotional engagement as school identification, measured by "school valuing" and "school belonging", which was weakly but significantly correlated with achievement (range r .07 to .10, $p < .05$) (Voelkl, 1996, 1997). A later study reported emotional engagement, defined as school identification, affected Grade Point Average (GPA) ($R^2 = .64$, $\beta = .32$, $p < .01$) (Wang & Holcombe, 2010).

The limitations with these findings are similar to those discussed above regarding behavioural engagement. There are relatively few empirical studies measuring the association between emotional engagement and academic achievement, and although some associations have been suggested, little is known about the causal effect of emotional engagement on academic achievement.

The relationship between cognitive engagement and academic achievement. Numerous studies show a positive correlation between cognitive engagement and achievement (Appleton et al., 2006; Fredricks et al., 2005; Green, Martin, & Marsh, 2007; Marks, 2000; Wang & Holcombe, 2010). For example, the factors of future aspirations and goals and extrinsic motivation were positively correlated with GPA in the expected positive direction ($r = .25$ and .19, respectively, $p < .05$) (Appleton et al., 2006). The evidence regarding positive correlation between cognitive engagement and achievement is varied. For example, in one study, four scales of cognitive engagement (self-regulation, deep processing, shallow processing, and persistence) were found to positively correlate with achievement (range r .26 to .40, $p < 0.01$), while in other studies there was no statistically significant correlation (Miller et al., 1996). In a later

study, Wang and Holcombe (2010) also found cognitive engagement, defined as using self-regulation strategies, had a low correlation with achievement ($r = .18$, $p < .01$) and effect on GPA ($R^2 = .42$, $\beta = .17$, $p < .01$). One limitation with the measurement of the cognition domain was that most of the studies measured only one aspect (for example, strategy use, problem-solving, preference for hard work, etc.). Nonetheless, to date little is known about the causal effect of cognitive engagement on academic achievement.

The relationship between engagement as a multi-domain construct and academic achievement. In more recent years, few studies have included all three domains of engagement – behavioural, emotional and cognitive – as a multi-domain construct and their impact on academic achievement (see Finlay, 2006; Fredricks et al., 2005; Martin, 2007, 2009; Wang & Holcombe, 2010; Wang, Willett, & Eccles, 2011b; Yazzie-Mintz, 2010), and no consistency is demonstrated. The correlations and association between student engagement factors and achievement have been found to range widely. Some research found that behavioural (school participation), emotional (school identification), and cognitive (use of self-regulation strategies) factors were positively associated with GPA ($R^2 = .41$, $f^2 = .69$; $\beta = .13$, .32, and .17, respectively) (Wang & Holcombe, 2010); whereas in other studies, some of the student engagement factors did not have statistically significant positive correlations with GPA (Finlay, 2006). Findings from the Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) 2000 (Willms, 2003) concludes that contrary to previous findings, engagement is not a predictor of academic success (Willms, 2003; Zyngier, 2008). The OECD research examined student engagement by sense of belonging and participation in school. The prevalence of students with a low sense of belonging in most countries did not differ substantially

from the OECD average (24.5%). New Zealand's prevalence was found to be below (21.1%), but with no statistically significant difference from the OECD average. However, the prevalence of students with low participation varies more among countries than the prevalence of students with a low sense of belonging. While the average level of low participation students among OECD countries is 20.0%, New Zealand (26.9%) is one of six countries that had average scores above 25%. In addition, findings from the OECD research PISA 2000 (Willms, 2003) show that the relationships between sense of belonging and three measures of literacy performance (reading, maths and scientific literacy) are very weak (ranging from r = .04 to .06); while the relationships between participation and academic performance are somewhat stronger, but still weak (ranging from r = .13 to .14). Such moderate findings suggest that there are many students with high achievement who are not engaged and vice versa (Willms, 2003). Another recent research that showed lack of correlation between engagement and achievement is a national research of Canadian middle and secondary schools (Dunleavy, Willms, Milton, & Friesen, 2012). Contrary to their expectations to find correlation between level of engagement and achievement, the findings indicate that many students were engaged in school but few were engaged in their learning. Moreover, they found that many students performed well in their courses without being intellectually engaged (Dunleavy, Milton, & Willms, 2012; Dunleavy, Willms, et al., 2012; Willms & Friesen, 2012; Willms, Friesen, & Milton, 2009).

Recent findings from a longitudinal study in New Zealand about trajectories and patterns of student engagement (Wylie & Hodgen, 2012) defined five engagement trajectory groups and found different trends. The high engagement trajectory group had above average mean scores on the cognitive competency composite measure that was

comprised of standardised measures of reading, writing, maths and the Raven's Standard Progressive Matrices. Although there was an almost linear relationship between the five engagement trajectory patterns (at low, middle and high levels) and school achievement, the high engagement group *was not* clearly distinct from the other groups. In addition, the correlation between school belonging and engagement in schoolwork, was higher (0.58). Thus, while a linear association for a 16 year-old student who was comfortable in the school environment and also putting energy into the work of learning was expected, it did not always follow, and vice versa. Moreover, belonging in school had a much lower correlation with performance on the first level of NCEA[5] than did student engagement in schoolwork (0.36 compared to 0.57) (Wylie & Hodgen, 2012).

Overall, the lesson learnt from Table 1.2 and the literature presented above is that the current literature suggests ample evidence regarding positive associations between student engagement and academic achievements. Studies have investigated the causality between student engagement and academic achievement, yet are much fewer (Connell et al., 1994; Goodenow, 1993a; Miller et al., 1996; Wang & Holcombe, 2010).

The "inter-relationship" between the three domains of engagement. Inter-relationship refers to the associations and effects that may be found between the three domains of engagement themselves (Skinner et al., 2008b). For example, it can be expected that emotional engagement may affect behavioural engagement and/or cognitive engagement. Research concerning the "inter-relationship" between the emotional and behavioural engagement domains (Goodenow, 1993a; Ryan, Stiller, & Lynch, 1994; Skinner et al., 2008b), indicated that emotional engagement significantly

[5] New Zealand's National Certificates of Educational Achievement (NCEA) are national qualifications for senior secondary school students. This is a criterion-referenced high school qualification, with three levels. Level 1 is usually the goal of Year 11 students (aged 14–15); Level 2 usually the goal of Year 12 students (aged 15–16); and Level 3 the goal of Year 13 students (aged 17–18).

predicted improvements in behavioural engagement and declines in behavioural disaffection (.24 and –.11, $p < .001$, respectively). Moreover, behavioural engagement and disaffection had little influence on changes in emotional engagement and disaffection (.10 and .14, $p < .001$, respectively) (Skinner et al., 2008b). Another aspect of emotional engagement is a sense of belonging or psychological membership in school, which was only weakly associated with measures of effort or behaviour (range *r* .14 to .23) and so limits the validity of causal conclusions. Longitudinal studies would be useful in determining more clearly the causality in this process (Goodenow, 1993b).

Limited evidence exists regarding the correlations between the emotional and cognitive domains (range *r* is .20 to .47) (Appleton et al., 2006). Overall, it seems that less is known about the inter-relationship between the behavioural and cognitive engagement domains.

Potential confounding variables of the association between student engagement and achievement

A confounder is a variable impact on the association between two other variables (the dependent and the independent variable). The confounding hypothesis suggests that a third variable explains some of the relationship between an independent and a dependent variable (MacKinnon, Krull, & Lockwood, 2000). For example, if behavioural engagement increases the likelihood of finding high achievement, and this likelihood is OR (odds ratio) = 2.5 among males and OR = 0.80 among females, then gender is a confounder of the association between behavioural engagement and achievement. In addition, the proportion of males in the sample will determine the overall OR.

As the main goal of the current research is to identify the relationship between student engagement and academic achievement, and whether the relationship suggests causal effect, it is important to control for potential confounding variables in the model that may be related to both engagement and academic achievement. The potential confounders may predict academic achievement and be associated with engagement at the same time (Sinclair, Christenson, Lehr, & Anderson, 2003; Skinner et al., 2008b; Skinner & Pitzer, 2012). Different studies identified four variables as the main potential confounders on this association between engagement and academic achievement: school environment; teacher support, peer support; and student background variables (for example, gender, ethnicity and SES), and they will be discussed in this section.

In addition, it is important to highlight the difference between the indicators of the three domains' content and variables that can influence student engagement. It is the differentiation between *indicators* and *facilitators*. As defined by Sinclair et al (2003, p. 30): "*indicators* are markers or descriptive parts *inside* a target construct, whereas *facilitators* are explanatory causal factors, *outside* that target construct, that have the potential to influence the examined target factor" (Sinclair et al., 2003; Skinner et al., 2008b; Skinner & Pitzer, 2012). Thus, the current research will consider the impact of those four selected potential confounders on the student engagement model.

The school environment. The literature concerning the school environment as a factor associated with student engagement and with academic achievement is varied and even contradictory. Previous studies suggest that different variables of school environment have a positive effect on academic achievement (Hattie, 2009a) and student engagement (Fredricks et al., 2004). For example, it was suggested that classroom behaviour, classroom climate, peer influence, and school leadership and

principal (effect size, Cohen's *d* of .80, .52, .34, and .36 respectively) had substantial impacts on student achievement (Hattie, 2009a). With regards to the association between school environment or school characteristics and engagement, most of the evidence refers to behavioural engagement (Fredricks et al., 2004). School size was found as having an impact on behavioural and emotional engagement (Finn & Voelkl, 1993), while other research shows a curve linear relation; that is, in general, the findings have supported making high schools smaller than they are, but not so small that they cannot offer a reasonable curriculum to their students (Lee & Burkam, 2003). It is noted that in research including three schools, some positive correlations between different domains of student engagement with GPA were found in some of the schools (range *r* .34 to .43, $p < .05$), while in other schools none of the engagement domains were correlated with GPA (Finlay, 2006). A recent national survey in New Zealand (Darr, 2012) showed differences between schools in levels of perceived engagement. In addition, Darr suggested that there is also large amount of variance *within* schools, at the class level, that may be explained by differences in teaching methods. Modest but consistently positive effects of some school characteristics (for example, size) and restructuring practices (for example, schools with traditional practices versus schools with restructured practices) were found for both achievement and engagement (Lee & Smith, 1993, 1995).

Teacher support. Teacher support can be academic, social or interpersonal (Wentzel, 1997). Some studies do not make this distinction and combine items of different domains into the same scale. Although the number of scales is varied, the content is more similar. Skinner and Pitzer (2012) defined three important qualities of student–teacher interactions as "pedagogical caring", which supports experiences of

relatedness; "optimal structure" which facilitates competence; and "autonomy support", which promotes self-determined motivation (Skinner & Pitzer, 2012). Wentzel and colleagues (2010) defined four dimensions of teacher support: (1) communication of expectations and values; (2) providing help, advice, and instruction; (3) creating a safe environment; and (4) providing emotional support. Other definitions tend to include a number of different variables of the teacher and student relationships, such as non-directivity, empathy, warmth, encouragement of high-order thinking, respect, level of involvement, and knowledge about the student and his or her needs (Hattie, 2009a).

Previous studies suggest that the quality of the student–teacher relationship is a key predictor of academic engagement, effort in the classroom, liking school, and achievement expectations (Birch & Ladd, 1997; Goodenow, 1993b; Skinner & Belmont, 1993). Longitudinal studies show that students who experience student–teacher interactions characterised by high levels of warmth and support, or low levels of conflict, gain more in achievement (Connell et al., 1995; Hamre & Pianta, 2001; Skinner, Chapman, & Baltes, 1988; Skinner et al., 2009a; Skinner et al., 2008b). Teacher social support predicts a range of indicators of behavioural, emotional, and cognitive engagement (Wang & Holcombe, 2010). Students who feel supported socially by teachers tend to exhibit greater compliance with a teacher's expectations, which in turn should reduce their involvement in distractive and deviant behaviours (Birch & Ladd, 1997). Positive student–teacher relationships are documented as having positive interactions with a motivation for learning, and with engagement in learning activities (Ryan et al., 1994; Skinner & Belmont, 1993).

Positive correlations were found between teacher support and student engagement (range r .08 to .78, $p < 0.5$) (Connell et al., 1995; Hamre & Pianta, 2001;

Skinner et al., 1988; Skinner et al., 2009a; Skinner et al., 2008b), as well as causal effects of teachers on learning and students' achievements (about 30% of the variance) (Hattie, 2003). Teacher support was reported as having an effect on engagement, and as a total effect of relatedness (that is, teacher support, peer support and parent support) was high both for behavioural and emotional engagement (R^2 = .33, f^2 = .49, R^2 = .39, f^2 = .64, respectively) (Furrer & Skinner, 2003). The unique contribution of teacher support to behavioural and emotional engagement, however, was found to be very low (R^2= .05, f^2 = .05, R^2= .14, f^2 = .10, $p < .01$, respectively) (Furrer & Skinner, 2003). Furthermore, seven domains for the teacher and their teaching were found to be among the top 10 influential factors on achievement (range d = .90 to .67) (Hattie, 2009b).

On the other hand, other findings suggest that there are dimensions of the student–teacher relationship, which lead to negative correlations with achievement. For example, directly controlling teacher behaviours are found to have negative effects on the emotions, motivational orientations, and engagement styles of both girls and boys (Assor, Kaplan, Kanat-Maymon, & Roth, 2005).

Contradictory findings were also reached regarding teacher social support (Wang & Holcombe, 2010). As expected, it was found that teachers can best promote students' positive identification with school and stimulate their willingness to participate in their tasks by offering positive and improvement-based praise, and emphasising effort while avoiding pressuring students for correct answers or high grades (mastery goal structure). However, contrary to Wang and Holcombes' expectations and other studies of the effect of teacher support on students' cognitive engagement, teacher social support was not associated with students' use of self-regulation strategies.

In summary, there are robust findings on the association between the teacher–student relationship and both engagement and achievement, and therefore the importance of including teacher support as one of the four selected potential confounders is highlighted.

Peer support. The importance of peer social support as a critical variable during adolescence has been well documented, both for students' experience at school and for their well-being (Connell & Wellborn, 1991; Furrer & Skinner, 2003; Levy-Tossman, Kaplan, & Assor, 2007; Wang & Eccles, 2012, 2013; Wentzel, Battle, Russell, & Looney, 2010). Although previous studies highlight negative developmental influences from friends, in recent years an increasing amount of research shows that children's relationships with peers in school can also exert positive effects on academic development, particularly school motivation and achievement (Skinner & Pitzer, 2012; Wang & Eccles, 2012).

The quality of peer support and relationships was found to be a key predictor of academic engagement, effort in the classroom, liking school, and achievement expectancies (Birch & Ladd, 1997; Goodenow, 1993b; Skinner et al., 2008b; Stewart, 2008). Positive correlations have found between peer support and academic achievement (range r = .06 to .38, $p < 0.5$) (Birch & Ladd, 1997; Goodenow, 1993b; Skinner et al., 2008b; Stewart, 2008).

Positive peer support was found to be a predictor of academic achievement, although the effect was low (R^2= .09, f^2 = .10, $p < .05$) (Stewart, 2008). In addition, as noted above, peer support was reported as having an effect on engagement, as part of the total effect of relatedness (for more details see above regarding teacher support); however,

the unique contribution of peer support to behavioural and emotional engagement was low (Furrer & Skinner, 2003).

In summary, there are many findings about the associations between peer support and both engagement and achievement and therefore it is important to include peer support as one of the four selected potential confounders in the current study.

Student background variables Student background variables, including gender, ethnicity, and socio-economic status of the student, are the main variables found in the literature as having an association with or impact on achievement or engagement, and so they were included in the current study.

Gender. Previous research has shown positive associations between engagement and gender of the student at all grade levels in elementary, middle, and high school; girls consistently report higher academic engagement than boys (Alexander et al., 1997; Bowen & Richman, 2010; Connell et al., 1995; Finn, 1989; Finn & Cox, 1992). For example, girls from third to sixth grades reported significantly higher engagement than did boys, for both behavioural engagement (M = 3.34 vs 3.18, $p < .001$) and emotional engagement (M = 3.16 vs 3.06, $p < .05$) (Furrer & Skinner, 2003). Similarly, another study (Skinner et al., 2008b) reported girls with significantly higher engagement for both behavioural (M = 3.47 vs 3.31, $p < .001$) and emotional engagement (M = 3.09 vs 2.96, $p < .01$); and lower behavioural disengagement (M = 1.87 vs 2.06, $p < .001$). However, girls were found to be non-significantly higher for emotional disengagement than boys (M = 2.17 vs 2.19, $p > .05$) (Skinner et al., 2008b). Another piece of research (Fredricks et al., 2005) conducted in primary school with third to fifth grade students reported higher behavioural engagement for girls than boys (M = 4.18 vs 3.76, $p <$ .001), higher emotional engagement (M = 3.89 vs 3.60, $p < .01$) and higher cognitive

engagement (M = 3.60 vs 3.36, $p < .01$). More recent research (Wang & Eccles, 2012) found that although girls tended to report higher levels of engagement in the seventh grade, girls and boys reported similar decline rates on the three domains of engagement toward the 11th grade. Similar results were also reported in recent research conducted in New Zealand (Darr, 2012). Although girls at Year 7 tended to report higher levels of engagement than boys did, engagement for both boys and girls declined from Year 7 to Year 10, to the point that the median engagement scores were almost the same at Year 10 for both girls and boys.

In addition, gender differences regarding engagement were found for one of the important confounders – the sense of relatedness towards the teacher. For example, in a study that examined the sense of relatedness as a predictor of engagement and learning it was found that although no significant differences were found between boys and girls on mean levels of relatedness to parents and peers, girls reported significantly more relatedness to their teachers than did boys (M = 3.20 vs 2.96, $p < .001$) (Furrer & Skinner, 2003). Moreover, unexpectedly, the effect of relatedness to teacher on engagement was higher for boys (average β = .42) than for girls (average β = .24), although there was also a significant effect for girls.

Ethnicity. Reviews of psychological, sociological, and educational literature confirm positive correlations between family demographic characteristics and school performance and adjustment (Connell et al., 1995; Sugland et al., 1995). In addition, family poverty, ethnicity and household composition has been positively associated with academic achievement (Alexander et al., 1997). Thus, those variables can be confounders when investigating the effect of student engagement on academic achievement.

Ethnicity was found to be a predictor of students' level of engagement (Connell et al., 1995; Finn & Cox, 1992). A study that examined the associations between student engagement and achievement in maths across five different racial groups (Indian, Asian, Black, Latino, and White) (Sciarra & Seirup, 2008) shows that for all five racial groups, the overall combination of engagement variables was significantly related differentially to maths achievement scores. In addition, the strength of the positive correlation between the three domains (behavioural, emotional, and cognitive) of engagement and maths grades were different and dependent on the racial groups. Regression analysis showed the levels of engagement across all three engagement domains were significant predictors for maths achievement scores in the Latino and White ethnicities; in contrast, only the behavioural and cognitive engagement domains were significant predictors in maths achievement scores for Indian, Asian, and Black ethnicities. The variance in the model for all three engagement domains (behavioural, emotional, and cognitive) as a predictor of maths achievement scores ranged from 7% for Black and Latino ethnicities up to 21% for the Indian ethnicity. For the Asian and White ethnicities, variance was 11% and 14% respectively (Sciarra & Seirup, 2008).

Recently, research conducted in New Zealand – the "Me and my school survey" – showed a lower median score for perceived engagement among Māori compared to other ethnicities (NZ European, Pacific Island, and Asian) at Years 7 and 8, and a much larger drop for Māori than for other ethnic groups at Years 9 and 10 (Darr, 2009, 2012).

Socio-economic status. Socio-economic status (henceforth 'SES') has been found to be positively correlated with engagement among elementary, middle, and high school students. Students with a higher level of SES have higher levels of engagement (r range –.01 to .13, $p < .05$) (Connell et al., 1995; Finn, 1989; Finn & Cox, 1992). A

study that examined family circumstances as a precursor to high school dropout, by tracking the educational progress from first grade over 14 years, found that SES has a statistically significant effect on dropout and level of disengagement ($R^2 = 0.22$, $\beta = .18$, $p < .01$) (Alexander et al., 1997). In addition, a number of background factors related to SES were found to influence a student's dropout rate and engagement, and thus SES has an impact on academic achievement potential (Alexander et al., 1997). It was found that coming from a low SES family, being born to a young mother, being male, living in a solo parent household, and having relatively many siblings all increase the risk of dropout. Moreover, SES was the only variable from the background characteristics cluster that retained its significance when all predictors were included in the regression. Furthermore, family context variables such as disruptive family changes (like divorce), as well as changing schools in the first grade without adequate parental support, are significant predictors for school dropout and thus low academic achievement (Alexander et al., 1997). Over the years, it has become more apparent that SES is primarily a distal factor, a latent construct that acts as proxy for other variables that are more likely to directly affect literacy and academic development at both the individual and school level (Buckingham, Wheldall, & Beaman-Wheldall, 2013). A research synthesis by Hattie (2009) includes two meta-analyses of studies on the home learning environment of school-age children and its impact on achievement. The estimated effect size of the meta-analyses of home environment on academic achievement was found to be in the medium–high range ($d = 0.57$) compared to other factors, but it is not specified which aspects of the home environment are most influential. Where aspects of parenting practices have been investigated more closely, home environment factors that have been shown to be strong predictors of reading

achievement were found to be parents' educational aspirations and expectations, and encouragement of intellectuality and reading (Buckingham et al., 2013).

In recent years, one of the most common indicators used for SES is *number of books at home* (Evans, Kelley, Sikora, & Treiman, 2010; Hansen & Munck, 2012; Iltus, 2007; Jariene & Razmantiene, 2006). That is, the number of books at home was found to be a reasonable predictor of SES, as parents from low-SES households may be unable to afford resources such as books, computers, or tutors to create a positive literacy environment (Orr, 2003). Moreover, the number of books at home was found to be associated with reading and achievement at school. Children's initial reading competence is associated with the home literacy environment and number of books owned, and parent distress (Aikens & Barbarin, 2008). For example, the number of books at home was found to have a statistically significant effect on children's educational attainment, independent of their parents' education, occupation, and class (Evans et al., 2010). The major effect of books at home is evident throughout the child's educational career. A child growing up in a family with 500 books gains 3.2 years more of education (95% CI, 3.1–.3), than an identical child from a home with no books does. A child growing up in a family with 500 books is 33% (95% CI, 32–33) more likely to finish Year 9; is 36% (95% CI, 35–37) more likely to graduate from high school, and is 19% (95% CI, 18–20) more likely to complete university than a comparable child growing up without a home library. Those findings were not restricted to the rich, long-democratic, market-oriented nations of Western Europe, but also in Eastern Europe, in Asia, in South America, and in South Africa. The effect remains strong after controlling for well-known sources of educational advantage: parents' education, father's occupation, father's class, gender, and nation. Furthermore, it was found that regardless

of how many books the family already had, each addition to a home library helped the children get a little farther ahead in school. The gains are not equal across the entire SES range, however. Instead, they are larger at the bottom, far below the elite level, in getting children from modest families a little further along in the first few years of school. Moreover, having books in the home has a greater impact on children from the least educated families, rather than on children of the university-educated elite (Evans et al., 2010).

Measuring Engagement

Measurement of student engagement involves different research methods. The majority of studies to date have used student self-report questionnaires, face-to-face interviews of students and teachers, as well as teacher ratings of students. Other studies have also used observational methods, but these are not as common.

Student self-report questionnaires. The first and most common method for assessing student engagement is student self-report questionnaires. In this methodology, students reflect on various aspects of engagement items by selecting the response that best describes them (Appleton et al., 2006; Connell, 1990; Finn & Voelkl, 1993; Fredricks et al., 2011; Goodenow, 1993b; Marks, 2000; Martin, 2009; Skinner et al., 2009b; Skinner & Zimmer-Gembeck, 2010).The most common argument for using self-report methods is that it is critical to collect data on students' subjective perceptions, as opposed to just collecting objective data on behavioural indicators such as attendance or homework completion rates (Appleton et al., 2006). As emotional and cognitive engagement cannot be observed directly, and also needs to be inferred from behaviours, self-report methods are particularly useful for assessing these factors. Self-report methods are widely used because they are often the most practical and easy to

administer in classroom settings (Fredricks et al., 2011). Self-report questionnaires can be given to large and diverse samples of students at a relatively low cost, making it possible to gather data over several points in time and compare results across schools. However, one concern with self-report measures is that students may not answer honestly under some conditions; for example, if the questionnaire is administered by their teacher with no anonymity provided. In such cases, self-reports may not reflect their actual behaviours, emotions or attitudes (Appleton et al., 2006; Fredricks et al., 2011), but rather students may tell what they think the teacher or researcher wants to hear.

Student interviews. The second method of assessing engagement in school is face-to face student interviews (Fredricks et al., 2004; Fredricks et al., 2011). One of the advantages of the interview method is that it can provide insight into the reasons for different levels of engagement (Fredricks et al., 2005). It may also provide insight into some of the statistical findings from the student self-report questionnaires, to understand why some students engage while others do not. Interviews can provide a detailed descriptive picture of how students construct their subjective meaning about their school experiences, which contextual factors are most important for them, and how these experiences relate to engagement (Fredricks et al., 2011). Such information provides qualitative differences and insight into the antecedents of engagement. These interviews can also help point out themes that cut across groups within the sample, which helps in understanding and analysing the quantitative data (Fredricks et al., 2005). On the other hand, interviews are not without their limitations. The knowledge, skills, and biases of the interviewer can all affect the quality, depth, and type of responses. There are also questions about the reliability (stability and consistency) and validity of interviewer

interpretations and findings, as well as social desirability influences (Fredricks & McColskey, 2012), yet these can be managed by precise and strict protocols. The main limitation of this method is that it requires a high budget and is time consuming to administer.

Teacher ratings of students. Teacher ratings of students (Fredricks et al., 2004; Fredricks et al., 2011; Skinner et al., 2009b; Skinner et al., 2008b) are a different mode of measurement engagement that applies a proxy measure; that is, student engagement is reported indirectly by teachers rather than directly by the students involved. The teachers' ratings of individual students' engagement is averaged across students in their classrooms. Some teacher rating scales include items assessing both behavioural and emotional engagement (Connell et al., 1995; Skinner & Belmont, 1993; Skinner et al., 1988; Skinner et al., 2009a; Skinner et al., 1990), and others reflect a multi-domain model of engagement (that is, behavioural, emotional, and cognitive) (Wigfield et al., 2008; Yazzie-Mintz, 2010). Some studies have included both teacher ratings and students' self-reports of engagement to examine the correspondence between the two measurement techniques (Furrer & Skinner, 2003; Skinner et al., 2009a; Skinner et al., 2008b). In general, there is a positive low to moderate correlation (range r = .20 to .45) between teacher and student reports of behavioural engagement, and of achievement across a variety of samples (Fredricks et al., 2004; Skinner et al., 2009a). In addition, the correlations between teacher and student reports of behavioural engagement were found to be stronger than the correlations between teacher and student reports of emotional engagement. This finding is understandable, as behavioural indicators can be easily seen by teachers (Fredricks et al., 2004). In contrast, emotional indicators need to be inferred from behaviour and it is possible that with some students it is difficult to

know their emotions as they do not visibly display them in the classroom (Skinner et al., 2008b). Given the fact that this is a proxy method, and that the low correlations explained only 4% to 17% of the variance, it needs to be flagged as part of the weakness of this method.

Observations. Observational methods have been used to measure engagement at both the individual and the classroom level (Fredricks et al., 2011). Although observations can provide greater insight than other methods, they do have their limitations as well. One limitation is that they are time consuming to administer, and require collection of data across various types of academic settings to get an accurate picture of student behaviour. There are also concerns about the reliability of observational methods without proper training of the observers. Finally, the main potential difficulty with observational methods in measuring student engagement is that they provide limited information on the quality of effort, participation, thought processes or emotions of the student (Fredricks et al., 2004; Fredricks et al., 2011). For example, students can be judged by the observer as "being on-task", while in subsequent interviews they can report that they were not thinking about the learning materials or activities at that time. In contrast, students who appear to be "off-task" to the observer can report themselves as actually being very highly cognitively engaged at that time (Fredricks & McColskey, 2012). Moreover, the observer can receive limited information about the emotions of the student during that task.

Given the above findings in the literature, the empirical research detailed in the following chapters utilises student self-report questionnaires. As noted above, the student self-report is the most common and useful method for collecting data from the student's point of view. This method seems to be practical, feasible, and economical.

Self-report engagement scales in the literature[6] which include all three domains. There are a few comprehensive reviews that synthesise the research on school engagement and the different scales used to measure engagement (Appleton et al., 2008; Finn & Zimmer, 2012; Fredricks et al., 2004; Fredricks & McColskey, 2012; Fredricks et al., 2011; Jimerson et al., 2003). Most of the scales deal with only one or two domains at a time and not all three. Thus, when comparisons of the different scales are made, care must be taken when interpreting the results, as the purpose and theoretical background used in the development of the scales are all different. The variety of definitions reflects the different theories of knowledge and constructs that scholars have used in developing the engagement measurement scales and tools (Fredricks & McColskey, 2012).

At the time of writing this chapter, only four scales were found that measure all three domains of student engagement, and they were designed to be used for the upper elementary through high school years using self-report questionnaire by students. These four scales are:

(1) The High School Study of Student Engagement (HSSSE) (Yazzie-Mintz, 2010);

(2) The School Engagement Measure (SEM), developed by the MacArthur Network for Successful Pathways through Middle Childhood (Fredricks et al., 2005);

(3) The Motivation and Engagement Scale (MES), developed by the Life Long achievement Group (Martin, 2007); and

(4) The Quantifying School Engagement (QSE), developed by the National Centre for School Engagement (NCSE) (Finlay, 2006).

[6] The literature review reflects the studies published before December 2011, when the current study was designed and conducted, and all decisions regarding the existing scales were made based on that knowledge. As some more recent studies have been published since then, some updates were added from recent study findings.

What is measured by four engagement scales. The HSSSE (Yazzie-Mintz, 2010) uses three domains of engagement for analysis: *Cognitive Engagement, Behavioural Engagement,* and *Emotional Engagement.* These three domains were defined in a broader way as follows: the cognitive domain also includes *Intellectual and Academic Engagement,* which captures students' strategies for learning, investment in work, and effort; that is, the work students do and the ways in which students go about their work. This domain, focusing primarily on engagement during instructional time and with instruction-related activities, can be described as "engagement of the mind" (for sample items see Table 1.3) (Yazzie-Mintz, 2010, p. 2). Survey questions that are grouped within this cognitive domain of engagement include questions about homework, classroom discussions and assignments, preparation for class, and the level of academic challenge that students report.

Behavioural engagement also includes *Social and Participatory Engagement*, which emphasises students' actions and participation within the school outside of instructional time, including social and extracurricular activities, non-academic school-based activities, and interactions with other students; that is, the ways in which students interact within the school community beyond the classroom. This behavioural domain, with its focus on student actions, interactions, and participation within the school community, can be described as "engagement in the life of the school" (for sample items see Table 1.3) (Yazzie-Mintz, 2010, p. 2). Survey questions that are grouped within this domain of engagement include questions about extracurricular activities, students' interactions with other students, and students' connections to the community within and around the school.

Emotional engagement encompasses students' feelings of connection to (or disconnection from) their school; that is, how students feel about where they are in school, the people within the school, and the ways and workings of the school. This domain, focusing largely on students' internal lives, not frequently expressed explicitly in observable behaviour and actions, can be described as "engagement of the heart" (for sample items see Table 1.3) (Yazzie-Mintz, 2010, p. 3). Survey questions that are grouped within this emotional domain include questions about general feelings about the level of support students perceive from members of the school community, and students' place in the school community.

According to the developer of the HSSSE (Yazzie-Mintz, 2010), while analysis of individual survey items allows schools to look at student responses to specific questions, these domains of engagement help schools focus on groups of questions connected to important areas of engagement. It allows the school to focus on one or more of these domains of engagement, depending on the goals that the school is setting for improvement. Schools focused on improving academic programmes may look more closely at cognitive and academic engagement. Schools focused on providing strong support networks, and strengthening students' feelings of connection to the school community, may emphasise emotional engagement. Schools can also examine all three domains in efforts to improve in the widest range of areas. The HSSSE survey is a long questionnaire, which includes 121 items (Yazzie-Mintz, 2010).

The SEM (Fredricks et al., 2005) includes a student survey and interview, and a teacher survey and interview, regarding student behavioural, emotional, and cognitive engagement in inner-city schools. The student measures include items about student engagement and classroom perceptions. Behavioural, emotional, and cognitive

engagement survey items (19) were drawn from a variety of previous tools (Finn et al., 1995; Pintrich, Smith, Garcia, & Mckeachie, 1993; Wellborn & Connell, 1987; Wellborn, Connell, Skinner, & Pierson, 1988) and also included new items that were developed by the research team of the SEM study. All of the items were on Likert scales from 1 to 5 (1 = *never*, 5 = *all of the time*; or 1 = *not at all true*, 5 = *very true*). The surveys also included 59 items regarding perceptions of the social context (teacher support and peer support), perceptions of the academic context (task challenge and work orientation), competence, values, and school attachment. These items were drawn from a variety of measures of motivation and classroom climate and context, as well as new items developed for that study (for sample items see Table 1.3) (Fredricks et al., 2005).

The MES instruments measure elementary, high school, and university students' motivation and engagement (Martin, 2007). It was adapted from the MES to assess motivation and engagement using three adaptive cognitive domains (self-efficacy, valuing, mastery orientation), three adaptive behavioural domains (persistence, planning, task management), three impeding/maladaptive cognitive domains (anxiety, failure avoidance, uncertain control), and two maladaptive behavioural domains (self-handicapping, disengagement); for sample items see Table 1.3 (Martin, 2007). Each of the 11 factors comprises four items – hence, the MES is a 44–item instrument. In most studies using the MES, the 7–point rating scale is typically used. However, the elementary school sample posed a distinct challenge in that a simpler survey form was desirable: Pilot work indicated that younger students had difficulty teasing apart the finer-grained rating points on the 7–point scale (Martin, 2008, 2009). Hence, there are three version of the scale: The MES for Junior School (MES –JS) asks students to rate themselves on a shorter scale of 1 (*strongly disagree*) to 5 (*strongly agree*), whereas for

the eldest students at High School, University and College (MES-HS, MES-UC), students rate themselves on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*).

The QSE (Finlay, 2006) survey combined nine different data sources and previous tools (for more details see Finlay, 2006). Changes were made in order to make the survey consistent in terms of the response scales and to make the items clearer to the students. In addition, as the questionnaire was aimed at a specific population of truant students, unique questions were added that seemed relevant to the project but were not considered school engagement questions. For example, questions were included about suspension, expulsion, and exposure to school dropout, thoughts of dropping out, experience with school failure, activities while skipping school, teenage parents, victimisation experience, and attitudes toward their neighbourhoods, future aspirations, and parental involvement (for sample items see Table 1.3) (Finlay, 2006).

Psychometric – reliability and validity of the scales. Three of the four scales reported estimates of the reliability (Cronbach's alpha) of the scales. The SEM reliability is .55–.86, the MES reliability is .70–.87 (and the Test–Retest reliability of .61–.81) and the QSE reliability is .48–.92 . The HSSSE currently has no published information on the psychometric property of the measure (Fredricks & McColskey, 2012).

One way to investigate construct validity is to examine whether the correlations between the engagement scales and the other related constructs are in the hypothesised direction based on theory and previous empirical work. The three engagement subscales (that is, behavioural, emotional, and cognitive) in the MacArthur measure (SEM) were moderately correlated with students' perceptions of aspects of the academic and social context, school value, and school attachment (Fredricks et al., 2005). Positive

correlations between engagement and indicators of participation (that is, attendance, teacher ratings of participation) were also reported as evidence of criterion-related validity, or the extent to which a measure is associated with a key behaviour or outcome on the majority of measures (Fredricks et al., 2011). Of the four instruments, the MES and the SEM reported moderate positive correlations with some measure of student achievement, although in some cases (as $r = .55$) it was too low to indicate a positive correlation.

In developing the SEM, all zero-order correlations were significant and in the expected directions (Fredricks et al., 2005). For example, behavioural, emotional, and cognitive engagement was found to be positively correlated with teacher support (r = .35 to .49, $p < .05$), peer support (r = .23 to .41, $p < .05$), work orientation (r = .37 to .42, $p < .05$), and task challenge (r = .30 to .41, $p < .05$). Students' reports of engagement were more strongly correlated with teachers' reports of behaviour (r = .29 to .43) than with teachers' perceptions of emotional engagement (r = .15 to .20). Students' reports of engagement were also positively correlated with school attachment (r = .44 to .57) and correlated lower with perceptions of school value (r = .26 to .32). In addition, students' responses on the survey were compared to interviews about engagement with the same sample of students. The engagement survey scales were moderately associated with the interview ratings of classroom context (no specific correlations were reported) (Fredricks et al., 2005). It can be seen that all of the three engagement domains have been found with low to moderate correlations, and between low to moderate for students' perceptions of aspects of the academic and social context, school values, and school attachment.

The MES (Martin, 2007) reported a significant positive correlation among adaptive factors (behavioural and cognitive) (mean correlation $r = .64$); a significant positive correlation was found among impeding factors (negative aspects of cognitive) (mean correlation $r = .51$); and a significant positive correlation was found among maladaptive factors (behavioural and cognitive) (mean correlation $r = .58$). Thus, all figures indicated ample concurrent validity yet sufficient distinctiveness to retain them as separate first-order factors (Martin, 2007).

Limitations of the current scales

Comparison of the four scales (Table 1.3), reveals many differences and variations, and each has its unique advantages and limitations. However, no scale was found to be applicable to the current research, which defines student engagement as learning in class (as discussed above). The main contextual limitation is that different scales emerged from different concept and theories, so they capture engagement in a different way and use different definitions of the three domains (Fredricks et al., 2004). Moreover, even when using the same wording of "behavioural", "emotional" and "cognitive" for the three domains of student engagement, in-depth comparisons of the scales show a wide range of different content within the same type of scale. For example, Table 1.3 shows sample items for each domain in each scale. It can be seen that there are content differences between the items referring to behavioural, emotional and cognitive engagement for each one of the four scales.

Another context limitation is that some items overlap, which blurs the lines between the three domains. For example, "class participation" was used as an indicator of both behavioural and cognitive engagement; "students' valuing of school" was used as an indicator of both emotional and cognitive engagement (Fredricks & McColskey,

2012), while "persistence" and "effort" were used both in behavioural and cognitive domains (Lawson & Lawson, 2013). The differentiation between indicators and facilitators is very important (as discussed above) and some scales include both of them in the engagement model (Sinclair et al., 2003; Skinner et al., 2008b; Skinner & Pitzer, 2012). For example, the emotional engagement scale overlaps with items of teacher support in the QSE Scale (Finlay, 2006).

In addition, it is not only the number of the domains that is very important, it is also the nature of the domains, based on the argument that alienation and disaffection likely reflect more than a lack of engagement (Jimerson et al., 2003; Skinner et al., 2008b). Thus, it is important to include scales regarding behavioural, emotional and cognitive disengagement alongside the engagement scales. Of the four scales compared in Table 1.3, only the MES includes some disengagement scales.

Another limitation of the existing scales is a methodological limitation regarding the type of measurement scale; as can be seen in Table 1.3, some scales use agreement scales rather than frequency scales. Agreement scales measure the attitude of the student toward engagement, while asking about frequency measures of the student's experience and the action of engaging themselves, which gives a better understanding of the phenomenon of engagement.

Some technical methodological considerations with agreement scales such as acquiescence bias need to be taken into account (Schwarz & Oyserman, 2001; Shulruf, 2005). Values, beliefs, attitudes, and behaviour seem to be culturally dependent, thus people from different cultures responding to questions regarding these factors are likely to compare themselves to what they believe is the norm scale in their own culture.

Table 1.3

A summary comparison of the four scales of engagement

Name and Reference	HSSSE Yazzie-Mintz, 2010	MES Martin, 2007	SEM Fredricks et al., 2005	QSE Finlay, 2006
What is Measured and Sample Items	**Behavioural/Social/Participatory engagement** (17 items): Thinking about this school year, how often have you done each of the following? (a) had conversations or worked on a project with at least one student of a race or ethnicity different from your own; (b) picked on or bullied another student. E**motional engagement** (39 items): How do you feel about the following statements related to your high school? Overall, (a) I feel good about being in this school; (b) I care about this school; (c) I feel safe in this school; (d) I have a voice in classroom and/or school decisions. **Cognitive/Intellectual/Academic engagement** (65 items): Thinking about this school year, how often have you done each of the following? (a) asked questions in class; (b) contributed to class discussions; (c) made a class presentation; (d) prepared a draft of a paper or assignment before turning it in; (e) received prompt feedback from teachers on assignments or other class work.	**Self-belief** (4 items): "If I try hard I believe I can do my schoolwork well" **Learning focus** (4 items): "I feel very happy with myself when I really understand what I am taught at school" **Valuing school** (4 items) "Learning at school is important" **Persistence** (4 items) "If I cannot understand my schoolwork, I keep trying until I do" **Planning** (4 items) "Before I start a project, I plan out how I am going to do it" **Study management** (4 items) "When I do homework, I usually do it where I can concentrate best" **Disengagement** (4 items) "I have given up being interested in school" **Self-sabotage** (4 items) "Sometimes I do not try at school so I can have reason if I do not do well" **Failure avoidance** (4 items) "The main reason I try at school is because I do not want to disappoint my parents" **Anxiety** (4 items) "When I have a project to do, I worry a lot about it" **Uncertain control** (4 items) "When I do not do well at school, I do not know how to stop that happening next time"	**Behavioural engagement** (5 items) "I pay attention in class" "I follow the rules at school" "I complete my work on time" **Emotional engagement** (6 items) "I am interested in the work at school" "I like being at school" "I feel excited by my work at school" **Cognitive engagement** (8 items) "When I read a book, I ask myself questions to make sure I understand what it is about" "I study at home even when I don't have a test" "I try to watch TV shows about things we do in school"	**Behavioural engagement** (7 items) "How often have you thought of dropping out?" "When I am in class, I just pretend I am working" "I follow the rules at school" **Emotional engagement** (16 items) "I am happy to be at my school" "When I first walked into my school I thought it was Good….Bad" "I enjoy the work I do in class" "I respect most of my teachers" **Cognitive engagement** (22 items) "How important do you think an education is?" "I am getting a good education at my school" "I will graduate from high school"

Table 1.3 continued

Name and Reference	HSSSE Yazzie-Mintz, 2010	MES Martin, 2007	SEM Fredricks et al., 2005	QSE Finlay, 2006
Type of scale	Different scales from 2 to 5 point-scale and a mix of different kinds: yes/no answers, frequency scales and agreement scales	5-point scale for primary and 7-point scale for high school; all are agreement scales	5-point Likert scales of frequency and agreement scales	–
Internal consistency	–	Cronbach's alpha .70–.87	Cronbach's alpha .55–.86**	Cronbach's alpha .48–.92**
Purpose of use	Developed to help schools and districts to monitor engagement and to help schools identify areas in need of improvement. The HSSSE provides descriptive and comparative data on high school students' views relative to the responses of other schools.	Developed to diagnose and identify students who are struggling or at risk of disengagement and academic failure. The MES creates profiles for individual students based on responses to 11 different subscales reflecting a multi-domain model of motivation and engagement.	Developed for a longitudinal study of the relationship between classroom context and engagement in urban minority youth, in the upper elementary grades.	As part of the evaluation of the Truancy Reduction Demonstration Program, an instrument was developed to measure students' school engagement to assess whether interventions in three intensive demonstration sites had an effect on student engagement. Thus, the questionnaire was aimed at a specific population of truant students.
Samples	Original sample included 7,200 students from four high schools. Survey administered to 200,000 students from across the nation. Students are ethnically and economically diverse and attend rural, suburban, and urban schools.	The Junior High version (age 9–13) has normed with 1,249 students (63 classes, 15 schools) in Australia. The High School version normed with 21,579 students, aged 12–18 across 58 schools. Samples were from urban, rural, and suburban areas of Australia, and predominately middle class students.	Original sample of 641 urban, low-income, primarily Black and Hispanic students in Grades 3 to 5 attending neighbourhood schools. Survey also used with other low-income ethnically diverse upper elementary school students.	135 students from 3 special schools for truant students.

Table 1.3 continued

Name and Reference	HSSSE Yazzie-Mintz, 2010	MES Martin, 2007	SEM Fredricks et al, 2005	QSE Finlay, 2006
Construct validity*	–	Positive significant correlation among adaptive factors (behavioural and cognitive) (mean correlation r = .64); positively significant correlation among impeding factors (cognitive) (mean correlation r = .51); and positive significant correlation among maladaptive factors (behavioural and cognitive) (mean correlation r = .58).	Behavioural, emotional, and cognitive engagement were low to moderate positively correlated with: Teacher support (r = .35 – .49); Peer support (r = .23 – .41); Work orientation (r = .37 – .42); and Task challenge (r = .30 – .41). Students' reports of engagement were low to moderate correlated with teachers' reports of behaviour engagement (r = .29 to .43), and with teachers' perceptions of emotional engagement (r = .15 to .20). Students' reports of engagement were positively low to moderate correlated with school attachment (r = .44 to .57) and with perceptions of school value (r = .26 to .32).	The results regarding engagement correlations with GPA are varied across schools and range from no significant correlations to low correlation as follows: Emotional range from n.s. to .32 Cognitive range from n.s. to .37 Behavioural range from n.s. to .34

Notes: * All correlations reported in the Construct validity section are significant $p < .05$

** As noted above, any reliability's estimate less than .7 is worrisome, below .6 is difficult to defend, and less than .55 is close to a random number (Wainer & Thissen, 1996).

Therefore, agreement measures are vulnerable to validity problems (Schwarz & Oyserman, 2001). In addition, frequency of behaviour is less likely to relate to a reference group than is comparing to level of agreement (Brown, 2001b, 2004). The correlation between attitude reports and actual behaviour is also low (rarely above .30) (Schwarz, 2007). As it is very important to measure the behaviour of the student regarding engagement, an alternative method – to minimise these problems and to make the behaviour and attitude scales more reliable across different contexts – is to ask the respondents to indicate frequency of behaviour rather than asking about their level of agreement with attitudes (Shulruf, Hattie, & Dixon, 2008).

It is not only the nature of the scale that matters, it is also the range and types of the ordinal levels of measurement used and their wording that matters (Schwarz & Oyserman, 2001). Although each design option for a questionnaire comes with its own specific benefits and limitations, and there is no "one way" that is better than others are, it is important to adjust the methods employed for each particular use. In order to compare and analyse different questions across the questionnaire, and moreover across different samples and sites, it is important to maintain precisely the same approach across the questions, including: the nature of the response scale, the number of possible responses per item, and the wording given to each. As can be seen in Table 1.3, comparing the scales previously used shows inconsistency with the number of optional responses per item, the type, the nature, and the wording. For example, some of the questions used a scale of two-point, while other questions used five-point or seven-point scales; most of the scales used agreement scales, while a few of them used a frequency scale.

An additional limitation is related to the level of the scales' reliability. The SEM reported estimate for reliability range is .55 to .86, and the QSE range is .48 to .92 (Table 1.3). It is important to note that any estimate for reliability that is less than .7 is worrisome; below .6 is difficult to defend, and less than .55 is close to a random number (Wainer & Thissen, 1996). A reliability of 0.85 has often been considered as minimal for a competently prepared test, and we would still find that 36% of scores vary between test and retest (Wainer & Thissen, 1996). There are more stringent rules claiming that: below .60 is unacceptable; between .60 and .65 is undesirable; between .65 and .70 is minimally acceptable; between .70 and .80 is respectable; between .80 and .90 is very good, and much above .90 is a need to consider shortening the scale (DeVellis, 1991).

In addition, inconsistency was reported for correlations of engagement with GPA. For example, the QSE scale, which was conducted in three different schools (Finlay, 2006), found correlations varied across schools and ranged from no significant correlations at all in one of the schools to low correlation in the other two schools, as can be seen in Table 1.3.

Also, in recent literature there is much agreement that further theoretical and empirical work is needed to produce and understand a comprehensive model that considers the internal interactions between the three domains of engagement (Fredricks et al., 2004; Fredricks & McColskey, 2012; Fredricks et al., 2011). Thus, the empirical research presented in the following chapters starts with the development of a new measurement tool, which includes the three domains of student engagement with learning: behavioural, emotional, and cognitive.

The suggested model of the current study

The new student engagement model, entitled the Auckland Student Engagement Model (ASE Model) (Figure 1.1), summarises the background literature and the main research question.

The ASE Model describes the suggested construct of the simultaneous and dynamic process and interactions across the three domains of engagement, the four main potential confounding factors related to students' engagement in class (school environment, teacher-support, peer support, and student background), and academic achievement. In an attempt to bridge the gap of knowledge in this area, this research is focus on the relationship between engagement and achievement, and whether the relationship suggests causal effect.

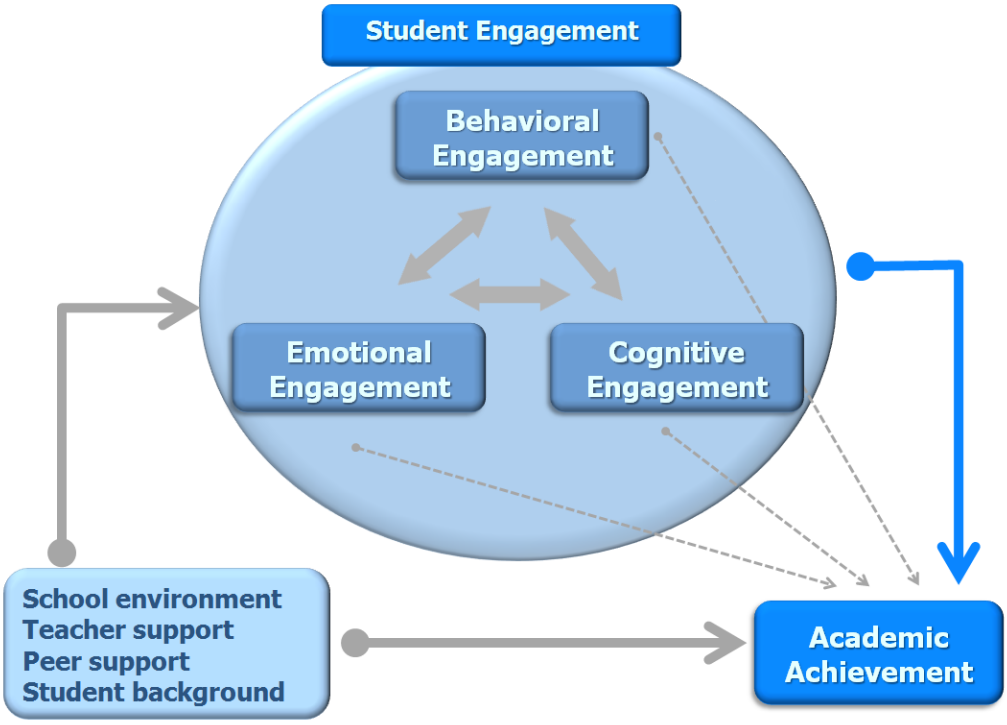

Figure 1.1: The Auckland Student Engagement Model (the ASE Model)

The current study echoes the definition and the conceptualisation of *Behavioural engagement* as behaviours such as doing class work and following rules in class (Skinner et al., 2009b). For example, positive conduct consists of behaviours that illustrate effort, persistence, concentration, attention, contributing to class discussion, following rules, studying, performing learning activities, completing homework, and participating in class activities. In addition, it includes absence of disruptive conduct (not skipping school and not getting into trouble). *Behavioural disengagement*, which signifies more than the absence of engagement, refers to the occurrence of behaviours that reflect a maladaptive motivational condition. Disengagement includes passivity and withdrawal from participation in learning activities, (Skinner et al., 2008b). *Emotional engagement* is defined as emotions indicating students' motivated participation during learning activities (Skinner et al., 2009b). For example, positive conduct consists of emotions that illustrate satisfaction, enjoyment, enthusiasm, pride, and vitality with learning activities. *Emotional disengagement* refers to the occurrence of emotions that reflect boredom, frustration, anxiety, sadness, and feeling bad in class and with learning activities. *Cognitive engagement* is conceptualised in terms of a psychological investment in learning. It draws on the idea of investment, and it incorporates being thoughtful and being willing to exert the necessary effort for comprehension of complex ideas and mastery of difficult skills, a preference for challenge and being "thoughtful when doing work", as well as being strategic and self-regulating (Connell & Wellborn, 1991; Fredricks et al., 2005).

Summary

Overall, the current literature suggests an association between student engagement and academic achievement, yet whether these associations imply causality is unclear. Thus,

the primary objective of this study is to identify the relationship between engagement and achievement and whether the relationship suggests causal effect between the three student engagement domains – behavioural, cognitive, and emotional engagement – and academic achievement, while considering the impact of selected potential confounding variables on the engagement model. These confounding variables include school environment, teacher support, peer support, and student background. This study also looks into the interactions between the engagement domains. For the current research, a new measurement tool (the ASE Scale) was developed, based on previous research (Fredricks et al., 2005; Skinner et al., 2009a), to address limitations identified in previous scales.

The research question

The main research question arising from the current literature is: To what extent do the three major student engagement domains – behavioural, emotional and cognitive – associated with student academic achievement in secondary schools and whether the relationship suggests causal effect of engagement on achievement. A secondary research question is: To what extent do factors such as school environment, teacher support, peer support, and student background confound the association between student engagement and academic achievement?

Understanding the relationship between engagement and achievement and whether the relationship suggests causal effect may provide educators with teaching that is more effective and learning strategies to improve educational outcomes.

Chapter 2

The development of the Auckland Student Engagement Scale

Study I

The previous chapter has demonstrated that there is consensus that student engagement is most cogently thought of as a complex construct comprising three domains – behavioural engagement, emotional engagement, and cognitive engagement (Fredricks et al., 2004). Research has shown that the three major domains of engagement are differently associated with students' learning, grades, and achievement test scores, as well as with patterns of attendance, retention, graduation, and academic resilience over the long term (Connell et al., 1994; Finn & Rock, 1997; Jimerson et al., 2003; Skinner et al., 2009a).

The combination of behavioural, emotional, and cognitive domains with respect to the notion of engagement is valuable because it provides a richer characterisation of children's concepts and behaviours than is possible when applying single or dual domains. It is suggested that these three domains of engagement are interrelated rather than operationally independent, and are thus highly correlated. Although many studies have addressed each of the domains separately, engagement as a multi-domain construct is likely to allow a more sensitive examination of the antecedents and consequences of behaviour, emotion, and cognition (Fredricks et al., 2004).

For many years, measurement scales for student engagement included only one or two domains at a time and not all three simultaneously. Moreover, different scales were developed from different theoretical backgrounds and were used for different purposes (Fredricks et al., 2011). The various theories reflect the different definitions and constructs that scholars have used in developing the engagement scales (Fredricks & McColskey, 2012). Although there has been growing agreement over the past 10 years that engagement is a phenomenon constructed of three domains of behavioural, emotional, and cognitive engagement, only a few new tools that include all three domains have been developed (Appleton et al., 2008; Fredricks et al., 2005; Fredricks et al., 2004; Fredricks & McColskey, 2012; Jimerson et al., 2003; Marks, 2000).

According to the ASE Model represented in Chapter 1 (Figure 1.1), there were five main requirements of the scale to be used for the current research: (1) to include all three domains – behavioural, emotional, and cognitive engagement – for which each includes an engagement and disengagement subscale; (2) to have good psychometric properties and good reliability; (3) it was important to find a scale which does not include any of the facilitators such as teacher support and peer support as part of the engagement domains (as explained extensively in Chapter 1); (4) it was also important also to find a scale which has no overlapping of items across the three engagement domains; (5) the type of measurement scale needs to be using frequency scales rather than agreement scales, as will be discussed further on in this section.

At the time the current study was undertaken[7], only four existing scales measuring the three domains as three subscales of one tool of student engagement were

[7] The literature review reflects the studies published before December 2011, when the current study was designed and conducted. All the decisions regarding the need to develop a new tool were made upon the existing scales at that point of time.

found in the literature (Fredricks et al., 2004; Fredricks et al., 2011). These four scales are:

(1) The High School Study of Student Engagement (HSSSE) (Yazzie-Mintz, 2010);

(2) the School Engagement Measure (SEM), developed by the MacArthur Network for Successful Pathways through Middle Childhood (Fredricks et al., 2005);

(3) the Motivation and Engagement Scale (MES), developed by the Life Long achievement Group (Martin, 2007);

(4) the Quantifying School Engagement (QSE), developed by the National Centre for School Engagement (NCSE) (Finlay, 2006).

A thorough review of the four scales revealed a number of differentiations and variations, each of which has advantages and limitations. However, no scale was found to be applicable to the current research, which defines student engagement with learning in class (as discussed in Chapter 1).There are two main context limitations. The first is that each scale emerged from different conceptual frameworks and theories, and so each captures engagement in a different way (Fredricks et al., 2004). The second is that some items overlap, which blurs the lines between the three domains. For example, "class participation" was used as an indicator of both behavioural and cognitive engagement; "students' valuing of school" was used as an indicator of both emotional and cognitive engagement (Fredricks & McColskey, 2012), while "persistence" and "effort" were used both in behavioural and cognitive domains (Lawson & Lawson, 2013). The differentiation between indicators and facilitators is very important too (as discussed in Chapter 1) and some scales include both of them in the engagement model as part of the three domains (Sinclair et al., 2003; Skinner et al., 2008b; Skinner & Pitzer, 2012). In addition, it is not just the number of domains that is very important, but the nature of the

domains, based on the argument that alienation and disaffection likely reflect more than a lack of engagement (Jimerson et al., 2003; Skinner et al., 2008b).

Another limitation of the existing scales is methodological; this limitation considers the type of measurement scale, as those four tools use mostly agreement scales rather than frequency scales. Each type of measurement scale has both advantages and limitations. Agreement scales measure the attitude of the student toward engagement, while asking about frequency measures of the student's experience and the act of engaging (Schaeffer & Presser, 2003). The decision to use the frequency scale rather than an agreement scale for the current study was based on a number of technical methodological considerations, made to minimise acquiescence bias (Schaeffer & Presser, 2003; Schwarz & Oyserman, 2001; Shulruf, 2005). Values, beliefs, attitudes, and behaviour seem to be culturally determined; therefore people from different cultures responding to questions regarding these constructs are likely to compare themselves to what they believe is the norm scale in their own culture. Therefore, agreement measures are vulnerable to validity issues (Schwarz & Oyserman, 2001). In addition, frequency of behaviour is less likely to be related to a reference group than level of agreement (Brown, 2001b, 2004). Moreover, the correlation between attitude reports and behaviour is low (rarely above .30) (Schwarz, 2007). Research that examined the potential implications of using a frequency versus an agreement item format for eliciting information about behavioural, emotional and health functioning found that the reliability of the frequency items was marginally higher than that of the agreement items (Marfeo, Ni, Chan, Rasch, & Jette, 2014). The research also found that frequency items perform better in the normal range of responses, capturing specific behaviours, reactions, or situations that may elicit a specific response: while agreement items

perform better for those whose scores are more extreme and capture subjective content related to general attitudes, behaviours, or feelings of work-related behavioural health functioning. As it is very important to measure the behaviour of the student regarding engagement, an alternative method to minimise these problems, and to make the behaviour, experience, and attitude scales more reliable across different contexts, is to ask the respondents to indicate frequency of behaviour rather than asking about their level of agreement (Shulruf et al., 2008).

As well as the nature of the scale, the range of ordinal levels of measurement and wording used is important (Schwarz & Oyserman, 2001). Although every design option of a questionnaire comes with its own specific benefits and limitations, and there is no "one way" that is better than others, it is important to adopt the right method for each particular use. In order to compare and analyse different questions across the questionnaire, and across different samples and sites, it is important to maintain precisely the same approach across the questions, including the nature of the response scale, the number of possible responses per item, the range and the wording. Comparison of the previous scales revealed inconsistency with the number of possible responses per item, the type, the nature, and the wording. For example, some of the questions used a scale of four-point scale, while other questions used five-point scale; most used agreement scales, with a few using frequency scales.

As it can be seen, at the time the current research was designed and undertaken, the five requirements that were stated above were not found in one existing measurement tool. Therefore, the current research focused on developing a new tool – a measurement tool which includes the strengths and advantages of previous tools, while utilising a uniform frequency scale of six-point scale across all scales and questions.

The purpose of the first study was to evaluate the appropriateness of the new tool, its reliability, and its construct validity. The feasibility impact of the mode of questionnaire (paper and online) for the respondents was also assessed.

Method

Development of the Scale. Based on previous literature, a new measurement tool incorporating behavioural, emotional, and cognitive engagement was developed. The new measurement tool was named the Auckland Student Engagement Scale (the ASE Scale). The ASE Scale items are drawn from two measurement tools: (1) The Engagement versus Disaffection Scale (EvD) (Skinner et al., 2008b); and (2) The School Engagement Measurement (SEM) (Fredricks et al., 2005). The behavioural and emotional scales were selected as they emerged from the conceptualisation of engagement versus disengagement with learning, which focuses on students' active participation in academic activities in the classroom. The cognitive engagement scale is a complementary scale to the first two. Hence, the new tool will cover all three engagement domains. In addition, each scale individually has considerable evidence from previous research supporting its reliability, which means it has high internal consistency.

The combined new measurement tool, the ASE Scale, is constructed using three domains. The new tool will follow the construct of the original tools that were adapted by changing from agreement scale to frequency of behaviour scales, and some word changes were made in some items. The reliability of the original five subscales that were adopted is as follows: *Behavioural engagement measurement tool* was drawn and adapted from the EvD and includes two subscales: (1) the behavioural engagement subscale (5 items, alpha = .72); and (2) the behavioural disaffection subscale (5 items,

alpha = .70) (Skinner et al., 2008b). The *Emotional engagement measurement tool* was also drawn and adapted from the EvD and includes two subscales: (1) the emotional engagement subscale (5 items, alpha = .84); and (2) the emotional disaffection subscale (5 items, alpha = .84) (Skinner et al., 2008b). The *Cognitive engagement measurement tool* was drawn and adapted from the SEM and includes a single subscale of cognitive engagement (8 items, alpha = .82) (Fredricks et al., 2005). It should be noted that following the existing literature, there was no appropriate scale found that consisted both of cognitive engagement and cognitive disengagement subscales.

Table 2.1 summarises the original subscales used to develop the ASE Scale by source, domain, subscales in each domain, the reliability, and the type of scale that was used, as reported in the literature.

Table 2.1

The source and reliability of the original scales reported in the literature

Source of original tool	The domain	The subscale	No. of Items	Type of scale used
Engagement versus Disaffection (EvD) (Skinner et al, 2008b)	Behavioural Engagement	Behavioural Engagement	5	4-point agreement scale ranging from: 1-'not at all true' to 4-'very true'
		Behavioural Disengagement	5	
	Emotional Engagement	Emotional Engagement	5	4-point agreement scale ranging from: 1-'not at all true' to 4-'very true'
		Emotional Disengagement	5	
School Engagement Measurement (SEM) (Fredricks et al., 2005)	Cognitive Engagement	Cognitive Engagement	8	5-point agreement scale ranging from: 1-'never' to 5-'very true'

All 28 items of the ASE Scale were administered using a 6-point self-report frequency scale (that is, 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, 5 = *Very often*, 6 = *Always*).

Reverse score transformation. The negative items were reversed in the positive direction for total scoring purposes. Hence, the higher the mean score, the higher the level of student engagement for all five factors. The reverse scoring makes the model more readily interpretable, and allows measurement of overall engagement (Field, 2009).

In addition, according to the model, the questionnaire included two subscales regarding support – teacher support, peer support and demographic and background information. The teacher support and peer support subscales were taken from the School Success Profile (SSP) measurement tool (Bowen, Rose, & Bowen, 2005): Teacher Support (8 items, Cronbach's alpha = .89) and Peer Support (5 items, Cronbach's alpha = .87). The demographic and background information included questions about the ethnicity, country of birth, and languages spoken at home, as well as socio-economic status (SES) such as: family structure, number of siblings and the respondent's position in the family, and parents' schooling level. This background information was used for analysis of the population and for comparison of the two schools (the questionnaire is attached in Appendix A).

The primary aim of the first study was to evaluate the appropriateness of the ASE Scale, with the expectation that the scale structure, which includes all three domains, measured by five factors of student engagement, would be confirmed. The secondary aim was to evaluate the feasibility of administering two versions of the new tool (paper and online) to New Zealand secondary school students.

Sample. It was aimed to recruit approximately 250 students. This sample size was selected based on the recommendation that 200 participants would be adequate to allow sufficient power to ascertain the estimates of reliability of the measures with

factor analysis (Mundfrom, Shaw, & Ke, 2005; Pett, Lackey, & Sullivan, 2003). The sample was drawn from two different urban New Zealand low-to-middle and upper-middle socio-economic areas (represented by the schools' decile[8] ratings) in September–October 2011. The schools that were selected in each area were from different socio-economic areas (deciles), to ensure a range of different socio-economic levels were included in the research. Year 8 (intermediate school) and Year 10 (high school) level participants were selected because those two groups of students were in their last year at their schools. Therefore, these students would not be attending those schools in the following academic year, when the second and main study and data collection would be conducted. Out of 280 students that were invited to participate in the first study, the sample included 250 students (89.2%).

Procedure. During interviews with the school principals, the opportunity was offered for the students to complete either a paper-based version or an online version of the questionnaire. One principal chose the paper-based version, and the other chose the online version. These decisions were based on the IT resources of participating schools. Therefore, part of the study was to examine whether the different versions (paper and online) would affect the findings or response rate.

The questionnaire was administered by the researcher, undertaken during class time, and students usually completed them (paper or online) within 10 to 15 minutes. Participation in the study was voluntary and no remuneration or reward was offered.

[8] Decile is the New Zealand government's index indicating the SES of schools. Decile indicates the tenth of SES in which the school falls as measured by statistical sampling of the incomes, household crowding, ethnicities, and education of a sample of households within the various geographic areas from which students attend the school (Ministry of Education NZ, 1997). School deciles range from 1 (low) to 10 (high). Deciles are used to provide funding to state and state-integrated schools. The lower the school's decile the more funding it receives. It needs to be noted that a school decile is the estimated average SES of all students in the school but in each school there may be students from all SES strata.

A pen-and-paper questionnaire was administered at the first school (a Decile 6 school) to 104 Year 8 students (four classes). At the second school (a Decile 10 school), 146 Year 10 students (six classes) responded via the online questionnaire. The total sample included 250 student participants.

Statistical analyses. Several procedures were conducted to achieve the goals of the study. The descriptive scale items examined the appropriateness of the measurement tool. Missing values, mean, standard deviation, skewness, and kurtosis were examined in order to evaluate the psychometric properties of each item. Exploratory factor analysis (EFA) using SPSS version 19 (SPSS Inc., 2012) was conducted to assess the loading of the items according to the theorised factors and to validate the new tool. The factor loading cut off for items in the scale was .30 (Tabachnick, Fidell, & Osterlind, 2001). In the event of cross-factor loadings of any items, some factors may need to be removed at this point. The observed correlations of the reduced scale among the five factors were examined to index the association between factors. There are five options of extraction method in the SPSS package. Three of them are orthogonal methods of rotation (varimax, quartimax, and equamax); while direct oblimin and promax are oblique. In the social sciences, some correlation among factors is generally expected, since behaviour is rarely functioning as an independent unit of one to another. The oblique methods allow the factors to correlate. Therefore, using orthogonal rotation results yield loss of valuable information if the factors are correlated, and oblique rotation should theoretically render a more accurate, and perhaps more reproducible, solution (Costello & Osborne, 2005). Confirmatory factor analysis (CFA) using AMOS 19 (Arbuckle, 2010) was conducted to verify the factor structure yield from the exploratory factor analysis. Multiple guidelines are available for an "acceptable" model

fit: recommended root mean square error of approximation (RMSEA) close to 0.06 or less; comparative fit index (CFI) close to 0.95 or greater; and Tucker-Lewis index (TLI) close to 0.95 or greater (Brown, 2006; Harrington, 2009). Other recommendations suggest low Chi-Square values relative to degrees of freedom with an insignificant *p* value ($p > 0.05$), RMSEA values less than 0.07, and CFI values greater than 0.95 (Hooper, Coughlan, & Mullen, 2008). Multiple group CFA invariance analysis was conducted to identify the impact of the groups on the model's fit. Finally, the reliability of each subscale was tested, using Cronbach's alpha, to indicate internal consistency.

Results

The sample included 250 urban students of middle (Decile 6) and upper-middle (Decile 10) socio-economic areas. Fifty-five percent ($n = 138$) of the participants were male and 45% ($n = 112$) were female. Most of the students identified their ethnicity as European (65%). Ethnicity distribution was found to be in line with the distribution of the New Zealand general population (Statistics New Zealand, 2011). Table 2.2 presents the background information for the total sample and comparison between the two schools.

To examine the quality of the data of the ASE Scale, the missing values and distributions of the items was examined. The item descriptions of the ASE Scale with 28 items (Table 2.3) show that the response rate of all items was very high (98.4%, n = 246 to 100%, n = 250 responses). The rate of missing data was very low and appeared to be random. There were no items with extreme skewness (values not higher than ±1.5), kurtosis (values no higher than ±3) or standard deviation (range 0.99 to 1.66).

Exploratory factor analysis (maximum-likelihood with promax rotation) yielded five factors, as was expected, for the ASE Scale with 28 items ($\chi^2 = 498.427$, df = 248, *p*

≤ .001, and explains 65.14% of the variance) (SPSS Inc., 2012). However, some cross-factor loadings were found within seven items. Table 2.4 presents the factor loading on five factors, with cross-factor loadings of seven items (item numbers 3, 17, 18, 20, 21, 24, 27, with gray background and stars).

Table 2.2

Comparison of the schools and participants by demographic data

Variable		Total (n=250) %	School I (n=104) %	School II (n=146) %
Year level	Year 8	41.6	41.6	–
	Year 10	58.4	–	58.4
Gender	Male	55.2	59.6	52.1
	Female	44.8	40.4	47.9
Ethnicity	European	65.0	65.4	64.7
	Asian	18.5	11.5	23.7
	Maori	4.9	8.7	2.2
	Pacific	4.5	10.6	–
	Other	7.0	3.8	9.4
ESOL* lessons at school	No	92.1	92.2	91.8
	Yes	7.9	7.8	8.2

*Note: ESOL is English for Speakers of Other Language.

In order to avoid cross-loading between factors and to have five clean loading factors, at the next stage the items with loading < .3 and/or cross-loading > .3 were excluded from the EFA one at a time (Osborne & Costello, 2009; Tabachnick et al., 2001). The EFA was repeated until cross-loading no longer occurred and all five factors were stable, with clean loading only on the main factor of each item. At the end of this process, seven items were excluded (item numbers 3, 17, 18, 20, 21, 24, 27, with gray background and stars, Table 2.4) due to not being loaded in a mutually exclusive way, and 21 items were retained in the model.

Table 2.3

Descriptive statistics of the ASE Scale items, (N=250)

The Student Engagement Factors	N Valid	N Miss.	Mean	SD	Skewness	Kurtosis
Behavioural Engagement						
1. I try hard to do well in school	248	2	4.74	1.00	–0.70	0.44
2. In class, I work as hard as I can	250	0	4.38	0.99	–0.34	–0.13
3. When I'm in class, I participate in class discussions	249	1	4.08	1.21	–0.02	–0.93
4. I pay attention in class	248	2	4.43	1.07	–0.48	0.01
5. When I'm in class, I listen very carefully	249	1	4.23	1.07	–0.46	0.16
Behavioural Disengagement (R)*						
19. When I'm in class, I just act like I'm working (R)	249	1	4.08	1.30	–0.61	0.01
20. I don't try very hard at school (R)	250	0	4.80	1.14	–1.17	1.46
21. In class, I do just enough to get by (R)	250	0	4.20	1.34	–0.52	–0.26
22. When I'm in class, I think about other things (R)	246	4	3.29	1.35	–0.06	–0.75
23. When I'm in class, my mind wanders (R)	250	0	3.46	1.40	–0.18	–0.92
Emotional Engagement						
14. When I'm in class, I feel good	249	1	3.74	1.29	–0.10	–0.52
15. When we work on something in class, I feel interested	249	1	3.76	1.14	–0.02	–0.37
16. Class is fun	249	1	3.53	1.30	0.08	–0.53
17. I enjoy learning new things in class	248	2	4.18	1.26	–0.30	–0.58
18. When we work on something in class, I get involved	249	1	3.98	1.20	–0.26	–0.33
Emotional Disengagement (R)						
24. When we work on something in class, I feel bored (R)	250	0	3.75	1.25	–0.46	–0.25
25. When I'm in class, I feel worried (R)	249	1	4.84	1.25	–1.27	1.30
26. When we work on something in class, I feel discouraged (R)	248	2	4.81	1.13	–1.09	1.34
27. Class is not all that fun for me (R)	247	3	4.21	1.28	–0.49	–0.22
28. When I'm in class, I feel bad (R)	249	1	5.07	1.12	–1.54	2.43
Cognitive Engagement						
6. I check my schoolwork for mistakes	246	4	3.59	1.25	0.01	–0.66
7. I study at home even when I don't have a test	247	3	2.67	1.50	0.75	–0.32
8. When I read a book, I ask myself questions to make sure I understand what it is about	250	0	3.10	1.66	0.34	–1.08
9. If I don't know what a word means when I am reading, I do something to figure it out	249	1	3.88	1.54	–0.17	–1.07
10. I read extra books to learn more about things we do in school	248	2	2.85	1.55	0.57	-0.74
11. If I don't understand what I read, I go back and read it over again	250	0	4.50	1.45	–0.86	–0.17
12. I talk with people outside of school about what I am learning in class	249	1	3.37	1.46	0.06	–0.85
13. I try to watch TV shows about things we do in school	250	0	2.34	1.34	1.03	0.66

*(R) = reversed score

Table 2.4

Factor loadings for 28 items of the ASE Scale (include the non-zero loadings)

Item No.	Item text	Factor				
		CE	BE	BDR	EE	EDR
7	I study at home even when I don't have a test	**.83**	–.11	.15	–.11	–.05
8	When I read a book, I ask myself questions to make sure I understand what it is about	**.83**	–.11	.00	.09	–.06
10	I read extra books to learn more about things we do in school	**.83**	–.16	.13	.09	–.11
9	If I don't know what a word means when I am reading, I do something to figure it out	**.75**	.02	–.01	.00	–.07
13	I try to watch TV shows about things we do in school	**.67**	–.16	.02	.22	–.05
11	If I don't understand what I read, I go back and read it over again	**.67**	.14	–.12	–.08	.10
12	I talk with people outside of school about what I am learning in class	**.63**	.07	–.09	.10	.04
6	I check my schoolwork for mistakes	**.54**	.27	.09	–.07	.02
4	I pay attention in class	–.18	**.88**	.07	.15	–.11
2	In class, I work as hard as I can	.03	**.87**	.07	.06	–.18
5	When I'm in class, I listen very carefully	–.13	**.83**	.05	.18	–.06
1	I try hard to do well in school	.07	**.82**	.08	–.03	–.08
20*	I don't try very hard at school	–.04	**.54**	.43	–.17	.15
18	When we work on something in class, I get involved	.20	**.36**	–.21	.35	.21
22	When I'm in class, I think about other things (R)**	.00	–.09	**.86**	.25	–.06
23	When I'm in class, my mind wanders (R)	–.01	–.07	**.77**	.29	–.03
19	When I'm in class, I just act like I'm working (R)	–.01	.29	**.66**	–.24	–.02
24	When we work on something in class, I feel bored (R)	–.01	.00	**.61**	.35	.12
21	In class, I do just enough to get by (R)	.24	.22	**.55**	–.42	.22
3	When I'm in class, I participate in class discussions	.27	.34	**–.36**	.14	.27
16	Class is fun	.09	–.01	.04	**.84**	–.08
14	When I'm in class, I feel good	–.02	.12	.03	**.79**	.00
15	When we work on something in class, I feel interested	.17	.26	.01	**.60**	–.07
17	I enjoy learning new things in class	.18	.23	.04	**.47**	.11
26	When we work on something in class, I feel discouraged (R)	–.05	–.16	.07	.02	**.88**
25	When I'm in class, I feel worried (R)	.02	–.15	.03	–.15	**.88**
28	When I'm in class, I feel bad (R)	–.13	.01	–.03	.10	**.85**
27	Class is not all that fun for me (R)	–.04	–.06	.19	.44	**.46**

Note: CE–Cognitive Engagement; BE–Behavioural Engagement; BDR–Behavioural Disengagement (R); EE–Emotional Engagement; EDR–Emotional Disengagement (R).
* In gray background – items with cross-loading > .3
**(R) = reversed score

The new ASE Scale includes five subscales (according to the five factors): Behavioural Engagement includes four items; Behavioural Disengagement, Emotional Engagement, and Emotional Disengagement factors include three items on each; and Cognitive Engagement includes eight items. Table 2.5 presents the final EFA for 21 items (χ^2 = 189.558, df = (115), $p < .001$).

It can be seen (Table 2.5) that the final solution shows clear factors, with high factor loading on five factors, minimal cross-factor loadings, and no items deviating from the expected factors. Each factor has each item contributing as expected, and there is sufficient variance between the factors to consider them related, but with sufficient difference to be considered unique. The five-factor model explains 68.69% of the variance.

Table 2.6 presents the observed correlations among the five final factors, which were all moderately high and in the expected directions. Because of reverse scoring of the negative items, all five factors were found to be positively correlated.

Overall, after excluding seven items of the original subscales, the final solution of the ASE Scale, with 21 items, shows five clear factors, with high factor loadings on each of them, minimal cross-factor loadings, and no items deviating from the expected factors. Also, these five subscales indicate high estimates of reliability for each scale (using Cronbach's alpha for internal consistency), and provide evidence for meaningfully interpreting a sum of the items for each scale. Although the correlation between some of the factors found a little bit high than was expected (r = 0.69, meaning 47% shared variance) all correlations in the normal range ($r < 0.8$) (Field, 2009).

Table 2.5

Factor loadings for 21 items of the ASE Scale (include the non-zero loadings)

Item No.	Item text	Factor				
		CE	BE	EE	EDR	BDR
8	When I read a book, I ask myself questions to make sure I understand what it is about	**.81**	–.10	.10	–.03	–.01
10	I read extra books to learn more about things we do in school	**.81**	–.09	.04	–.04	.07
7	I study at home even when I don't have a test	**.81**	–.07	–.13	–.01	.17
9	If I don't know what a word means when I am reading, I do something to figure it out	**.75**	.08	–.07	–.06	–.03
11	If I don't understand what I read, I go back and read it over again	**.69**	.18	–.09	.10	–.15
13	I try to watch TV shows about things we do in school	**.64**	–.14	.25	–.02	–.02
12	I talk with people outside of school about what I am learning in class	**.60**	.10	.16	.06	–.17
6	I check my schoolwork for mistakes	**.54**	.31	–.09	.09	.07
4	I pay attention in class	–.12	**.89**	.08	.01	.02
2	In class, I work as hard as I can	.08	**.86**	.00	–.09	.03
5	When I'm in class, I listen very carefully	–.07	**.83**	.12	.04	.01
1	I try hard to do well in school	.11	**.81**	–.05	–.02	.03
16	Class is fun	.05	–.03	**.89**	–.04	.02
14	When I'm in class, I feel good	–.05	.07	**.87**	.04	.04
15	When we work on something in class, I feel interested	.15	.19	**.66**	–.03	.01
26	When we work on something in class, I feel discouraged (R)*	.01	–.04	–.01	**.88**	.04
25	When I'm in class, I feel worried (R)	.07	–.07	–.15	**.86**	.06
28	When I'm in class, I feel bad (R)	–.09	.08	.17	**.81**	–.09
22	When I'm in class, I think about other things (R)	.00	–.06	.12	.01	**.91**
23	When I'm in class, my mind wanders (R)	.01	–.04	.13	.06	**.85**
19	When I'm in class, I just act like I'm working (R)	–.04	.29	–.22	–.04	**.64**

Note: CE – Cognitive Engagement; BE – Behavioural Engagement; EE – Emotional Engagement; ED – Emotional Disengagement (R); BD – Behavioural Disengagement (R).
*(R) = reversed score

Table 2.6

Correlations between the factors with 21 items (N=250)

Student Engagement factors	BE (1)	CE (2)	EE (3)	BD(R) (4)	ED(R) (5)
(1) Behavioural Engagement	–				
(2) Cognitive Engagement	0.61*	–			
(3) Emotional Engagement	0.69*	0.65*	–		
(4) Behavioural Disengagement (R)**	0.51*	0.35*	0.43*	–	
(5) Emotional Disengagement (R)	0.42*	0.26*	0.52*	0.51*	–

Note: * Correlation is significant at the <=0.01 level (2 tailed)
**(R) = reversed score

Given that the exploratory analysis of the ASE Scale showed no items deviating from the expected factors, CFA using AMOS 19 (Arbuckle, 2010) was used to confirm the final fit of the items to factors. The final model (Figure 2.1) has an acceptable fit (χ^2 = 280.292, df = 184, p < .001), (standardised model, CMIN/DF = 1.523, CFI = .870, TLI = .837 and RMSEA=.071).

In addition, CFA was used to check for significant differences between the two schools on the ASE Scale. On the first step AMOS groups were used, by including the whole sample, and two groups were defined – one for each school. The model had acceptable fit (χ^2 = 649.511, df = 368, p < .001), (standardised model, CMIN/DF = 1.765, CFI = .898, TLI = .872 and RMSEA = .056). Finally, AMOS multiple-groups analysis of the two schools indicated an acceptable model fit (χ^2 = 649.511, df = 368, p < .001), (standardised model, CMIN/DF = 1.765, CFI = .898, TLI = .872 and RMSEA = .056, p = .230) and the model parameters were not significantly different across the group (p > .05).

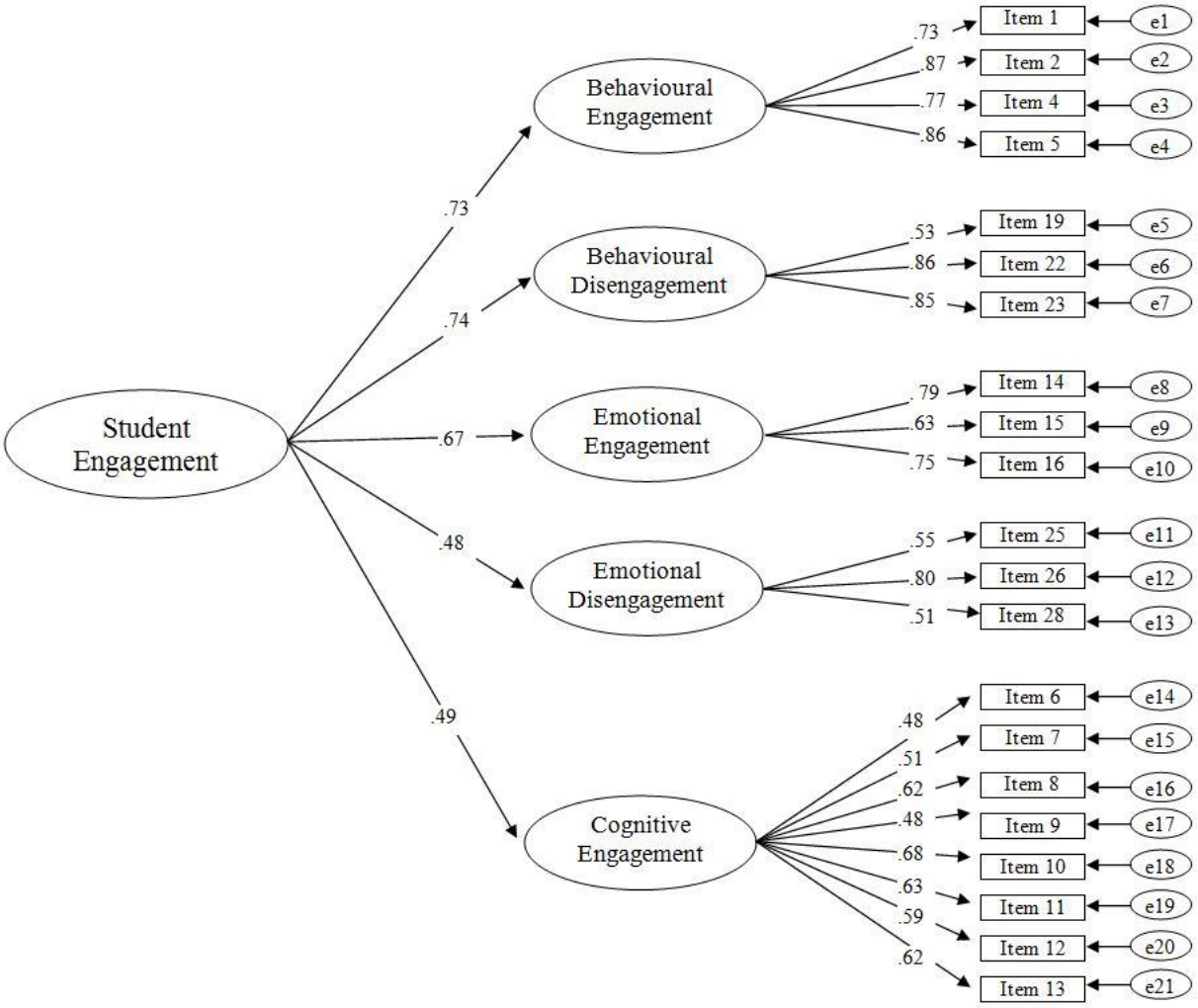

Figure 2.1: Structural model* of the ASE Scale

*(See Table 2.3 for item descriptions)

Finally, the reliability of the reduced scales with 21 items was examined, using Cronbach's alpha, for internal consistency. Table 2.7 presents high estimates of reliability for each scale, and provides more evidence for meaningfully interpreting a sum of the items for each factor. An additional check was conducted by removing any item would not improve the total Cronbach's alpha score for the scale.

Table 2.7

The reduced scales with 21 items, by reliability, Mean, SD (N=250)

Student Engagement Scales	α	Mean	SD	Number of students
Total engagement (21 items)	0.91	3.85	0.77	250
Behavioural engagement (4 items)	0.90	4.45	0.90	246
Behavioural disengagement (R)* (3 items)	0.79	3.61	1.13	245
Emotional engagement (3 items)	0.87	3.67	1.11	247
Emotional disengagement (R) (3 items)	0.81	4.91	0.99	246
Cognitive engagement (8 items)	0.88	3.29	1.08	240

Note: *(R) = reversed score

Discussion

The first aim of this chapter was to develop and validate a new comprehensive measurement tool for student engagement, the Auckland Student Engagement Scale (ASE Scale), which includes all three domains of engagement – behavioural, emotional, and cognitive. In addition, the feasibility impact of the mode of the questionnaire (paper and online) on the respondents was measured among New Zealand secondary school students.

The new scale – the ASE Scale – was developed by combining of two existing scales. The new ASE scale benefits from having a consistent measurement scale across all domains. All 28 items were administered using a 6-point self-report frequency scale

rather than different kinds of agreement scales as discussed in the Chapter 1 of the literature review.

Overall, results indicate good feasibility and suitability of the ASE Scale, for both versions of the questionnaire and for both schools. The findings suggest that there are no significant differences due to the school on the factor model, allowing the two schools to be combined into one sample. Furthermore, as one school used paper and pen while the other school used an online mode of data collection, this evidence strengthens the assumption that the mode of data collection (paper or online) makes no significant impact on the factor model.

The current research indicated that there was a need to remove seven items from the ASE Scale in order to retain good psychometric properties. The new ASE Scale with 21 items shows clear factors, with high factor loadings on five factors, minimal cross-factor loadings, and no items deviating from the expected factors (Table 2.5). Each factor has each item contribute as expected, and there is sufficient variance between the factors to consider them related but with sufficient difference to be considered unique. The five-factor model explains 60.5% of the variance of the factors' structure.

There is broad agreement that a factor with five or more loading items indicates a stronger and more solid factor (Kahn, 2006; Osborne & Costello, 2009; Tabachnick & Fidell, 2007). However, the accepted heuristic, or "rule of thumb", is that a factor with three items is the minimum required for stability, and ultimately this depends on the nature of the phenomenon (Osborne & Costello, 2009; Tabachnick et al., 2001). The correlations between the final factors indicate that some of the observed correlations among the five factors are low to moderate, while some of them are moderately high and in the expected directions, with all five factors positively correlated. As expected,

behavioural engagement has high correlation with emotional and cognitive engagement. On the other hand, those factors have low correlation with disengagement factors. These results are also in line with previous research (Skinner et al., 2008b). Behavioural engagement seems to be the main driver of actual learning activities and performance, and emotion is likely the fuel for the kind of behavioural and cognitive engagement that leads to high-quality learning (Skinner et al., 2008b). Furthermore, as expected, negative behaviours and emotions have low correlations with positive engagement factors, while showing high correlations between themselves.

Confirmatory factor analysis (CFA) indicates that the final standardised model has an acceptable fit (Harrington, 2009; Hu & Bentler, 1999; Kline, 2005), which confirms the model and indicates structural (and factorial) construct validity (Harrington, 2009). In addition, Cronbach's alpha indicates the ASE Scale and the structural model have good reliability. Thus, each one of the engagement subscales indicates high internal consistency; that is, how closely related a set of items is. CFA group and CFA multiple-group analysis indicates an acceptable model fit and no significant differences between the two schools ($p > .05$). Based on these findings it is suggested that the ASE Scale is insensitive to either mode of application (paper and online) or age (Year level 8 and Year level 10), or both. However, further research is required to confirm that conclusion within bigger samples and different populations.

The main limitation of the new scale is the reduced number of items in four of the subscales. As discussed above, although the reduced number is within the limit of the number that is accepted in the literature, it would be generally considered to be more reliable to have expanded subscales with a higher number of items on each. Unfortunately, the time frame and budget of the current study did not allow for another

round of improvement of the scales at this stage. Therefore, future work may consider improving this new measurement scale by increasing the number of items on the behavioural engagement, behavioural disengagement, emotional engagement, and emotional disengagement subscales.

In summary, the findings in this chapter indicate that the study's objectives were successfully achieved. The new measurement tool for student engagement – the ASE Scale – has acceptable psychometric properties, acceptable model fit, and is ready for the next steps of use and development.

Chapter 3

The Relationship between Student Engagement and Academic Achievement

Study II

Although previous studies consistently demonstrate a positive relationship between most of the student engagement domains and academic achievement (Connell et al., 1994; Finn & Rock, 1997; Jimerson et al., 2003; Skinner et al., 2009a), research examining the causal effect of student engagement on academic achievement is sparse (Fredricks et al., 2004; Marks, 2000). In addition, most of the research deals with one or two of the engagement domains at a time but rarely considers all three domains simultaneously (behavioural, emotional and cognitive). Research including all three domains of engagement, and examining their effect on achievement or dealing with engagement as a multi-faceted construct, is still rare (Fredricks & McColskey, 2012). Examining each of the student engagement domains separately is biased, whereas in real life these three domains are dynamically embedded within a single individual and are not isolated processes (Fredricks et al., 2005). Thus, investigating the impact of all three domains simultaneously on academic achievement may provide better insight into the role that student engagement has within the learning process.

The relationship between student engagement and academic achievement

Various studies report positive correlations between each of the three domains of student engagement – behavioural, emotional, and cognitive – and academic achievement (henceforth "achievement"). For example, several studies have demonstrated a positive correlation between *behavioural engagement* and achievement (for example, standardised tests, grades) for elementary, middle, and high school students (range r .13 to .59, $p < .01$) (Connell et al., 1994; Connell & Wellborn, 1991; Furrer & Skinner, 2003; Marks, 2000; Skinner & Belmont, 1993). Previous studies have also identified associations between student engagement and academic achievement (range R^2 .08 to .32, f^2 .09 to .47, β –.17 to .55, $p < .01$) (Connell et al., 1994; Fredricks et al., 2004), yet little is known about the causal effects of behavioural engagement on academic achievement.

The association of *emotional engagement* with academic achievement is somewhat unclear (Appleton et al., 2006; Connell et al., 1994; Marks, 2000; Martin, 2009; Skinner et al., 2008b; Skinner et al., 1990). Some studies show positive correlations between achievement and a combined measure of emotional and behavioural engagement (range r .18 to .51, $p < .01$) (Connell et al., 1994; Skinner et al., 1990); however, because of the use of a combination of different types of engagement it is difficult to understand the discrete contribution of emotional engagement on academic outcomes.

Studies showing a positive correlation between *cognitive engagement* and achievement appear to be limited (Appleton et al., 2006; Green et al., 2007; Marks, 2000). For example, the factors of future aspirations and goals and extrinsic motivation

were positively correlated with grade point average (GPA) in the expected positive direction (range *r* .001 to .32, $p < .05$) (Appleton et al., 2006; Wang & Eccles, 2011a).

In recent years, a few studies have included all three domains of engagement and achievements (Finlay, 2006; Martin, 2007, 2009; Sciarra & Seirup, 2008; Wang & Holcombe, 2010; Yazzie-Mintz, 2010), yet their findings did not provide a conclusive model. The correlations and association between student engagement factors and achievement were found to range widely. Wang and Holcombe (2010) found that behavioural (school participation), emotional (school identification), and cognitive (use of self-regulation strategies) engagement factors were positively associated with GPA ($R^2 = .41$, $f^2 = .69$, $\beta = .13$, .32, and .17, respectively), whereas in other studies some of the student engagement factors were not found to have statistically significant correlations with GPA (Finlay, 2006).

Overall, the current literature seems to suggest that there are positive associations between student engagement and academic achievement, yet whether that association suggests causality is unclear.

The relationship between potential confounding variables, student engagement, and academic achievement

As discussed in the previous chapter, a confounder is a variable impact on the association between two other variables (the dependent and the independent variable); that is, a third variable explains some of the relationship between an independent and a dependent variable (MacKinnon et al., 2000). To address the lack of evidence concerning causality, the objective of this study is to identify in longitudinal research whether the relationship between engagement and achievement suggests causal effect. To identify such associations, some important factors that may be related to both

engagement and academic achievement need to be controlled for: teacher support, peer support, school environment, and student socio-economic background. These variables are examined because evidence has already been reported regarding their effect on either academic achievement, student engagement, or both. The first two variables – teacher support and peer support – are the most important because these variables are defined as *facilitators* that have the potential to influence the target variable – engagement (Sinclair et al., 2003; Skinner et al., 2008b; Skinner & Pitzer, 2012). Importantly, these two variables can be modified if needed by educational intervention programmes. The other two variables – school environment and student socio-economic background – are important, as there is also evidence of their impact on student engagement, academic achievement, or both. Although it is very difficult to change these variables, if at all, knowledge about the association between them and engagement enables the development of special educational programmes aimed at the individual needs of different groups; for example, according to gender, age, ethnicity, or socio-economic status (SES).

The associations between these four variables as potential confounders were reviewed in detail in the literature review (Chapter 1). In summary, it is important to note that the associations reported in the literature regarding each of the four selected potential confounders is varied and range from no statistically significant correlations to moderate, and in some cases even large, effects with high statistical significance. For example, positive correlations were found between *teacher support* and student engagement (range r .08 to .78, $p < 0.5$) (Connell & Wellborn, 1991; Hamre & Pianta, 2001; Skinner et al., 2009a; Skinner et al., 2008b), while seven domains regarding the teacher and teaching were found to be among the top 10 influential factors on

achievement (range d = .90 to .73) (Hattie, 2009a). Moreover, teachers were found to have causal effects on learning and students' achievements (about 20% to 30% of the variance) (Hattie, 2003). Positive low correlations were also found between *peer support* and academic achievement (range r = .06 to .38, p < 0.5) (Birch & Ladd, 1997; Furrer & Skinner, 2003; Goodenow, 1993b; Skinner & Greene, 2008a; Stewart, 2008), and for peer support as a predictor of academic achievement, although the effect was very low (R^2= .09, f^2 = .10, p < .05) (Stewart, 2008).

The findings regarding the *school environment* as a factor associated with student engagement and academic achievement are varied and even contradictory (as discussed in Chapter 1). School environment was found to have a positive effect on academic achievement (range effect size, Cohen's d of .80 to .34) (Hattie, 2009a), while the evidence for its association with student engagement is more limited (Darr, 2012; Finlay, 2006; Finn & Voelkl, 1993; Fredricks et al., 2004) (for more details see Chapter 1).

Reviews of psychological, sociological, and educational literature indicate that student background variables, including gender, ethnicity, and SES of the student are the main variables associated with, or having impacts on, achievement or on student engagement. Positive correlations have been shown between engagement and *gender* of the student. For example, at all grade levels in elementary, middle, and high school, girls are consistently more academically engaged than boys (Alexander et al., 1997; Bowen & Richman, 2010; Connell et al., 1995; Finn, 1989; Finn & Cox, 1992). In addition, *family poverty*, *ethnicity* and *household composition* have been positively associated with academic achievement (Alexander et al., 1997; Connell et al., 1995; Finn & Cox, 1992; Sciarra & Seirup, 2008) (for more details see Chapter 1).

As there is evidence about the impact of teacher support, peer support, school environment, and demographic background of the student both on engagement and on achievement, it is important to include them as potential confounders when examining the relationship between engagement and achievement, particularly when examining whether this relationship suggests causal effect. Figure 1.1 in Chapter 1 summarised in a schematic chart the suggested associations between student engagement, academic achievement and the four selected potential confounders.

The research questions

The primary objective of this study is therefore to identify the relationship between engagement and achievement, and whether the relationship suggests causal effect, controlled for selected potential confounders such as teacher support, peer support, school environment, and student demographic characteristics.

Method

Sample. The participants of this study were 2,156 Year 7 to Year 9 students from three urban secondary schools who volunteered to participate in the study. Only students who completed the research questionnaire at the beginning and at the end of the academic year, and whose academic achievements were provided by the schools, were included in the final sample. Thus, data for 1,617 students (75% of participants) were included in the analysis.

Measurement tools. Students completed the ASE Scale, a self-report questionnaire, and reported on their behavioural, emotional, and cognitive engagement in the classroom, and two support domains – teacher support and peer support. In addition, students reported some background information (see the questionnaire in

Appendix A). Academic achievements (Assessment Tools for Teaching and Learning – asTTle[9]) were provided by the schools from student records.

The ASE Scale includes three domains by five factors of student engagement and two factors of support as follows (for further information see Chapter 2): Behavioural Engagement (4 items, Cronbach's alpha .90), Behavioural Disengagement (3 items, Cronbach's alpha = .79), Emotional Engagement (3 items, Cronbach's alpha = .87), Emotional Disengagement (3 items, Cronbach's alpha = .81), and Cognitive Engagement (8 items, Cronbach's alpha = .88); Teacher support and peer support were measured by two subscales taken from the School Success Profile (SSP) (Bowen et al., 2005) (for further information see Chapter 2): Teacher Support (8 items, Cronbach's alpha = .89) and Peer Support (5 items, Cronbach's alpha = .87).

Composite scores were determined by calculating the average of items of the five engagement subscales and of the two support subscales. Negative items were reverse-coded (as discussed in Chapter 2 in the Method section). All 41 items were administered using a 6-point self-report frequency scale (that is, 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, 5 = *Very often*, 6 = *Always*). Resulting scores ranged from 1 to 6, with higher scores indicating more of the respective construct. In addition, averages of the positive items and the reverse-coded negative items of the same factors were computed. Mean *Total student engagement* was computed by averaging all 21 positive and negative reverse-coded items.

[9] National standardised academic achievement was provided by asTTle assessment (Ministry of Education NZ, 2013).

Academic achievement. Student academic achievement from the asTTle in reading and writing was provided by the schools. The asTTle is a national standardised assessment tool, which was developed for the New Zealand Ministry of Education by Auckland University team researchers (Ministry of Education NZ, 2013). The asTTle was developed to assess students' achievement and progress in reading, writing, and mathematics (both in English and in Māori – pānui, pāngarau, and tuhituhi). It is designed to provide reliable and valid assessment information for teachers and students to enhance teaching and learning. The assessment is done using two parallel types of grade report. One uses a continuous scale of raw scores (asTTle Scale) (the range is 1,200 to 2,000) and the second uses scores (asTTle Level) that are compatible with the curriculum level. These level scores, as alphanumeric variables, were converted into 17 numeric categories (range 1 to 17) for the current study. The comparison between these two types of asTTle (Scale and Level) is described in detail in the Results section of the current chapter. A total grade in English was computed by the average of students' grades in reading and writing, aiming to have an overall academic achievement in English.

***Demographic and background information*.** The questionnaire also included demographic and background questions regarding ethnicity, country of birth, and languages spoken at home, as well as SES such as: family structure, number of siblings, birth order, the number of books at home and the parents' schooling level.

Potential confounding variables. The confounding hypothesis suggests that a third variable explains some of the relationship between an independent and a dependent variable (MacKinnon et al., 2000). Accordingly, some background variables and demographic characteristic were controlled in the statistical model, as previous

studies have suggested that student demographic characteristics can influence both student engagement and academic achievement.

Gender. A dichotomous variable indicated whether the student was female (1) or male (2). Female is the reference category.

Year level. The year level was represented by three categorical variables: Y7 (1), Y8 (2), and Y9 (3). Y7 is the reference category.

School. The school was represented by three categorical variables: School 2 (2), School 4 (4), and School 5 (5). School 2 is the reference category.

Ethnicity. The ethnicity of the student was represented by six categorical variables: European (1), Māori (2), Pacific (3), Asian (4), South Asian (5) and other (6). European is the reference category.

Family structure. The family structure of the student was represented by three categorical variables: Living with two parents (1), Living with one parent (2), Other situation (3). Living with two parents is the reference category.

Number of books at home. The variable regarding the number of books at the student's home was represented by five categories, modified and used as dummy variables as appropriate: There are 0 to 10 books at home (1), There are 11 to 50 books at home (2), There are 51 to 100 books at home (3), There are more than 100 books at home (4), and Don't know (5). Zero to 10 books at home is the reference category.

Mother or father's level of schooling. The parents' level of schooling was represented by five categorical variables, and measured separately for each one of the parents: Did not finish high school (1), Finished high school with qualifications (2), Trade or professional qualification (3), University degree (4), Don't know (5) Did not finish high school is the reference category.

Procedure. Following approval from the University of Auckland Human Subjects Ethics Committee, (Appendix C) three secondary schools were recruited to participate in the study. All students in each school were invited to participate in the survey. All students were given oral explanations and information sheets about the research. Participation in the research was completely voluntary and no remuneration was offered. The students were told that whether they chose to be involved or not would not affect any aspect of their schooling, and that they may leave the study at any time without giving a reason. All participating students signed a consent form. The school staff administered this process during class time and students generally filled out the questionnaires within 10 to15 minutes. There were two points of data collection: at the beginning, and at the end (T1, and T2, respectively) of the year (February and November 2012).

Statistical methods. As the study design included two points of data collection, *changes* in student engagement and in achievement were able to be calculated.

The benefit and challenges regarding the use of change score have been extensively debated in the literature. Some authors pointed out some limitations such as low reliability, validity, violation of the distribution around the regression line (Allison, 1990; Cronbach & Furby, 1970; Edwards, 2001); and that it does not take into account the impact of the starting point on overall impact measured.

Despite these limitations, from the early '1970's , scholars have raised contradictory claims and have been proven them in various studies (Allison, 1990; Cunningham, 2011; Dimitrov & Rumrill Jr, 2003; Edwards, 2001; Zimmerman & Williams, 1982). They argued that score differences are a natural and logical approach to conceptualising and testing certain research questions, particularly when the aim

providing a dependent variable or outcome for intervention and education studies (Cunningham, 2011; Edwards, 2001) . For example, high face validity, intuitive nature and meaning, difference often assumed to represent something distinct from their component parts, frequently used in repeated measures analyses, and to operationalise issues that matter to applied researchers, consultants, and professional practitioners (Cunningham, 2011). It also has been demonstrated that reliability of change scores is high in many practical situations, particularly when the pre-test and post-test scores do not have exactly equal variance and equal reliability (Dimitrov & Rumrill Jr, 2003). Moreover, with none-experimental data, the measurement of a dependent variable at two (or more) points in time is widely regarded as a powerful tool for supporting causal relationship.

Using standardised calibrated tests for measuring changes in academic achievement (as the asTTle in the current study) provides a solution for three of the main limitations. As an interval measurement system, which allow a very large range (across the Year levels), it eliminates the limitation of "Ceiling effect", as for the students that are already have very high grades, usually have no option to move up. This is not the case with the asTTle as it is crosses Year level, furthermore, the expected change is uniform (Ministry of Education NZ, 2013). In addition, the use of path analysis provides the solution regarding the limitation of the absent "beginning-point" as it include two point of time - the beginning of the year and the end of the year in the model.

The change in student engagement throughout the year. The changes within total student engagement and each one of the engagement factors between the beginning

of the year (T1) and the end of the year (T2) was calculated as the difference of the student engagement means at T2 and T1.

***The change in academic achievement throughout the year*.** The change in achievement between the beginning of the year (T1) and the end of the year (T2) was calculated as the difference between the achievement means at T2 and T1.

Descriptive analyses. A paired-samples t-test compared the means between two related groups on the same continuous, dependent variable. A paired t-test was conducted exploring the differences between the means of student engagement and achievement at the beginning of the year compared to the end of the year for the whole sample.

Multivariate analyses. *Hierarchical multiple linear regressions* were used to examine the prediction value of a variable based on the value of two or more other variables. The dependent variable (DV) achievement was regressed by the independent variable's (IV) value of five student engagement factors. Three objectives were defined to answer the research question: (1) To what extent student engagement at the beginning of the year impacted on academic achievement at the end of the year. (2) To what extent student engagement impacted on the change in academic achievement throughout the year; and (3) To what extent the change in student engagement impacted on the change in academic achievement throughout the year. Accordingly, a set of three hierarchical multiple linear regressions were repeated for each of these objectives.

Hierarchical regression. This is a method of hierarchical multiple linear regression where the order in which predictors are entered into the regression model is determined by the researcher, based on previous research: variables already known to be predictors are entered first, while other variables are entered afterwards (Field, 2009).

Hierarchical regression can be useful for evaluating the contributions of predictors above and beyond previously entered predictors, as a means of statistical control, and for examining incremental validity. Hierarchical regression is a sequential process involving the entry of predictor variables into the analysis in steps (Lewis, 2007). Hierarchical regression is an appropriate tool for analysis when variance on a criterion variable is being explained by predictor variables that are associated with each other (Pedhazur, 1982). As the order of variable entry into the analysis is based on theory, hierarchical linear regression was conducted with achievement regressed by student engagement. Teacher support, peer support, school, and the SES variables were entered into the equation as independent variables. All statistical analyses were performed using SPSS version 19 (SPSS Inc., 2012).

The two-way analysis of variance (ANOVA) is a method that compares the mean differences between groups that have been split on two independent variables (called factors). The main purpose of a two-way ANOVA is to understand if there is an interaction between the two independent variables on the dependent variable. The interaction term in a two-way ANOVA informs whether the effect of one of the independent variables on the dependent variable is the same for all values of the other independent variable (and vice versa).

Path Analysis is a method employed to determine whether or not a multi-variate set of non-experimental data fits well with a particular causal model (Pedhazur, 1982). To address the research questions structural equation modelling (SEM) using AMOS 19 (Arbuckle, 2010) was conducted to verify the relationship between engagement and achievement and to test the feasibility of causal relationship in the model. The model assessed the direct effects of the five factors of student engagement and the academic

achievement at T1 on the five factors of student engagement and the academic achievement at T2.

Results

Sample validation. As described above, the participants in the current study were those who completed the questionnaire at two points of time (T1 and T2), and standardised academic achievement information was available from their school. Hence, data for 1,617 students (75% of participants) were included in the analysis. These students are of three schools from different socioeconomic areas and different deciles[10], which include students from diverse SES backgrounds.

Given that asTTle reports by Level are derived from asTTle reports by Scale, it is obvious they should be highly correlated. As the asTTle Level was converted from an alphanumeric variable to a numeric variable, a Pearson correlation coefficient was computed to confirm the relationship between asTTle reports by Scale and asTTle reports by the converted Level (Figure 3.1).

Overall, as expected, there was a statistically significant high positive correlation between asTTle Scale and asTTle Level in both reading and writing assessment at T1(r = .98 and r = .97 respectively, n = 842, all ps < .01) and at T2 (r = .98 for both, n = 842, all ps < .01). The scatterplot in Figure 3.1 summarises the results and indicates that the asTTle Scale and asTTle Level can be used as two types of grade report in the current research. Although using the asTTle Scale achievements was preferred because of its greater accuracy, the decision was taken to use the asTTle Level in order to maximise the sample size.

[10] Decile is the New Zealand government's index indicating the socio-economic status of schools (for further explanations and references see comment 2 in Chapter 2).

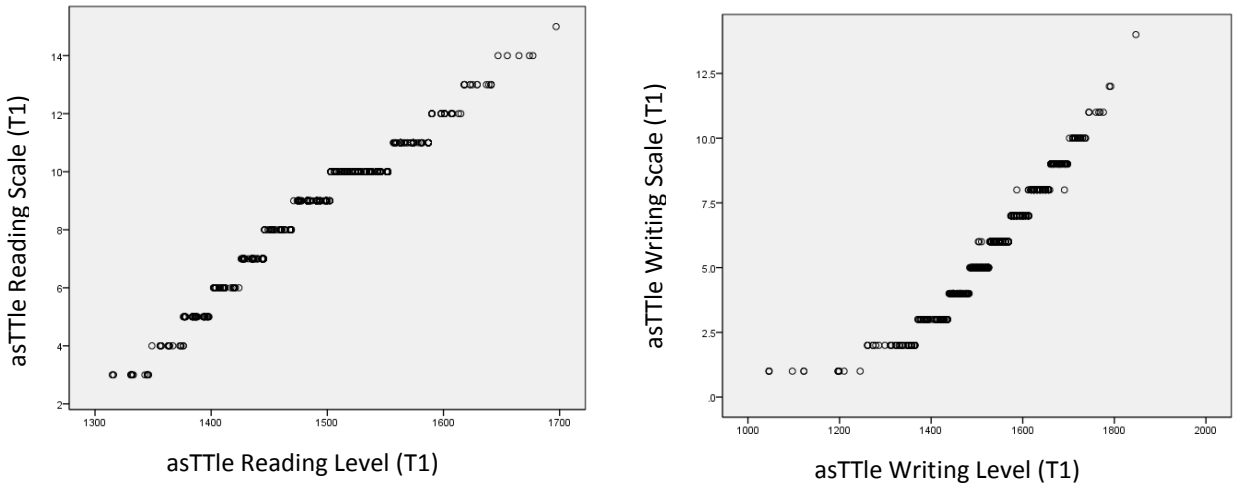

Figure 3.1. Scatterplot comparing asTTle achievement by Scale and Level

The final sample of 1,617 students consisted of three urban secondary schools: 789 male (48.8%) and 828 female (51.2%) of Year 7 to Year 9 (age 11 to 14 years old). The majority of the students (64.0%) categorised themselves as New Zealand European/Pākehā; 18.5% as East Asian; 10.0% as Māori; 3.3% as Pacific; 2.3% as South Asian; and 1.9% as other ethnicity. School 2 (n = 571, 35.3%) was Decile 10, School 4 (n = 800, 49.5%) was Decile 10, and School 5 (n = 246, 15.2%) was Decile 6.

Table 3.1 presents the reliability and means for all engagement factors, support factors, and academic achievement at T1 and T2. It can be seen that Cronbach's alpha is high for all engagement factors and support factors (range .74 to .93,), and all means are above the midpoint for their respective scales (this indicates positive attitudes in all variables). For example, the lowest mean that was measured is 3.65 for cognitive engagement at T1, which is above the midpoint of 3.5 (for a scale ranging from 1 to 6). In addition, low correlations among student engagement factors and academic achievement at T1 and at T2 (Table 3.7, Appendix D) are indicated.

Table 3.1

Comparing all variables at T1 with T2, by reliability and paired sample t-test

	T1			T2					
Variables	α	*Mean*	*SD*	A	*Mean*	*SD*	Mean Diff	*t*	*Cohen's d*
Total Student Engagement	.90	4.36	0.69	.91	4.22	0.73	–0.15	–9.60***	0.20
Behavioural Engagement	.86	4.91	0.76	.88	4.74	0.78	–0.17	–9.57***	0.22
Behavioural Disengagement(R)	.74	4.33	1.01	.84	4.19	1.11	–0.14	–5.53***	0.13
Emotional Engagement	.84	4.42	1.00	.85	4.27	1.02	–0.15	–6.08***	0.15
Emotional Disengagement (R)	.74	5.18	0.81	.81	5.13	0.87	–0.05	–2.14*	0.06
Cognitive Engagement	.85	3.78	0.96	.86	3.61	0.99	–0.17	–7.66***	0.17
Teacher support	.89	4.91	0.90	.92	4.76	1.03	–.14	–6.09***	0.16
Peer support	.90	4.92	1.04	.93	4.78	1.16	–.14	–4.62***	0.13
English (reading and writing)	N.A.	7.57	2.09	N.A.	9.12	2.17	1.55	36.55***	0.73

Note: * $p < .05$, *** $p < .001$

The relationship between student engagement and academic achievement.

The main research question was to examine the relationship between student engagement and academic achievement and the extent to which student engagement impacts on academic achievement. Accordingly, a series of three hierarchical multiple linear regressions models were conducted in order to examine each one of the three objectives as follows:

Objective 1: Student engagement as a predictor of academic achievement.

A hierarchical multiple linear regression analysis was carried out to examine to what extent Student Engagement statistically significantly predicted end–of–year achievement. The first regression model was conducted with achievement at T2 (DV) regressed by Total Student Engagement at T1 (IV). The same regression model was repeated with five Student Engagement factors in one block. All five factors of Student

Engagement were entered into the regression together in one block, and each factor was measured while the four other factors were controlled.

The results of the first hierarchical multiple linear regression indicated that Total Student Engagement T1 had negligible effect on achievement T2, as it explained only 1.2% of the variance; although it was statistically significant ($R^2 = 0.12$, $F(1,1615) = 19.93$, $p < .001$).

The results of the hierarchical multiple linear regression with all five Student Engagement factors (Table 3.2, Model 1, Appendix D) indicated small effects (explained 5.7% of the variance), yet were statistically significant. In addition, most of the Student Engagement factors had statistically significant positive and low effects, while Emotional Disengagement was found to have the largest positive effect (20% of the variance, $p < .001$); whereas Emotional Engagement was the only factor with a negative effect (18% of the variance, $p < .001$). No explanation was found to these unexpected results of the emotional negative effect and it may occur due to an artefact which needs further investigation in future studies.

Objective 2: Student engagement as a predictor of change in academic achievement. The second objective of the study examined to what extent Student Engagement predicted the change in learning between the beginning of the year (T1) and the end of the year (T2). The change in achievement between T1 and T2 was calculated and the difference in achievement (DV) was regressed on the first model by Total Student Engagement (IV). On the second model, difference in achievement was regressed by five factors of Student Engagement at T1 (IV). As all five factors of Student Engagement were entered into the regression together in one block, each factor was measured separately while the four other factors were controlled.

The results of the second hierarchical multiple linear regression (Table 3.3, Model 1, Appendix D) indicate no statistically significant effect of the change in Total Student Engagement on achievement (R^2 = 0.001, F(1,1615) = 1.01, p > .05; β = .03, p>.05). In addition, the second regression model with five Student Engagement factors suggests that there is only a negligible yet statistically significant effect.

Objective 3: Change in student engagement as a predictor of change in academic achievement. The third objective examined to what extent a change in student engagement predicts a change in achievement throughout the year. The change in student engagement and in achievement was calculated for each as the difference between T2 and T1. On the first regression model, the change of achievement (DV) was regressed by the change in total student engagement. On the second model, the change of achievement (DV) was regressed by the change of five Student Engagement factors (IV). As all five factors of Student Engagement were entered into the regression together in one block, each factor was measured separately while the four other factors were controlled.

The results of both regression models (Table 3.2, Model 1, Appendix D) indicate that the change in Total Student Engagement had no statistically significant effect on the change in achievement between T1 and T2 (R^2 = 0.000, F(1,1615) = 0.10, p > .05; β = –.01, p > .05), nor were any of the Student Engagement factors found to affect the change in achievement.

Academic Achievement as Predictor of Student Engagement. All three hierarchical multiple linear regressions were repeated in the reverse direction, to test whether there was a statistically significant effect in the opposite direction; that is, if achievement at the beginning of the year had affected student engagement at the end of

the year. Each one of the five Student Engagement factors (as DV) was regressed by achievement (as IV) one at a time. The results found even smaller effects and negligible variance explained by the models (R^2) than in the original models. Most of the analyses showed no statistically significant effect of achievement on Student Engagement factors. Only a few of those were found to be statistically significant and had small effects on Student Engagement factors. These results support the expectation that if there was a causal effect between student engagement and academic achievement then engagement was more likely to impact on achievement than the other way around.

In addition, a path analysis of the original model yielded poor fit (engagement at T1 as predictor of achievement at T2). Figure 3.2 presents the standardised path coefficients for the model. The overall model fit was poor (χ^2 = 2054.266, df = 35, p < .001, N = 1,617; CFI = 0.75, TLI = 0.442, RMSEA = 0.189), and the model accounted for a small portion of the variance in the outcomes. It also shows that in the opposite direction (achievement T1 as predictor of the engagement factors at T2) the coefficient is even smaller and negligible.

The Impact of the Potential Confounding Variables on the Relationship between Student Engagement and Academic Achievement. The second research question sought to identify the extent to which the selected potential confounders (teacher support, peer support, school environment, and SES variables) confound the relationship between student engagement and academic achievement. A hierarchical multiple linear regression was conducted using the same regression model as reported above; with achievement at T2 regressed by Student Engagement factors at T1 in the first block (Method = Enter), while adding Teacher support and Peer support in the second block (Method = Enter), and all other potential confounders in the third block

(Method = Stepwise). The potential confounders entered into the model were: school, gender, year level, ethnicity, birth order, language at home, family structure, number of books at home, mother's level of schooling, and father's level of schooling (Tables 3.2, 3.3 and 3.4, Appendix D).

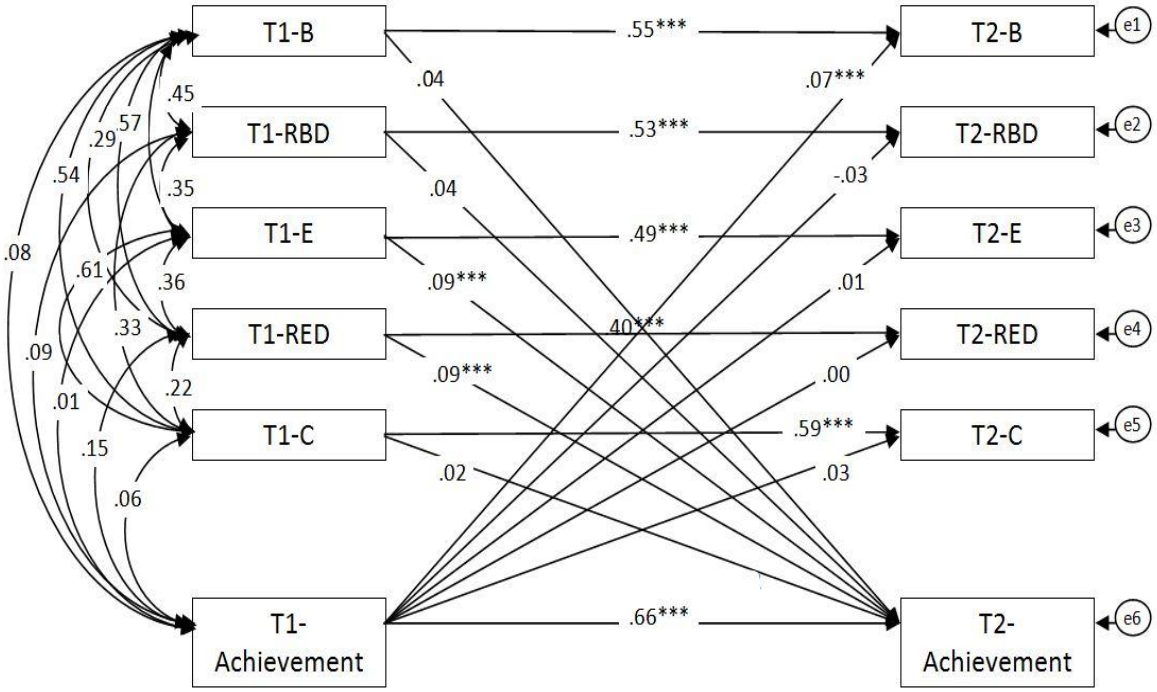

Figure 3.2. Path analysis of Student Engagement factors at T1 effect on Achievement at T2, and of the reversed direction (Achievement T1 effect on Engagement T2).

Legend: T1 = beginning of the year; T2 = end of the year, B – behavioural; RBD – behavioural Disengagement (R); E – emotional; RED – emotional disengagement (R); C – cognitive. *** $p < .001$

This comparison of the two models identified that the coefficient of the second model was much higher ($R^2 = .321$ to $R^2 = .183$, $p < .001$) than that of the first model ($R^2 = .057$, $p < .001$ to $R^2 = .004$, $p > .05$). In addition, the beta of the potential confounders was found to be higher than the beta for the engagement factors (range β

.43 to .16, $p < .001$ versus range β .20 to .07, $p < .05$, respectively). However, the confidence interval (CI) of the engagement factors in Model 2 overlaps with the CI in Model 1 (Tables 3.2 to 3.4, Appendix D). If the engagement coefficients do not significantly differ across the models (that is, 95% CI is overlapping) then the potential confounders are not actually confounding the association between engagement and achievement. These results suggest that these potential confounding variables had a greater impact on achievement than on the engagement factors, but did not confound the association between engagement and achievement.

It is noted that most of these variables have a positive impact, while the impacts of ethnicity (Pacific and Māori) and birth order were negative low. Teacher support and peer support were found to have no statistically significant impact on achievement.

The comparison models of the regression were repeated using change in achievement and change in student engagement accordingly, with the three objectives described above. Tables 3.3 and 3.4 (see Appendix D) show the same trend of higher coefficients with the potential confounders (Model 2) compared to the first model without them (Model 1), although the coefficient was lower than in the first regression (R^2 = .186, and .183, respectively, $p < .001$).

A set of additional analyses was conducted in order to gain a better understanding of the impact of the potential confounders separately on the association between student engagement and achievement. The same series of hierarchical multiple linear regressions as reported above (Tables 3.2 to 3.4, Appendix D) was conducted; however, this time each of the potential confounders was entered into the equation separately in order to avoid a situation of masking the impact of these variables. The

findings also suggest that there was no confounding effect of the potential variables on the association between engagement and achievement (tables not presented).

In summary, partially supporting results from previous studies, the findings suggest that student engagement is positively associated with academic achievement, but evidence for causal effects could not be established. Those findings remained regardless of whether or not selected potential confounders such as teacher support, peer support, school environment, and background variables of the student were considered. In addition, although school environment and gender had a small impact on the relationship between engagement and achievement, they are unlikely to confound the relationship between engagement and achievement. The breadth and depth of the statistical analyses undertaken in this study suggests that the findings are unlikely to be statistical artefact but represent the relationships between engagement and achievement in the sample used for this study.

Interaction effect of the relationship between student engagement and achievement. In order to examine the effect of several variables on the relationship between student engagement and achievement, a two-way ANOVA was conducted for each of the variables. Among all variables that were examined, there was a statistically significant interaction effect of two variables – gender and school – on the relationship between student engagement factors on achievement (Figures 3.3 and 3.4, Appendix D).

Gender interaction. There was a statistically significant small interaction effect of gender on the relationship between: Behavioural Engagement and achievement $F(1, 1,613) = 9.367$, $p < .01$; Behavioural Disengagement and achievement $F(1, 1,613) = 3.875$, $p < .01$; Emotional Engagement and achievement $F(1, 1,613) = 9.385$, $p < .01$; and Emotional Disengagement and achievement $F(1, 1,613) = 4.346$, $p < .05$ (Figure

3.3, Appendix D). There was no statistically significant interaction effect of gender on the relationship between cognitive engagement and achievement.

The interaction plots (Figure 3.3, Appendix D) showed that the higher the engagement of males the more highly they achieved, while with females there was a negligible effect of engagement on achievement. Moreover, a statistically significant negative effect was found for Behavioural Engagement and Emotional Disengagement on achievement for females ($p < .01$, and .05, respectively).

School interaction. There was a statistically significant interaction effect of School on the relationship between: Behavioural Engagement and achievement $F(2, 1,611) = 6.840$, $p < .01$; Cognitive Engagement and achievement $F(2, 1,611) = 6.339$, $p < .01$; Emotional Engagement and achievement $F(2, 1,611) = 8.124$, $p < .01$; and Emotional Disengagement and achievement $F(2, 1,611) = 7.622$, $p < .05$. There was no statistically significant interaction effect of School on the relationship between behavioural disengagement and achievement.

The school interaction plots (Figure 3.4, Appendix D) show that there was a positive small effect of student engagement on achievement at School 4 and School 5, as the higher engagement the higher the achievement, while at School 2 there was a negligible or even negative effect of engagement on achievement.

Overall changes over the academic year. A paired samples t-test was conducted (Table 3.1) to determine whether student engagement means, teacher-support and peer-support factors means, and achievement means at T2 were statistically significantly different from the means at T1. The analysis indicates that there was a statistically significant *decrease* in all Student Engagement factors at T2 compared to T1. The larger decrease was in Behavioural Engagement (Cohen's $d = .22$) and the smaller decrease

was in Emotional Disengagement (Cohen's *d* = .06). In addition, there was a statistically significant decrease in both teacher support and peer support at T2 compared to T1. In contrast, achievement in English showed a statistically significant increase from T1 to T2 (Cohen's *d* = .73).

Overall changes over the academic year by school. A paired t-test by school (Table 3.5, Appendix D) was conducted to gain a better understanding of the changes over the year in engagement factors, support factors, and achievement, and the differences in these between schools.

The results indicate small changes (range *d* 0.04 to 0.29) over the year, yet most of them are highly statistically significant for engagement and support factors. In contrast, achievement yielded the largest difference over the year, although the difference varied across the schools; in two of the schools the difference over the year was much larger (*d* = 0.98 and *d* = 0.95) than in the third school (*d* = 0.31).

In summarising the results across schools, it is noted that changes in engagement and achievement throughout the year differed across schools, which suggests that school environment might have an impact on both of those variables.

Overall changes over the academic year by gender. A paired t-test by gender was conducted (Table 3.6, Appendix D) to better understand the changes over the year in engagement factors, support factors and achievement, and the differences in these between genders.

Although there was a statistically significant interaction of school and the effect of engagement on achievement, the results of the paired t-test shows medium to small changes (range *d* 0.11 to 0.32). In contrast, for achievement there is the largest and most

meaningful difference over the year, yet no differences were found for achievement across gender (d = 0.73 for female and 0.75 for male).

Notwithstanding the above, it is important to note that there were differences between the genders for the factors that showed significant difference and effects of a higher magnitude and those that did not throughout the year.

Overall, female engagement decreased more than male engagement for most of the engagement factors.

Discussion

The findings of the current study did not find meaningful impact of student engagement on academic achievement. These findings remained regardless of whether or not potential confounders such as teacher support, peer support, school environment, and background variables of the student were considered. The results also indicate that school environment and gender have a small impact on the relationship between engagement and achievement but they are unlikely to be considered confounders of the association.

Five criteria need to be considered when establishing a causal effect. The first three criteria generally considered as the necessary and essential basis for identifying a causal effect are: empirical association; appropriate time order (that is, the cause happened *before* the effect); and non-spuriousness (that is, a relationship between two variables that is not due to variation in a third confounding variable). After these three conditions have been met, two other criteria are also important – identifying a causal mechanism and specifying the context. The last two criteria considerably strengthen the causal explanations, although they are not considered to be requirements for establishing a causal relationship (Bachman & Schutt, 2013; Trochim & Donnelly,

2007). Obviously, the most difficult criterion to meet is the non-spuriousness – ruling out alternative explanations for the observed effect (Trochim & Donnelly, 2007).

Based on previous studies indicating a positive association between different student engagement factors and achievement (Fredricks et al., 2004; Fredricks & McColskey, 2012; Skinner et al., 2008b; Wang & Holcombe, 2010), it was expected that student engagement would have a positive effect on achievement. The main goal of this chapter was to establish the relationship between engagement and achievement, and whether evidence suggesting causal effect could be found. However, put together, results from the present study suggest complex and somewhat counterintuitive relationships between engagement and achievement.

Following the five criteria for causal effect noted above, although some results regarding the effect of engagement on achievement were statistically significant (range R^2 .057 to .008, $p < .004$, see Tables 3.2 to 3.4, Appendix D), the impact found was weak and considered not educationally meaningful. Thus, the findings do not meet the first criterion of "empirical association". The second criterion regarding "appropriate time order" was established as part of the longitudinal study design. As such, data was collected at two points in time and that enabled the data to be ordered in time as *before* and *after*. Moreover, although such a study design enabled examination of the effect of the change in student engagement on achievement and vice versa, no such statistically significant effect was found.

The second research question examined the confounding effects of variables such as teacher support, peer support, school environment, and student background on the relationship between student engagement and achievement. This goal addressed the third criterion regarding "non-spuriousness"; that is, to examine the extent to which the four

potential confounding variables confounded the relationship between student engagement and achievement.

School environment and gender had a larger impact (but still minor) on achievement, in comparison to the other potential confounders (Tables 3.2 and 3.4, Appendix D). Student background variables (ethnicity, language at home, parents' level of education, number of books at home, and birth order) did not have a meaningful impact on academic achievement, nor did they impact on the association between student engagement and academic achievement (Tables 3.2 to 3.4, Appendix D).

The effect of student engagement on academic achievement. Most of the previous studies that examined the impact of student engagement on academic achievement measured the impact on achievement at a single point in time (Connell et al., 1995; Connell et al., 1994; Goodenow & Grady, 1993; Marks, 2000; Miller et al., 1996; Skinner et al., 1990). Thus, although those studies demonstrated strong correlations between engagement and achievement, and were even predictive of positive and negative educational outcomes, the causal effect over time could not be established in a cross-sectional study (Connell et al., 1995; Finlay, 2006). Only a few studies, however, have examined the effect across two points in time (Miller et al., 1996; Skinner et al., 1990), and some causal effects were reported. However, those studies did not examine all three domains of student engagement, but only one or two of them. In order to address this gap, the current study used a longitudinal design, included two points in time of data collection, and measured all three domains of student engagement. In addition, the current study conducted a series of three different hierarchical multiple linear regressions in order to address the main research question and this gap in the literature regarding causal effect.

Contradictory to prior studies, the main results of the current study reveal that engagement at the beginning of the year had a low to no meaningful effect on achievement at the end of the year. As would be expected, there is robust evidence that prior achievements are a main predictor of academic success. In meta-analyses that examined the effect size of prior achievements (Hattie, 2009a), prior achievement was found to be a powerful predictor of academic success (d = 0.67) and was ranked 14th in the meta-analyses rank order. Prior achievement was found to be the best individual predictor for academic success right through the education system, from preschool through to high school and even through to adult success (Duncan et al., 2007; Kuncel, Hezlett, & Ones, 2001; La Paro & Pianta, 2000; Schuler, Funke, & Baron-Boldt, 1990). Based on the literature, it seems that controlling for the effect of prior achievement is necessary (Tables 3.3 and 3.4, Appendix D). Surprisingly, the effect dropped off from the first regression to the third one (Tables 3.2 to 3.4, Appendix D), to a very low level and to the point of non-significance. Contrary to the literature, these findings indicate that student engagement in this sample has no direct effect on achievement. As the main results of the study were contradictory to the literature and to expectations, several explanations were explored as follows.

Level of student engagement. Comparison of the current study's student engagement level (mean score within a similar subscale) with previous studies' results revealed similar findings. Consistent with previous studies (Fredricks et al., 2005; Furrer & Skinner, 2003; Miller et al., 1996; Skinner et al., 2008b; Wylie & Hodgen, 2012), the students in the current study reported a moderate to high level of engagement and a moderate to low level of disengagement on all three student engagement domains (by five factors) that were measured. In addition, the nature of student engagement

levels over time (over the academic year) revealed similar trends as reported in the literature. For example, and similar to the results of the current study, there have been reports of low decreases in student engagement during the academic year (Connell et al., 1995; Skinner et al., 2008b) or no statistically significant changes (Miller et al., 1996; Skinner & Belmont, 1993; Skinner et al., 2009a).

Notwithstanding this, although student engagement levels in the current study were found to be similar to previous studies, some differences can explain the low correlation between student engagement and achievement. In comparison to previous studies, the distribution of levels of student engagement in the current study was narrower. Most of the students reported high engagement for all three domains, measured by five subscales (range 96.2% to 67.4% above 3.5 on a 6-point scale) and only a handful of students reported low engagement. When the variance is small, high linear correlation is unlikely to be found.

Unlike previous studies, the current study used standardised calibrated tests for measuring changes in academic achievement. This method enabled examination of the effect of engagement on the extent of progress in achievement. Although the findings indicated a small positive change in academic achievement from beginning of the year (T1) to the end of the year (T2), as the level of engagement was quite high, the change was small. It is suggested that future studies, aiming to examine the added value of engagement on achievement, use standardised tests as well, using two points of measures over time and examining the effect of change in engagement on the change in achievement.

As the current findings are contradicting previous findings, it seems that it is necessary to raise the question of whether these findings are related to the age and Year

level of secondary school; or are related to the current sample of New Zealand's students. The first question will discussed below under the Sample section. As for the second question, there is little research that has been conducted on the level of engagement in recent years in New Zealand to use as a comparison. A study using the data from the OECD PISA 2000 (Willms, 2003) examined student engagement by sense of belonging and participation in school. The prevalence of students with a low level of sense of belonging in most countries did not differ substantially from the OECD average (24.5%). New Zealand prevalence was found to be below the OECD average (21.1%) but with no statistically significant difference between them. However, the prevalence of students with low participation levels varies more among countries than the prevalence of students with a low level of sense of belonging. While the average level of low participation of students among OECD countries is 20.0%, New Zealand (26.9%) is one of six countries that had average scores above 25%. In addition, findings from a national research of Canadian middle and secondary schools (Dunleavy, Willms, et al., 2012) showed that many students were engaged in school but few were engaged in their learning. Moreover, contrary to their expectations, the findings indicated that many students performed well in their courses without being intellectually engaged (Dunleavy, Milton, et al., 2012; Dunleavy, Willms, et al., 2012; Willms & Friesen, 2012; Willms et al., 2009).

The only recent report that was found describing the development of a new survey tool for New Zealand schools is called "Me and My School Survey" and was developed by researchers at the New Zealand Council for Educational Research (NZCER) (Darr, 2012). It would be helpful to compare the findings of the current study with results using this new tool when they are published with more data in the future.

The findings of the current study also suggest that future research should be undertaken to investigate the reasons why New Zealand students are more engaged than students from other countries and how that impacts on educational outcomes at a national level.

Causality and temporal effects. The findings from the current study suggest that student engagement has a positive low association with academic achievement, but this is insufficient evidence to support a causal effect (Tables 3.2 to 3.4, Appendix D), as they do not meet all three necessary criteria for establishing causal effect (Bachman & Schutt, 2013; Trochim & Donnelly, 2007). Previous studies demonstrated a stronger association between engagement and academic achievement, but a closer look at the literature reveals several trends and differences that can explain the controversial findings of the current study compared with previous studies. First, level of engagement has risen over time[11]. For example, the mean range was 3.82 to 4.78 (Miller et al., 1996) in the 1990s, compared to a mean range of 2.79 to 5.18 (Skinner et al., 2008b) and a mean range of 3.22 to 4.85 (Darr, 2012) in more recent studies. Also, a considerable proportion of the studies that reported high correlations were published in the 1990s, for example, range r = .25 to .30 (Goodenow, 1993b; Voelkl, 1995), or range r = .18 to .51, p < .01 (Connell et al., 1994; Miller et al., 1996; Skinner et al., 1990; Wentzel, 1998); whereas more recent research reported lower correlations (range r = .17 to .23, p < .01) (Wang & Holcombe, 2010). In addition, previous studies that measured the impact of engagement (including all three domains of behavioural, emotional and cognitive) on change in academic achievement suggested a low to moderate impact (range R^2 = 0.35 to 0.42, range β = .17 to .32 , p < .01) (Wang & Holcombe, 2010).

[11] To be able to compare the findings of the various studies over time, all the results were converted into a uniform 6-point scale.

The growing evidence and findings regarding the associations between engagement and achievement levels suggest the possibility that in the contemporary educational environment, students are generally more engaged than students were in the past. Such a change would reflect a positive development in education over the past decades. However, it also reduces the variance of engagement levels across students, and therefore the effect size of engagement level on achievement would be expected to be smaller. Moreover, within this highly engaged environment, the main variance explaining academic achievement may lie within other factors such as previous achievement (Hattie, 2009a), school environment (Hattie, 2009b; Willms, 2003; Zyngier, 2008) and many other variables. For example, students' perceptions of the school environment were found to have an impact on their academic achievement, directly and indirectly, through the three domains of school engagement (Wang & Holcombe, 2010).

That being said, contrary to the view of many researchers that student engagement is strongly related to achievement, there are also previous studies suggesting engagement is not a predictor of academic success (Willms, 2003; Zyngier, 2008). Findings from OECD research, PISA 2000 (Willms, 2003), show that the relationships between sense of belonging and three measures of literacy performance (reading, maths and scientific literacy) are very weak (ranging from r = .04 to .06); while the relationships between participation and academic performance are somewhat stronger, but still weak (ranging from r = .13 to .14). Such moderate findings suggest that there are many students with high achievement levels who are not engaged and vice versa (Willms, 2003). As mentioned above, findings from the national research of Canadian middle and secondary schools (Dunleavy, Willms, et al., 2012) found no

evidence of engagement having impact on achievement. Although many students were engaged in school, only few were engaged in their learning. Moreover, they found that many students performed well in their courses without being intellectually engaged (Dunleavy, Milton, et al., 2012; Dunleavy, Willms, et al., 2012; Willms & Friesen, 2012; Willms et al., 2009).

In addition, these findings suggest that it is possible that there is a temporal effect, which reduces the association between student engagement and academic achievement globally. If so, future multi-national research should be sought for answers to this phenomenon.

The findings of the current study raise questions about whether the different educational systems, different school environments, and differences arising because of cultural differences or other such variables can influence the association between engagement and achievement. Further research may shed light on these important questions.

In addition, the findings regarding the overall changes in engagement and achievement levels (Table 3.1) strengthen suggested explanations about the lack of causal effect of engagement on achievement. As can be seen, the level of engagement decreased while there was an increase in achievement. These two simultaneous trends reduce the possibility for a correlation, and for a causal effect. This simultaneous trend may be explained also by changes in the students' perceptions regarding school and getting a more practical approach – perhaps students are becoming more accepting that school is a place to study and to get the best achievement they can, and less a place where engagement is necessary, desirable or something they look for.

The sample. Another possible explanation for the inconclusive findings of the current study is the sample. The study was conducted within intermediate schools (Year 7 to 9), while many of the previous studies were conducted in primary schools with younger students (Year 4 to 6). The literature already reports a decrease in student engagement levels as students get older (Fredricks et al., 2004; Wylie & Hodgen, 2012). A study examining the association of engagement and achievement levels in the upper grades of elementary levels showed inconsistent findings (Finn & Zimmer, 2012). Some studies found that student engagement modestly predicted achievement (beta = 0.11) (Shernoff & Schmidt, 2008), while others reported positive correlations between engagement and achievement, but no other findings have been reported regarding a statistically significant and meaningful causal effect on achievement (Finn, 1993). Thus, it will be worthwhile to repeat the study in primary schools as well as in high schools, in order to examine the impact of educational level on the association between engagement and academic achievement in all levels of the New Zealand education system, from primary to high school.

The role of the potential confounders. Previous studies reported that a number of variables such as teacher support, peer support, school environment, and background variables of the student confounded the association between student engagement and academic achievement (Connell et al., 1995; Darr, 2012; Finn & Zimmer, 2012; Fredricks et al., 2004; Wylie & Hodgen, 2012). In the current study, investigation took place to identify whether those four variables confounded the association between engagement and academic achievement. The most straightforward analysis to identify confounding effects was to compare the coefficient associated with engagement in the regression models that predicted academic achievement, across two models. The first

included only engagement as the independent variable (Model 1, Tables 3.2 to 3.4, Appendix D); and the second model included engagement and other selected potential confounders as independent variables (Model 2, Tables 3.2 to 3.4, Appendix D).

The comparison of the two models identified that the CI of the engagement factors in Model 2 overlaps with the CI in Model 1 (Tables 3.2 to 3.4, Appendix D). If the engagement coefficients are not significantly different across the models (that is, 95% CI is overlapping), then the potential confounders are not actually confounding the association between engagement and achievement. These results suggest that the potential confounding variables examined in the current study have a greater impact on achievement than the engagement factors, but did not confound the association between engagement and achievement.

Teacher support impact on the association between engagement and achievement. The association between student–teacher relationships and both student engagement and achievement levels has been extensively studied over the years (Allen et al., 2013; Anderson, Christenson, Sinclair, & Lehr, 2004; Cunningham, Wang, & Bishop, 2007; Flanders, Morrison, & Brode, 1968; Hattie, 2003, 2005, 2009a; Hayam-Jonas & Friedman, 2000; Miller et al., 1996; Skinner & Belmont, 1993; Skinner et al., 2009b; Suldo, McMahan, Chappel, & Bateman, 2013; Wentzel, 1998; Wentzel et al., 2010). The teacher–student relationship was found to be a powerful predictor of achievement, and student attitudes (d = 0.72) ranked 11th in a meta-analyses rank order (Hattie, 2009a). Among the eight factors of the student–teacher relationships that were examined in a meta-analysis (Cornelius-White, 2007), the four variables with higher effects were non-directivity (d = 0.76), empathy (d = 0.68), warmth (d = 0.68), and encouragement of higher order thinking (d = 0.60).

The current study measured teacher support by one summary factor only, and found some differences in the changes of teacher support between the schools over the year. It seems to be important to examine the teacher support factor in depth, in order to have a better understanding of the different factors that could explain the discrete effect of teacher support on student engagement, and on the association between student engagement and achievement.

Moreover, an important finding is that the changes in engagement by school seem to be related to the changes in teacher support. A comparison of the levels of student engagement between the schools indicates that there are schools with statistically significant higher engagement levels than others (Table 3.2, Appendix D). In these schools with statistically significant higher engagement levels, the decrease in student engagement was the lowest and non-significant. Moreover, the decrease in teacher support level was also the lowest and non-significant, in these schools, compared to the other schools. These findings should be treated with due caution since the effects were moderate to low. They are in line with previous studies, suggesting that supportive teachers play a particularly important role in reducing the decline in engagement levels (for example, school compliance, sense of school identification, and subjective valuing of learning at school) (Wang & Eccles, 2012). In addition, the two most important support variables, teacher support and peer support, were found to have a statistically significant higher effect in those schools compared to the other schools. In light of these results, it is suggested that the correlation between student engagement and achievement, and the suggested causal effect of student engagement on achievement, are affected by some other variables *within* the school. There may be

variables that are unique to the school and which would be part of a broader model that should include other variables not included in the current ASE model.

Comparing the schools that were found with most of the student engagement factors that affect achievement, by SES variable, is interesting. The comparison indicates that these schools are very different to one another in most of SES variables that can be compared. The comparison was made using the Education Review Office (ERO[12]) reports on the schools and according to the SES variables that were examined in the current study (school decile, ethnicity, number of books at home, number of siblings, and education level of the parents). One school is Decile 4, with a very heterogeneous and diverse ethnicity and is a medium sized school, and has a lower level of parents' education; while the other schools are quite the opposite – Decile 10, homogeneous European ethnicity, bigger schools, and have a higher level of parents' education. However, teacher support had the highest statistical significance in the lower decile school. In addition, the decrease in the difference in teacher support between T1 and T2 was the smallest in this school compared to the other schools. It is surprising to note that teacher support was not found to have an impact on achievement and also was not found to interact with the relationship between levels of student engagement and achievement. These findings are also contrary to findings of previous studies (Wang &

[12] The Education Review Office (ERO) is the New Zealand government department that evaluates and reports on the education and care of students in schools and early childhood services. The ERO reports are used by parents, teachers, early childhood education managers, school principals and trustees, and by government policy makers. Most schools are reviewed on average once every three years. Reviews are undertaken more frequently (every one to two years) where the performance of a school needs improvement, and there are risks to the education and safety of the students. The purpose of ERO reviews is to give assurance about the quality of education that schools provide and their children receive. An ERO school report answers the question "How effectively is this school's curriculum promoting student learning – engagement, progress and achievement?" Under that overarching question, the ERO reports on the quality of education and learning outcomes for children and for specific groups of children, including Māori students, Pacific students and students with special needs. The ERO also reports on the quality of the school's systems for sustaining and continuing improvements (Education Review Office, 2013).

Holcombe, 2010). Considering the importance of the role of the teacher, it would be valuable to have a better understanding of the relationship between teachers and students in the current educational system in New Zealand. It would be useful to further investigate different aspects of teacher support measures and their associations with and impacts on student engagement, as already there are contradictory findings regarding teacher social support (Wang & Holcombe, 2010). Wang & Holcombe (2010) suggested that teachers can best promote students' positive identification with school and stimulate their willingness to participate in their tasks by offering positive and improvement-based praise, and emphasising effort while avoiding pressuring students for correct answers or high grades (mastery goal structure). However, contrary to Wang and Holcombe's expectations and other studies into the effect of teacher support on students' cognitive engagement, teacher social support was not associated with students' use of self-regulation strategies.

This discrepancy may be due to the different aspects of teacher support measures that were used across studies. For example, Wang & Holcombe (2010) focused on students' perceptions of whether they could depend on teachers in the school for help when they had personal or social problems. Therefore, it is possible that if teachers focus only on the social aspect but fail to attend to the academic aspect, students are less likely to be cognitively engaged in learning. Future studies should distinguish the dimensions of teacher support in order to identify their individual effects on different students' engagement dimensions. Based on such findings, intervention programmes that aim to change these relationships and to improve them may change the impact of teacher support on academic achievement.

School interactions on the association between engagement and achievement. There is robust research on the role of the school in terms of its impact on achievement. There is prior evidence that New Zealand is among the countries with the lowest percentage of *between*-school variance, thus the *within*-school variance is much greater (Hattie, 2009a). In addition, in New Zealand, differences *between* schools are smaller (about 4% to 12% percent) compared to the USA (about 25%) where most of the studies on student engagement were done (Lietz, 2009). Recently, findings of a national survey conducted in New Zealand (Darr, 2012) showed differences between schools in student engagement levels; however, the statistical significant of those findings was not reported.

The unique character of each school consists of a combination of hundreds of variables and it obviously cannot be measured in one study. However, the main school effect was found to be within school, as some variables such as class climate, management style, principals' leadership, and student–teacher relationships have already been found to have an effect on achievement (Hattie, 2009a). Some of these variables may affect both student engagement, achievement and the association between them. More recent studies also demonstrated that different features of the school environment impact on student behavioural, emotional, and cognitive engagement (Wang & Eccles, 2011a) and, moreover, that each type of school engagement (behavioural, emotional, and cognitive) affected academic achievement performance (Wang & Holcombe, 2010).

Each of the findings from these analyses in and of itself is low and weak, and cannot serve as sufficient evidence of an association with, or impact on, the relationship between engagement and achievement levels. However, because it seems that there is

an accumulation of a number of different intertwined findings that may indicate a specific trend, it is suggested that future studies with other populations and other representative samples should be undertaken to enhance knowledge in that regard.

For example, although no particular potential confounder was found to be statistically significant, the School variable had an interaction on the association between engagement and achievement levels (Figure 3.4, Appendix D). However, we should be aware too that although the interaction effect was statistically significant it was low (range R^2 = .063 to R^2 = .029, p < .01).

The role of student background variables. Contradicting previous studies that reported a relationship between some background variables of the student, such as gender, ethnicity, parents' level of education and SES with engagement and with achievement (Alexander et al., 1997; Bowen & Richman, 2010; Connell et al., 1995; Finn, 1989; Finn & Cox, 1992), in the current study the only variable that interacted with engagement and achievement was gender (Figure 3.3, Appendix D). These findings suggest that engagement has a positive impact on the achievement of male students in comparison to female students. It can be seen that males reported much lower levels of engagement (Table 3.6, Appendix D). Thus, they have a better chance to improve and get higher levels of engagement over time, compared to females.

Limitations of the current study. The current study has several limitations, which are related to methodology, sample, measurement, and context. First, the study tried to examine the net contribution of student engagement to academic achievement. Based on previous findings regarding the correlations and associations between student engagement and achievement, it was anticipated that a causal effect of engagement on achievement would be found. Therefore, the current study design did not include

measures of variables other than the four selected potential confounders; for example, other variables such as personal variables or school characteristics that may affect student engagement. The unique character of each school consists of a combination of hundreds of variables and they obviously cannot all be measured or controlled for in a single study.

Recent studies suggest, however, that engagement is a modifying variable within a complicated model (Skinner & Pitzer, 2012; Wang, 2009; Wang, Brinkworth, & Eccles, 2013; Wang & Eccles, 2011a, 2013). Thus, future research is required to investigate the impact of a range of variables related to school climate, school leadership style, class management, behaviour in class, working in small groups, and one-on-one tutoring, on the relationship between levels of engagement and academic achievement. In addition, it is important to examine the different aspects of teacher support that seem to affect achievement (Hattie, 2009a), and that are also found to be intertwined with the school variables (Wang & Eccles, 2012; Wang & Holcombe, 2010).

The differences of the current findings compared to previous findings could also be explained by the difference in what was measured in each case and how student engagement was defined and measured. "One of the challenges with research on student engagement is the large variation in the measurement of this construct, which has made it challenging to compare findings across studies" (Fredricks & McColskey, 2012). The gaps and the differences in the definitions of student engagement are large. According to the literature, these large differences range from a high-level definition of student engagement, to a level describing the subscales of student engagement, to the number and nature of the subscales and all the way to the basic level of the items used to

measure student engagement. These differences make it difficult to compare the findings across different studies. There is growing knowledge and evidence about the concept of engagement as a multi-domain phenomenon, consisting of three domains – behavioural engagement, emotional engagement, and cognitive engagement. It would be helpful to include all of those three domains in future research, and to strive for more unity in the definition and measurement tools to better understand the phenomenon of student engagement.

Summary

The main findings from the current study suggest that student engagement is positively associated with academic achievement. However, no evidence was found to suggest causal effect of engagement on academic achievement within the studied population. Those findings remained whether or not selected potential confounders such as teacher support, peer support, school environment, and background variables of the student were considered.

For practitioners, these findings suggest that once students are sufficiently engaged, enhancing engagement is not the most effective tool to improve achievement, and interventions for improving academic achievement should be sought elsewhere. These findings also pave the way for researchers by demonstrating that advancing the research on engagement requires testing causality models.

Chapter 4

Improving the Auckland Student Engagement Scale

Study III

The results of the previous two studies, which were reported in Chapters 2 and 3, suggest that the new measurement tool for student engagement – the Auckland Student Engagement Scale (the ASE Scale) would benefit from an improvement by adding more items in four of the five subscales. As was reported extensively in Chapter 2, during its development the new measurement tool (the ASE Scale) was reduced from 28 to 21 items because of cross-loading of seven items. The ASE Scale included 21 items measuring three domains of student engagement by five subscales: Behavioural Engagement included four items; Behavioural Disengagement included three items; Emotional Engagement included three items; Emotional Disengagement included three items; and Cognitive Engagement included eight items.

The literature is robust regarding the minimum number of items per factor required to establish a solid and meaningful factor (Kahn, 2006; Osborne & Costello, 2009; Tabachnick & Fidell, 2007; Thompson, 2004). The accepted heuristic, or "rule of thumb" is that a factor with three items is the minimum required for stability, as long as the factor is able to be meaningfully interpreted and makes theoretical sense (Osborne & Costello, 2009; Tabachnick et al., 2001). Beyond that, there is a broad consensus in the

literature regarding the second "rule of thumb": that a factor with five or more loading items indicates a better and more solid factor.

Thus the third study, designed as a supplementary study, is aimed to establish an improved ASE Scale by extending the number of items of four of the subscales. This process was based on new items that were added to the last wave of the data collection.

Method

Sample. The participants in this study were 1,945 Year 7 to Year 9 students from four urban intermediate and secondary schools. Those students voluntarily completed the research questionnaire at the end of the academic year (November–December 2012).

The sample of 1,945 students consisted of 950 males (48.8%) and 995 females (51.2%) of levels Year 7 to Year 9 (aged 11 to 14 years old). The majority of the students (58.9%) categorised themselves as New Zealand European/Pākehā, 11.3% as Māori, 7.3% as Pacific, 19.1% as Asian, and 3.3% as Other Ethnicity. School 2 (n = 571, 29.4%) and School 4 (n = 815, 41.9%) were Decile 10[13], School 1 (n = 315, 16.2%) was Decile 6, and School 3 (n = 244, 12.5%) was Decile 4.

Measurement tools. Students completed the same self-report questionnaires as reported in Chapter 2. However, the current questionnaire consisted of 45 items regarding student engagement: the 28 items of the original scale (that was used and reported in Chapter 2), and an additional 17 new items. The new items were constructed in order to expand the existing factors that remained with less than five items. Some of the new items were taken from the expanded versions of the original scales (Skinner et al., 2008b), and some were constructed, based on the literature, by a panel of three

[13] Decile is the New Zealand government's index indicating the socio-economic status of schools. For further explanation, see footnote 2 in Chapter 2.

subject experts, and the author of the current research along with two other senior researchers. The new items were chosen in order to expand and elaborate the concept of the factor, and yet maintain its uniqueness without creating overlap with the other factors. All other parts of the questionnaire remained the same (for more details and the full questionnaire, see Chapter 2, Appendix A, and Appendix B).

Composite scores were determined by calculating the average of the items of each subscale. All 41 items were administered using a 6-point self-report frequency scale (that is, 1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, 5 = *Very often*, 6 = *Always*). Resulting scores ranged from 1 to 6, with higher scores indicating more of the respective construct. The negative items were reversed in the positive direction. Therefore, the higher the mean, the higher the level of engagement of the students (for further explanation see Chapter 2). Table 4.1 indicates the number of items by each engagement factor of the two versions of the questionnaire.

Table 4.1

The ASE Scale comparison of the two versions, by number of items

Student Engagement Subscales	No. of items in Version 1	No. of items in Version 2
Behavioural engagement	4	9
Behavioural Disengagement (R)	3	9
Emotional engagement	3	9
Emotional Disengagement (R)	3	10
Cognitive engagement	7	8
Total number of items	28	45

Procedure. Following approval from the University of Auckland Human Subjects Ethics Committee (Ref. 2011/298), four secondary schools were recruited to participate in the study. All students in each school were invited to participate in the

survey. All students were given oral explanations and information sheets about the research. Participation in the research was completely voluntary and no remuneration was offered. The students were told that whether they chose to be involved or not would not affect any aspect of their schooling, and that they may leave the study at any time without giving a reason. All participating students signed a consent form. The school staff administered this process during class time and students generally filled out the questionnaires within 10 to15 minutes. The data collection was conducted at the end of the academic year (November–December 2012).

Statistical analysis.

Descriptive analyses. The descriptive scale items examined the appropriateness of the measurement tool. Missing values, mean, standard deviation, skewness and kurtosis were examined in order to evaluate the psychometric properties of each item.

Factor Analysis. Exploratory factor analysis (EFA) was conducted to assess the loading of the items according to the theorised factors and to validate the new tool. The factor loading cut off for items in the scale was .30 (Tabachnick et al., 2001). In the event of cross-factor loadings of any items, some factors may need to be removed at this point. There are five options of extraction method in the SPSS package. As discussed in Chapter 2, the oblique method (Promax) was used as it allows the factors to correlate. In the social sciences, it is generally expected there will be some correlation among factors, since behaviour rarely functions as independent units of one to another. Therefore, using orthogonal rotation results in yield loss of valuable information if the factors are correlated, and oblique rotation should theoretically render a more accurate, and perhaps more reproducible, solution (Costello & Osborne, 2005). Confirmatory factor analysis (CFA) was conducted to verify the factor structure yield from the EFA.

Multiple guidelines are available for "acceptable" model fit; however, there is a consensus regarding the recommendation of root mean square error of approximation (RMSEA) close to 0.06 or less; comparative fit index (CFI) close to 0.95 or greater; and Tucker-Lewis index (TLI) close to 0.95 or greater (Brown, 2006; Harrington, 2009). Other recommendations indicate for low Chi-Square values relative to degrees of freedom with an insignificant *p* value ($p > 0.05$), RMSEA values less than 0.07, and CFI values greater than 0.95 (Hooper et al., 2008). The observed correlations of the reduced scale among the five factors were examined to index the association between factors. Finally, the reliability of the whole scale and of each subscale was tested using Cronbach's alpha to indicate internal consistency of the new scale. All statistical analyses were performed using SPSS version 19 (SPSS Inc., 2012), and AMOS 19 (Arbuckle, 2010).

Results

Descriptive analysis. To examine the psychometric properties of the new and improved ASE Scale, the quality of the data was examined (missing values and distributions). The item descriptions of the ASE Scale with 45 items (Table 4.2) show that the response rate of all items was very high (98.25%, n = 1,911 to 99.69%, n = 1,939 responses). The rate of missing data (indicated as "Miss." in Table 4.2) was very low and appeared to be random. There are no items with extreme skewness (values not higher than ±1.5) (except 1 item), kurtosis (values no higher than ±3) (except 1 item), nor extreme standard deviation (range 0.88 to 1.56).

Table 4.2

Descriptive statistics of the ASE Scale with 45 Items, (N=1,945)

Item No.	The Student Engagement Domains and Items	N Valid	N Miss.	Mean	SD	Skewness	Kurtosis
Behavioural engagement							
1	I try hard to do well in school	1,936	9	5.02	0.88	–0.76	0.50
2	In class, I work as hard as I can	1,933	12	4.83	0.90	–0.57	0.09
3	When I'm in class, I participate in class discussions	1,929	16	4.46	1.10	–0.42	–0.31
4	I pay attention in class	1,923	22	4.66	0.94	–0.65	0.54
5	When I'm in class, I listen very carefully	1,927	18	4.52	0.97	–0.47	0.13
42a*	I do my best in class	1,923	22	4.93	1.02	–0.99	1.10
43a	I participate in class activities	1,930	15	4.85	1.04	–0.81	0.42
44a	In class, I do more than we are asked to do	1,915	30	3.80	1.21	–0.25	–0.31
45a	When I'm in class my mind is focused on class work	1,913	32	4.22	1.08	–0.43	–0.05
Behavioural Disengagement (R)*							
19	When I'm in class, I just act like I'm working (R)	1,939	6	4.76	1.23	–1.13	0.90
20	I don't try very hard at school (R)	1,930	15	5.01	1.13	–1.43	2.01
21	In class, I do just enough to get by (R)	1,916	29	4.38	1.42	–0.68	–0.40
22	When I'm in class, I think about other things (R)	1,919	26	3.71	1.39	–0.35	–0.74
23	When I'm in class, my mind wanders (R)	1,933	12	3.92	1.40	–0.45	–0.65
46a	When I'm in class, I wish I was in another place (R)	1,913	32	3.93	1.41	–0.42	–0.70
47a	When I'm in class, I do not work as hard as I can (R)	1,918	27	4.52	1.30	–0.80	–0.03
48a	When I'm in class, I do things which are not related to the lesson (R)	1,920	25	4.40	1.24	–0.68	–0.14
49a	When I'm in class, I cannot wait for the lesson to end (R)	1,930	15	3.78	1.44	–0.37	–0.71
Emotional engagement							
14	When I'm in class, I feel good	1,936	9	4.37	1.20	–0.56	–0.02
15	When we work on something in class, I feel interested	1,939	6	4.30	1.06	–0.51	0.21
16	Class is fun	1,925	20	4.24	1.30	–0.53	–0.30
17	I enjoy learning new things in class	1,934	11	4.59	1.15	–0.68	0.13
18	When we work on something in class, I get involved	1,918	27	4.50	1.05	–0.47	–0.16
50a	I like being in my class	1,926	19	4.38	1.28	–0.54	–0.32
51a	I enjoy class activities	1,932	13	4.57	1.15	–0.55	–0.22
52a	I like what we do in class	1,913	32	4.36	1.16	–0.38	–0.26
53a	I feel welcome in my class	1,928	17	4.63	1.25	–0.71	–0.15

Table 4.2 Continued

Item No.	The Student Engagement Domains and Items	N Valid	N Miss.	Mean	SD	Skewness	Kurtosis
Emotional Disengagement (R)							
24	When we work on something in class, I feel bored (R)	1,928	17	4.13	1.24	–0.51	–0.24
25	When I'm in class, I feel worried (R)	1,932	13	5.00	1.16	–1.23	1.11
26	When we work on something in class, I feel discouraged (R)	1,932	13	4.99	1.12	–1.15	1.02
27	Class is not all that fun for me (R)	1,930	15	4.55	1.32	–0.81	0.00
28	When I'm in class, I feel bad (R)	1,918	27	5.18	1.04	–1.47	2.16
54a	I get bored with class activities (R)	1,927	18	4.12	1.27	–0.41	–0.48
55a	When I'm in class, I feel anxious (R)	1,911	34	4.67	1.23	–0.71	–0.18
56a	When I am in class, I feel uncomfortable (R)	1,921	24	4.97	1.16	–1.15	0.90
57a	When I'm in class, I feel unsafe (R)	1,912	33	5.32	1.07	–1.84	3.23
58a	When I'm in class, I feel disconnected (R)	1,921	24	5.05	1.14	–1.29	1.31
	Cognitive engagement						
6	I check my schoolwork for mistakes	1,929	16	4.03	1.13	–0.33	–0.21
7	I study at home even when I don't have a test	1,934	11	2.97	1.48	0.41	–0.71
8	When I read a book, I ask myself questions to make sure I understand what it is about	1,924	21	3.62	1.56	–0.10	–1.03
9	If I don't know what a word means when I am reading, I do something to figure it out	1,929	16	4.09	1.43	–0.38	–0.71
10	I read extra books to learn more about things we do in school	1,927	18	3.19	1.46	0.20	–0.90
11	If I don't understand what I read, I go back and read it over again	1,924	21	4.83	1.31	–1.06	0.35
12	I talk with people outside of school about what I am learning in class	1,922	23	3.90	1.42	–0.31	–0.71
13	I try to watch TV shows about things we do in school	1,934	11	2.64	1.37	0.50	–0.65

*a = additional new item

**(R) = reversed score

The improvement process and development of the ASE Scale. Exploratory factor analysis (EFA) (maximum-likelihood with Promax rotation) was used to ascertain the factor loadings of the items for the five factors of the ASE Scale with all 45 items (Table 4.3) (χ^2 = 55393, df = 990, $p < .001$, and explains 59.88% of the variance). For the purpose of scoring and to end up with a clear concept of a student

engagement model, the negative items were reversed (as described above), so all items scored in the same direction.

The EFA indicated for five factors as expected. However, some cross-factor loadings were found within 18 items (items' factor loadings are marked with gray background in Table 4.3). In order to avoid cross-loading between factors and to have five clean loading factors, at the next stage the items with loading < .3 and/or cross-loading > .3 were excluded from the EFA one at a time (Osborne & Costello, 2009; Tabachnick et al., 2001). The EFA was repeated until all five factors were stable, with clean loading only on the main factor of each item. At the end of this process, 12 items were excluded because of their inability to load in a mutually exclusive way, and 33 items were retained in the model. Due to the process of excluding items, some of the scales had their number of items reduced: Behavioural Engagement scale decreased to six items; Behavioural Disengagement scale decreased to five items; Emotional Disengagement and Cognitive Engagement scales decreased to seven items on each; and Emotional Engagement scale decreased to eight items.

Table 4.3

Factor loadings for 45 items of the ASE Scale (including the non-zero loadings)

Item No.	Item text	Factor				
		EE	EDR	BDR	BE	CE
52a*	I like what we do in class	**0.76**	0.01	0.09	0.14	0.02
51a	I enjoy class activities	**0.75**	0.02	0.02	0.14	0.02
50a	I like being in my class	**0.74**	0.04	0.06	0.05	0.02
16	Class is fun	**0.71**	0.02	0.09	0.01	0.14
53a	I feel welcome in my class	**0.60**	0.28**	–0.12	0.15	–0.05
14	When I'm in class, I feel good	**0.59**	0.15	–0.02	0.11	0.13
15	When we work on something in class, I feel interested	**0.46**	–0.01	0.07	0.18	0.28
17	I enjoy learning new things in class	**0.45**	0.00	0.05	0.19	0.29
27	Class is not all that fun for me	**0.41**	0.26	0.33	–0.09	0.03

Table 4.3 Continued

Item No.	Item text	Factor				
		EE	EDR	BDR	BE	CE
57a	When I'm in class, I feel unsafe (R)***	0.02	**0.78**	–0.10	0.00	0.03
56a	When I am in class, I feel uncomfortable (R)	0.07	**0.77**	0.00	0.01	–0.03
58a	When I'm in class, I feel disconnected (R)	0.06	**0.74**	0.02	0.02	0.04
25	When I'm in class, I feel worried (R)	–0.04	**0.69**	0.05	–0.04	–0.03
55a	When I'm in class, I feel anxious (R)	–0.06	**0.69**	0.04	–0.01	–0.01
28	When I'm in class, I feel bad (R)	0.13	**0.68**	0.09	–0.03	–0.02
26	When we work on something in class, I feel discouraged (R)	0.02	**0.63**	0.15	0.04	0.00
22	When I'm in class, I think about other things (R)	–0.04	–0.01	**0.82**	0.10	0.05
23	When I'm in class, my mind wanders (R)	–0.04	0.05	**0.79**	0.11	0.04
24	When we work on something in class, I feel bored (R)	0.24	0.13	**0.58**	–0.08	0.12
48a	When I'm in class, I do things which are not related to the lesson (R)	–0.01	0.14	**0.55**	0.18	0.01
49a	When I'm in class, I cannot wait for the lesson to end (R)	0.28	0.08	**0.53**	–0.05	0.09
46a	When I'm in class, I wish I was in another place (R)	0.29	0.10	**0.52**	–0.09	0.09
19	When I'm in class, I just act like I'm working (R)	–0.05	0.13	**0.46**	0.24	0.02
54a	I get bored with class activities	0.35	0.09	**0.39**	–0.09	0.03
21	I do just enough to get by	–0.07	0.19	**0.37**	0.14	0.13
47a	When I'm in class, I do not work as hard as I can	–0.03	0.22	**0.36**	0.18	0.03
2	In class, I work as hard as I can	0.05	–0.01	0.02	**0.80**	0.02
1	I try hard to do well in school	0.08	0.03	–0.05	**0.76**	0.03
5	When I'm in class, I listen very carefully	0.00	0.01	0.14	**0.66**	0.10
4	I pay attention in class	–0.01	0.03	0.21	**0.65**	0.03
42a	I do my best in class	0.21	–0.02	0.11	**0.63**	0.01
45a	When I'm in class my mind is focused on class work	0.18	–0.06	0.34	**0.42**	0.08
3	When I'm in class, I participate in class discussions	0.18	0.08	–0.11	**0.41**	0.13
43a	I participate in class activities	0.35	0.05	–0.02	**0.41**	0.02
18	When we work on something in class, I get involved	0.33	0.09	–0.07	**0.37**	0.20
20	I don't try very hard at school	–0.05	0.18	0.30	**0.35**	0.00
44a	I do more than we are asked to do	0.25	–0.09	0.12	**0.35**	0.21

Table 4.3 Continued

Item No.	Item text	Factor				
		EE	EDR	BDR	BE	CE
8	When I read a book, I ask myself questions to make sure I understand what it is about	–0.06	0.00	0.01	–0.04	**0.81**
10	I read extra books to learn more about things we do in school	0.04	–0.05	0.06	–0.07	**0.74**
9	If I don't know what a word means when I am reading, I do something to figure it out	–0.04	0.09	–0.06	0.00	**0.73**
7	I study at home even when I don't have a test	–0.02	–0.06	0.15	0.05	**0.62**
11	If I don't understand what I read, I go back and read it over again	–0.02	0.13	–0.14	0.10	**0.58**
12	I talk with people outside of school about what I am learning in class	0.12	–0.02	0.01	0.02	**0.57**
13	I try to watch TV shows about things we do in school	0.10	–0.16	0.11	–0.02	**0.57**
6	I check my schoolwork for mistakes	–0.07	0.00	0.07	0.38	**0.42**

Note: EE–Emotional Engagement; ED–Emotional Disengagement (R); BD–Behavioural Disengagement (R); BE–Behavioural Engagement; CE–Cognitive Engagement.
*a = additional new item
** In gray background – items with cross-loading
***(R) = reversed score

Table 4.4 presents the final EFA for 33 items (χ^2 = 38794.98, *df* = 528, $p < .001$). It can be seen that the final solution shows clear factors, with high factor loading on five factors, minimal cross-factor loadings, and no deviant items from the expected factors. Each factor has each item contributing as expected, and there is sufficient variance between the factors to consider them related but with sufficient difference to be considered unique. The final solution of five factors model with 33 items explains 63.28% of the variance.

Table 4.4

Factor loadings for 33 items of the final ASE Scale (include the non-zero loadings)

Item No.	Item text	Factor				
		EE	EDR	CE	BE	BDR
50a*	I like being in my class	**0.91**	–0.02	–0.07	–0.07	0.02
52a	I like what we do in class	**0.90**	–0.05	–0.05	0.03	0.04
51a	I enjoy class activities	**0.89**	–0.03	–0.06	0.00	0.01
16	Class is fun	**0.82**	–0.02	0.07	–0.08	0.04
53a	When I'm in class, I feel good	**0.70**	0.25	–0.10	0.04	–0.13
14	I feel welcome in my class	**0.67**	0.12	0.08	0.03	–0.07
17	I enjoy learning new things in class	**0.53**	–0.04	0.26	0.14	–0.01
15	When we work on something in class, I feel interested	**0.51**	–0.03	0.25	0.13	0.03
56a	When I am in class, I feel uncomfortable (R)**	0.05	**0.81**	–0.01	0.01	–0.05
57a	When I'm in class, I feel unsafe (R)	0.00	**0.81**	0.06	–0.04	–0.12
58a	When I'm in class, I feel disconnected (R)	0.05	**0.77**	0.05	–0.02	0.02
55a	When I'm in class, I feel anxious (R)	–0.11	**0.71**	0.03	–0.01	0.01
28	When I'm in class, I feel worried (R)	0.13	**0.68**	–0.05	–0.03	0.09
25	When I'm in class, I feel bad (R)	0.00	**0.65**	–0.06	–0.08	0.11
26	When we work on something in class, I feel discouraged (R)	0.02	**0.65**	–0.03	0.03	0.13
8	When I read a book, I ask myself questions to make sure I understand what it is about	–0.09	0.04	**0.85**	–0.04	–0.03
9	If I don't know what a word means when I am reading, I do something to figure it out	–0.10	0.11	**0.79**	0.02	–0.09
10	I read extra books to learn more about things we do in school	0.05	–0.07	**0.72**	–0.09	0.09
11	If I don't understand what I read, I go back and read it over again	–0.10	0.14	**0.62**	0.14	–0.15
12	I study at home even when I don't have a test	0.12	–0.02	**0.60**	–0.03	–0.02
7	I talk with people outside of school about what I am learning in class	0.01	–0.09	**0.56**	0.03	0.17
13	I try to watch TV shows about things we do in school	0.14	–0.16	**0.52**	–0.07	0.14
2	In class, I work as hard as I can	–0.03	–0.06	–0.05	**0.96**	–0.04
1	I try hard to do well in school	0.01	–0.01	–0.03	**0.90**	–0.11
4	When I'm in class, I listen very carefully	–0.06	0.00	0.02	**0.71**	0.14
5	I pay attention in class	–0.03	–0.03	0.08	**0.68**	0.10
42a	I do my best in class	0.23	–0.03	–0.04	**0.62**	0.05
3	When I'm in class, I participate in class discussions	0.14	0.02	0.12	**0.41**	–0.07

Table 4.4 Continued

Item No.	Item text	Factor EE	EDR	CE	BE	BDR
22	When I'm in class, my mind wanders (R)	0.02	–0.04	–0.02	–0.07	**0.97**
23	When I'm in class, I think about other things (R)	0.00	0.03	–0.01	–0.05	**0.91**
48a	When I'm in class, I do things which are not related to the lesson (R)	0.00	0.19	0.01	0.17	**0.44**
19	When I'm in class, I just act like I'm working (R)	–0.06	0.14	0.00	0.24	**0.43**
21	In class, I do just enough to get by (R)	–0.07	0.18	0.08	0.10	**0.40**

Note: EE–Emotional Engagement; ED–Emotional Disengagement (R); CE–Cognitive Engagement; BE–Behavioural Engagement; BD–Behavioural Disengagement (R)
*a = additional new item
**(R) = reversed score

Correlations between the reduced factors were conducted. Table 4.5 presents the observed correlations among the five factors, which were all low to high correlated and in the expected direction. As expected, as the negative items were reversed, all five factors were found to be positively correlated.

Table 4.5

Correlations between the factors of the final ASE Scale (with 33 Items) (N=1,945)

Student Engagement Subscales	BE (1)	BDR (2)	EE (3)	EDR (4)	CE (5)
1. Emotional Engagement	–				
2. Emotional Disengagement (R)*	.41**	–			
3. Cognitive Engagement	.50**	.09**	–		
4. Behavioural Engagement	.60**	.37**	.50**	–	
5. Behavioural Disengagement (R)	.48**	.40**	.380**	.50**	–

Note: BE–Behavioural Engagement; BDR–Behavioural Disengagement (R); EE–Emotional Engagement; EDR–Emotional Disengagement (R); CE–Cognitive Engagement;
*(R) = reversed score
** $p < 0.01$ (2 tailed)

Overall, after excluding 12 items from the scale, the final ASE Scale, with 33 items, shows the three domains demonstrated by five clear factors, with high factor loadings on each of them, minimal cross-factor loadings, and no deviant items from the expected factors. The final solution of EFA with the reduced scale of 33 items shows a clean construct of each factor. The values of the current model fit the criteria for reasonable error model fit (Harrington, 2009; Hu & Bentler, 1999; Kline, 2005). Also, these five subscales indicate high estimates of reliability for each scale (using Cronbach's alpha for internal consistency), and provide evidence for meaningfully interpreting a sum of the items for each scale.

Given that the exploratory analysis of the ASE Scale showed no deviant items from the expected factors, CFA using AMOS 19 (Arbuckle, 2010) was used to confirm the final fit of the model. The final hierarchical model (Figure 4.1) has a good fit ($\chi 2$ = 3683.186, df = 480, $p < .001$), (standardised model, CMIN/DF = 7.673, CFI = .918, TLI = 0.910, and RMSEA = .059).

Finally, the reliability of the reduced scales with 33 items was examined, using Cronbach's alpha, for internal consistency (Table 4.6).

Table 4.6

The Final ASE Scale (33 items), by Reliability, Mean, and SD (N=1,945)

Student Engagement Subscales	α	M	SD
Total engagement (33 items)	0.93	4.40	0.72
Behavioural engagement (6 items)	0.88	4.74	0.77
Behavioural Disengagement (R)* (5 items)	0.85	4. 23	1.06
Emotional engagement (8 items)	0.93	4.43	0.98
Emotional Disengagement (R) (7 items)	0.89	5.03	0.89
Cognitive engagement (7 items)	0.85	3.60	1.04

*(R) = reversed score

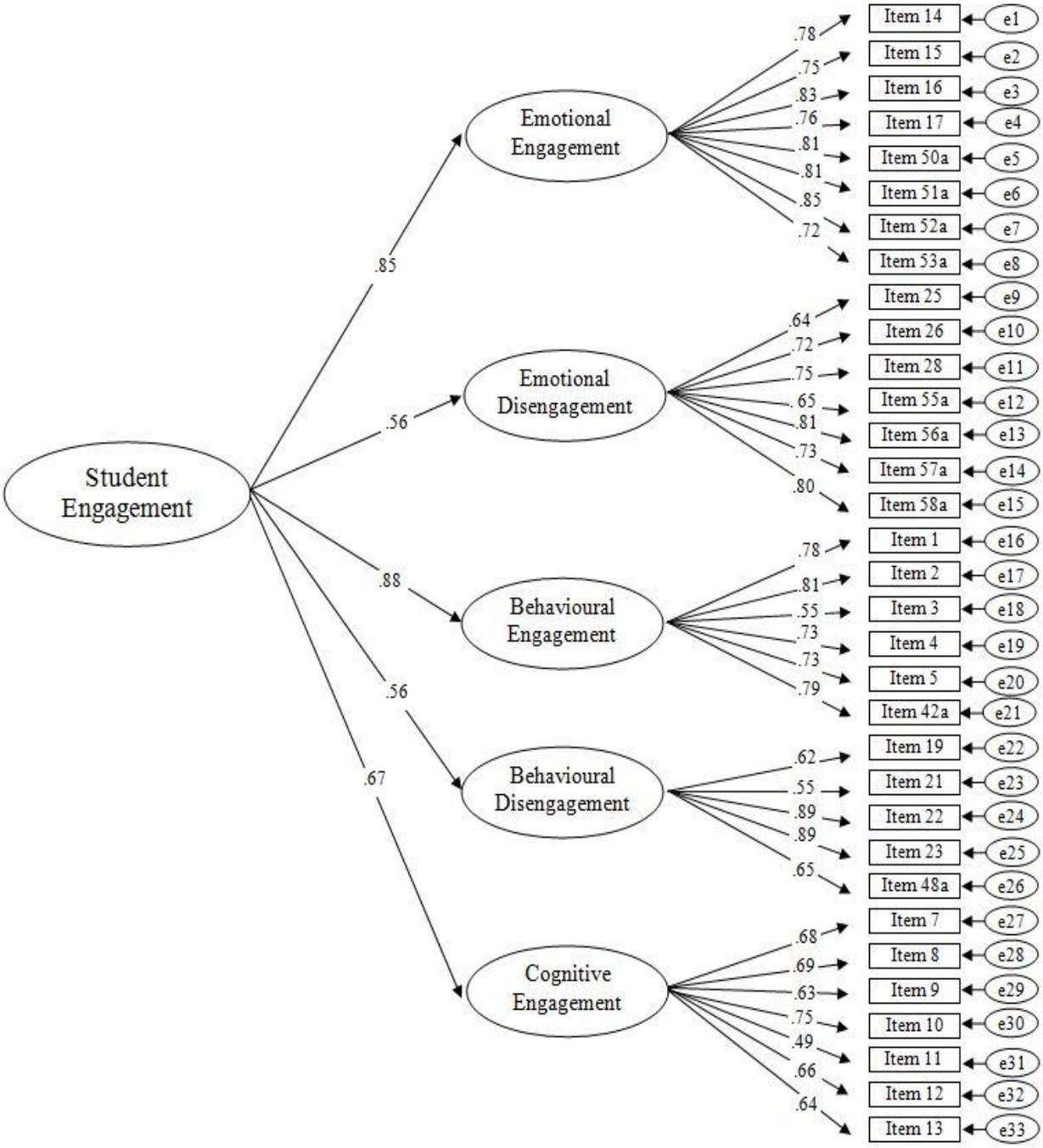

Figure 4.1: Structural model* of the Final ASE Scale

*(See Table 4.4 for item descriptions)

As can be seen in Table 4.6, the final and improved ASE Scale presents high estimates of reliability for each scale, and provides more evidence for meaningfully interpreting a sum of the items for each factor. In addition, removing any item would not improve the total Cronbach's alpha score for the scale. Thus, overall, the final and improved ASE Scale has good psychometric properties and an acceptable model fit.

Discussion

The main goal of this chapter was to improve and establish a final ASE Scale by expanding four of the five factors. The main result of the current research is that the final and improved ASE Scale yielded good psychometric properties, clear factors, with high factor loading on five factors, minimal cross-factor loadings, and no deviant items from the expected factors (Table 4.4). Each factor has each item contributing as expected to its factor, and there is sufficient variance between the factors to consider them to be related but with sufficient difference for each factor to be considered unique. The five-factor model explains 63.28% of the variance in the factor structure.

All five factors are more solid, with five to eight items each (in comparison to three items in the reduced scale with 21 items), and can be interpreted more meaningfully and make more theoretical sense (Osborne & Costello, 2009; Tabachnick et al., 2001).

The observed correlations between the final factors indicate low to high correlations for all five factors and in the expected directions, with all five factors positively correlated. The finding of a high correlation between some of the factors is in line with previous research (Fredricks et al., 2004; Skinner et al., 2009a; Skinner et al., 2008b; Wang et al., 2011b) and may suggest that a second-order model needs to be examined in the future. It is also well discussed in the literature that the nature of

student engagement is a multi-domain concept and it is difficult to define clear-cut domains with no overlap between them (Fredricks et al., 2004).

Most of the psychometric properties of the final ASE Scale show better results as the Cronbach's alpha indicates that the final and structural model have good reliability. In addition, most of the factors' reliability is even higher in comparison with the reliability of the ASE Scale used in Chapter 2 (Table 2.7), and the variance explains it is slightly higher. The CFA of the final ASE Scale also indicates that the final standardised model has a good fit and is better than the original scale of 21 items.

Given the constraints of this study, the main limitation of the improved final ASE Scale is that because of limited time and budget it was based on improvement of existing scales from previous studies rather than developing a new scale. Although it seems that most of the final subscales are within the acceptable psychometric properties, there is one main limitation apparent: that is, the need to develop the Cognitive Disengagement subscale in accordance with the two other domains. Thus, future work may consider further expansion of the Cognitive engagement scale and Cognitive Disengagement scale and distinguishing them into subscales that are more specific and defined. That kind of expansion would allow the capture and clearer expression of the different aspects of each factor and would give a more meaningful interpretation of the phenomenon of student engagement. For example, recent research found that a model of three domains – behavioural, emotional and cognitive engagement – represented by two factors each (Wang et al., 2011b), provided acceptable fit and captured a wider range of aspects of student engagement.

In summary, the findings in this chapter indicate that the study's objectives were successfully achieved. The final and improved measurement tool for student

engagement – the ASE Scale – has good psychometric properties, good model fit, and would benefit from further improvement in the future.

Chapter 5

Discussion and Conclusions

Discussion

The primary objective of this study was to identify the relationship between three domains of student engagement – behavioural, emotional and cognitive engagement – and achievement, and whether the relationship suggests causal effect, controlled for selected potential confounders such as teacher support, peer support, school environment, and student demographic characteristics.

The rationale underlying the current study was based on a wealth of evidence the research literature provides on the relationship and associations between student engagement and achievement (Connell et al., 1994; Finn & Rock, 1997; Jimerson et al., 2003; Skinner et al., 2009a). Most of the studies deal with correlation between engagement and achievement and with prediction of achievement by engagement, many used measures taken at the same time. Few of the studies, however, looked into causal effect of the three domains of student engagement on academic achievement (Fredricks et al., 2004; Fredricks & McColskey, 2012; Marks, 2000; Skinner & Pitzer, 2012). In addition, most of the research examine one or two of the engagement domains at a time but rarely considers all three domains simultaneously (Fredricks & McColskey, 2012). As these three domains are dynamically embedded within a single individual and are

not isolated processes (Fredricks et al., 2005), investigating the simultaneous impact of all three domains on academic achievement may provide better insight into the role student engagement has within the learning process and its effect on achievement.

Based on previous studies indicating a positive association between different student engagement factors and achievement (Fredricks et al., 2004; Fredricks & McColskey, 2012; Skinner et al., 2008b; Wang & Holcombe, 2010), it was expected that student engagement would have a positive effect on achievement. Contradicting expectations, the main findings of the current study suggest that student engagement had no meaningful impact on academic achievement (Tables 3.2 to 3.4, Appendix D). Results also indicate that school environment and gender have a small impact on the relationship between engagement and achievement, but they are unlikely to be considered confounders of the association.

Following the five criteria for causal effect noted previously in Chapter 3, although some results regarding the effect of engagement on achievement were statistically significant, the impact found was weak and considered not educationally meaningful (range R^2.057 to .008, $p < .004$, see Tables 3.2 to 3.4, Appendix D). Thus, the findings do not meet the first criterion. Although the study design enabled examination of the effect of the change in student engagement on achievement and vice versa, in accordance with the second criterion regarding "appropriate time order", no statistically significant effect was found.

The overall and main findings arising from the second study were that although student engagement was positively associated with academic achievement, no evidence supporting causal relationship was found. These findings remained whether or not selected potential confounders such as teacher support, peer support, school

environment, and background variables of the student were considered. Results also indicate that although school environment and gender have a small impact on the relationship between engagement and achievement, they are unlikely to be considered confounders of the association.

There may be several explanations for the lack of effect of engagement on achievement found in the current study – some of them methodological and some of them contextual (as discussed extensively in Chapter 3). Alternatively, it may be that there are many more critical determinants of academic achievement than engagement. The results also may be explained by both global trends and by local trends within the sample. Those different trends are also interrelated. That is, the global increase of level of engagement and the increase of level of engagement in New Zealand over time both support methodological explanations.

For example, most of the students reported high engagement of all three domains, measured by five subscales (range 96.2% to 67.4% above 3.5 on a 6-point scale) and only a handful of students reported low engagement. When the variance is small, high linear correlation is unlikely to be found. As discussed extensively in the Discussion of Study II in Chapter 3, another explanation is that the current study used standardised calibrated tests for measuring changes in academic achievement. This method enabled examination of the effect of engagement on the extent of progress in achievement. Although the findings indicated a positive change in academic achievement from beginning of the year (T1) to the end of the year (T2), as the level of engagement was quite high, this change was small. It is suggested that future studies, aiming to examine the added value of engagement on achievement, use standardised

tests as well, using two points of measure over time and examining the effect of change in engagement on the change in achievement.

Moreover, it is plausible that each engagement factor has no direct association with academic achievement, and that its association operates indirectly through the effects of other variables that were not measured in the current study (Archambault, Janosz, Fallu, & Pagani, 2009; Wang & Eccles, 2011a). For example, students may claim high engagement in schooling for reasons other than maths and English outcomes, and thus they can have higher levels of engagement, but this does not necessarily translate into higher achievement in maths or English scores. Likewise, the current study found a small impact of school environment variables on the relationship between engagement and achievement, which needs to be examined in more detail. Future research that examines the confounding effects of school engagement more deeply may extend our understanding of the underlying processes.

In addition, the contextual explanation suggests that measuring engagement using different scales will produce different results. The lack of effect of engagement on achievement in the current findings may reflect the different aspects of engagement that have been measured and conceptualised across different studies (Shulruf, 2005; Wang & Eccles, 2011a). Thorough examination of different engagement measurement tools indicates the use of different items, and different ways of conceptualising engagement across studies. For instance, as Wang and Eccles (2011a) found, some studies define emotional engagement as "school belonging" and "valuing of school" combined into one composite (Voelkl, 1997), whereas in the Wang & Eccles (2011a) study, emotional engagement focused only on school belonging and assessed whether students "feel attached to" and "feel part of" their school as well as the extent to which they feel

"happy" and "safe" in their school. In their study, emotional engagement was not found to have an effect on achievement. Similarly, in the current study, emotional engagement primarily referred to students' affective reactions and feelings in the classroom, including interest, boredom, happiness, sadness, and anxiety, and was reflected and measured by emotional engagement vs emotional disengagement. In both cases, students may have positive feelings of belonging to school because they enjoy interacting with their peers or like their teachers. However, if students do not feel that school or education has any purpose or meaning for them, then a sense of school belonging may not motivate them to study hard and enhance their academic performance (Wang & Eccles, 2011a). Future research should strive for a deeper understanding of the components of engagement and greater uniformity in the definition of the measurement scales, and items in each subscale.

Furthermore, while several recent studies suggest that engagement has an effect on achievement, there are also previous studies suggesting engagement is not a predictor of academic success (Willms, 2003; Zyngier, 2008). Findings from OECD research, PISA 2000 (Willms, 2003), showed that the relationships between a sense of belonging and three measures of literacy performance (reading, maths and scientific) were very weak (ranging from r = .04 to .06); and the relationships between participation and academic achievement were also found to be weak (ranging from r = .13 to .14). Such modest findings suggest that many students with high achievement are not engaged and vice versa (Willms, 2003). In addition, these findings suggest that it is possible that there is a temporal effect, which reduces the association between student engagement and academic achievement globally. If so, future multi-national research should be sought for answers to this phenomenon. Likewise, as noted above, findings

from a national research of Canadian middle and secondary schools (Dunleavy, Willms, et al., 2012) also found no evidence for the impact of engagement on achievement . Their findings indicate that although many students found to be engaged in school, only few were also engaged in their learning. Moreover, many students performed well in their courses without being intellectually engaged (Dunleavy, Milton, et al., 2012; Dunleavy, Willms, et al., 2012; Willms & Friesen, 2012; Willms et al., 2009). These findings raises more questions regarding different kinds of engagement, the impact of different of engagement measurements scales and also the need of extensive and deeply examination of the associations between school engagement, learning engagement and the relationship between engagement and subject-domain motivation as discussed in Chapter 1.

Another explanation for the lack of effect of the current sample of New Zealand students may be found on a cultural ground and relate to a specific educational environment, as school environment had a larger impact (but still minor) on achievement, in comparison to the other potential confounders (Tables 3.2 and 3.4, Appendix D). Findings from a recent study in secondary schools in New Zealand (Denny et al., 2011) support and strengthen this explanation. The study compared findings regarding students' health and well-being in 2007 with 2001. These findings suggest that the extensive effort to improve student engagement and achievement, made since 2001 in secondary schools throughout New Zealand, was successful. In addition, meaningful improvement was found in different protective factors and school engagement when comparing 2007 with 2001. For example, more students reported in 2007 than in 2001 that teachers at their school treated students fairly (48.8% ,CI 46.5–51.0 and 42.8%, CI 41.0–44.7 respectively, $p < 0.001$); that they felt part of their school

(87.8%, CI 86.7–88.8 and 81.9%, CI 81.0–82.9 respectively, $p < 0.001$); and that they felt safe at their school (83.5%, 81.7–85.3 and 78.1% , CI 76.2–80.0, respectively , $p < 0.001$) (Denny et al., 2011). It can be seen that the changes are meaningful as there are no overlaps between CI in 2007 compared to 2001.

Limitations

The current study has two main limitations. The first is that as a result of budget and time constraints, the data used to assess school engagement relied mainly upon self-report information from students. Future studies should use multiple sources of information and multiple methodologies to gain more diverse perspective on school engagement. For example, it would be worthwhile interviewing students from different combinations of engagement and achievement levels. This may lead to a better understanding of the association, or lack of association, between engagement levels and achievement in the eyes of the students themselves and of their subjective perception of the association.

The second limitation is the lack of a cognitive disengagement scale. As mentioned above and discussed extensively in Chapter 4, the main limitation of the current final ASE Scale is the lack of a cognitive disengagement subscale in accordance with the two other domains. This understanding came up only at a later stage of the research, hence could not be addressed in the current study. Thus, future work may consider further expansion of the Cognitive Engagement scale and Cognitive Disengagement scale by distinguishing them into two subscales that are more specific and defined.

Concluding comments

It is an understandable assumption, and even desire, to find that engagement has a positive effect on academic achievement. The sense of engagement is not an innate characteristic; it is not a fixed variable that cannot be changed as are the students' experiences at home or their socioeconomic status. Rather, engagement is a feeling that can be influenced and shaped by the behaviour of teachers and by educational intervention programmes. Thus, research into engagement has increased considerably in recent years in educational research, and was the motive for this piece of research from the beginning.

The main lessons from the current work may help in strategic decision-making at all levels – from the policy makers and stakeholders, through to school principals, educators, and teachers, who are investing financial, organisational, and human resources into implementing educational intervention programmes that aim to increase achievement through increasing engagement. If the main goal of these investments is to raise achievement, engagement may not always serve as the best "instrument" to use – not in every educational environment, not in every cultural environment, or every country.

From the policy makers' and principals' point of view, as the current study did not find support for the assumption that engagement affect achievement, probably because the engagement level was already high, it will be worthwhile to look for other strategies for improving academic achievement than engagement when the engagement level is already high. Having saying that, it is important to notice that this is the case when the aim is to *increase academic achievement*. However, it seems that it will be worthwhile and important to continue and invest recourse to maintain and sustain the

high level of engagement. For example for a similar contradicting findings of New Zealand Educational system compared to the other world can be found in a study regarding school investment in extracurricular activities as an effort to affect academic achievement. Previous research, mainly from the USA, showed an association between these two factors. However, a recent study, based on a New Zealand sample (Shulruf, 2010), suggests a positive relationship between participation in school-sponsored activities and achievement, but also lack of evidence for causality. In both cases, the meaning for policy makers and school principals is that it would better to invest in other educational programmes *when the aim is to increase* levels of academic achievement.

From the classroom teachers' point of view, the lesson that needs to be learned from the current study is that there is no need to invest in educational strategies to increase levels of engagement when they are already high, as it does not affect academic achievement, but it will be important to sustain this level. Rather, it will require the teachers to seek and invest in other educational strategies that were found to have an effect on achievement. Recent studies demonstrate a wide range of factors, all of them related to the teacher role, teaching strategies, and the teacher–student relationship that may affect achievement; for example, factors such as quality of teaching, reciprocal teaching, providing feedback, teacher support and the teacher–student relationship (range d from 0.77 to 0.72) (Hattie, 2009a). Moreover, listening more deeply to the students' voices and to their needs (Hayam-Jonas & Friedman, 2000) about what will help them achieve better may be as important. Studies also refer to the benefit of teachers who are capable of adjusting different teaching strategies to suit different students – to be "adaptive learning experts" who not only use different effective

strategies, but also have the flexibility to adapt and accommodate different learning strategies when the routines ones are not enough or do not suit all (Hattie, 2009a).

Previous qualitative research from New Zealand (Rubie-Davies, Peterson, Irving, Widdowson, & Dixon, 2010) reports that students placed more significance on the relationship they had with their teachers than did the teachers. Furthermore, students invested academically in teachers they perceived as caring sufficiently about their learning to make additional efforts to facilitate student achievement. Moreover, students are interested in being involved, having an opinion and influencing school life, and want to have a relationship based on respect and care (Hayam-Jonas & Friedman, 2000).Two findings of the current study indicate that it is worthwhile examining the associations between teacher support, engagement and achievement more deeply in the future. The first is that differences were found in the changes in teacher support between the schools over the year. The second is that the changes in engagement by the school seemed to be related to the changes in teacher support (Table 3.5, Appendix D). These findings suggest that it would be important to examine the teacher support factor in depth, in the future, to better understand the different factors that could explain the discrete effect of teacher support on student engagement, and on the association between student engagement and achievement. The current study measured teacher support by one summary factor only, and future studies should distinguish the dimensions of teacher support in order to identify their individual effects on different students' engagement dimensions. Based on such findings, intervention programmes that aim to change these relationships and to improve them may change the impact of teacher support on academic achievement.

The current findings suggest two main areas for future research. First, for a better understanding of other factors that may affect achievement, it would be worthwhile investigating what impacts on achievement from the students' point of view, as noted above – "to listen to the student's voice" (Hayam-Jonas & Friedman, 2000). For example, using qualitative methods as interviews which will focus on the understanding of the student's point of view regarding to relationship between engagement and achievement or regarding to what would help them most to attain better achievement?" would may benefit the understanding of this question. In addition, it will be worthwhile to do it in an international comparative study in order to have better understanding regarding engagement in different Educational environment. It will also be important to get answers from students of different levels of achievement, as there may be different needs and different answers to this question, according to their individual level of achievement. Findings on higher benefits from engagement for the lowest-ability students than for high-ability students (Carini, Kuh, & Klein, 2006) empower this kind of future research direction. Second, as noted above, it will be important to have a better understanding of the different factors that comprise the "teacher–student relationship" and which of them would contribute to t better achievement.

If, however, the main goal is not increasing achievement but rather the sense of engagement itself, then recent findings indicate that educational intervention programmes targeting increased levels of engagement are useful and successful and may affect factors other than achievement (Denny et al., 2011). Schools provide opportunities for students to learn, achieve, socialise with their peers, and to feel connected to and supported by adults outside their families. As such, positive and

healthy school environments are well recognised as important protective factors in the lives of students. There is robust evidence in the literature regarding positive and healthy school environments being important protective factors in the lives of students (Denny et al., 2011; Patton et al., 2006; Resnick et al., 1997). The findings from Denny et al. (2011) suggest that the efforts made in secondary schools throughout New Zealand to improve student engagement may be succeeding: More students in 2007 than in 2001 reported feeling part of their school, that adults at school cared about them and teachers treated them fairly, and that they felt safe at school. In addition, the level of well-being has increased, as a greater proportion of students reported in 2007 being "very happy" or "satisfied" with their life compared with students in 2001 (Denny et al., 2011). Although their analyses cannot explain the factors causing these improvements in the students' well-being, they suggest that it is possible that improvements in school environments, such as increasing engagement, play a major part in these changes.

The main contribution of the current study to the academic discussion of the relationship between engagement and achievement and whether the relationship suggests causal effect of engagement on achievement is by conducting a large scale sample, using standardised calibrated tests and longitudinal research. In addition, this study advances the field with the introduction of a new student engagement measurement tool – the improved final ASE Scale, which includes all three domains.

Finally, the positive relationships between student engagement and academic achievement described in this study are relatively small in magnitude. A large portion, and in some cases a majority, of the variance in key outcomes remains to be explained by as yet undiscovered factors. However, although engagement may not be the best tool to increase academic achievement in every educational environment, it would still be a

useful tool for increasing positive effects on students' well-being; for the "simple" *but most important feeling of being engaged*, no matter what the students' achievements are.

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Appendices

Appendix A

The ASE Questionnaire – Version 1

Students' school-life experience

Student questionnaire – I

Hello,

Please answer each question thoughtfully and honestly, there is no right or wrong answer.

We appreciate the time and energy you put into completing this survey. It helps to make this study possible. Thank you for your participation in this survey!

The research team

First, let's try some examples.

Please <u>circle only one number for each</u> question which best describe you:

	Never 1	Rarely 2	Sometimes 3	Often 4	Very often 5	Always 6
1. I like to play basketball	1	2	3	4	5	6

There is no right or wrong answer. If you want to change your answer, make a cross out the one you marked and tick a new one, like this:

	Never 1	Rarely 2	Sometimes 3	Often 4	Very often 5	Always 6
2. I like to play basketball	1	2	~~(3)~~	4	(5)	6

Remember, we will not share your answers with anyone! Also, it's OK to ask questions during the survey. Let's get started.

Please <u>circle only one number for each</u> question which best describe your school life experience:

	Never	Rarely	Sometimes	Often	Very often	Always
	1	2	3	4	5	6
1. I try hard to do well in school	1	2	3	4	5	6
2. In class, I work as hard as I can	1	2	3	4	5	6
3. When I'm in class, I participate in class discussions	1	2	3	4	5	6
4. I pay attention in class						
5. When I'm in class, I listen very carefully	1	2	3	4	5	6
6. I check my schoolwork for mistakes	1	2	3	4	5	6
7. I study at home even when I don't have a test	1	2	3	4	5	6
8. When I read a book, I ask myself questions to make sure I understand what it is about	1	2	3	4	5	6
9. If I don't know what a word means when I am reading, I do something to figure it out	1	2	3	4	5	6
10. I read extra books to learn more about things we do in school	1	2	3	4	5	6
11. If I don't understand what I read, I go back and read it over again	1	2	3	4	5	6
12. I talk with people outside of school about what I am learning in class	1	2	3	4	5	6
13. I try to watch TV shows about things we do in school	1	2	3	4	5	6
14. When I'm in class, I feel good	1	2	3	4	5	6
15. When we work on something in class, I feel interested	1	2	3	4	5	6
16. Class is fun	1	2	3	4	5	6
17. I enjoy learning new things in class	1	2	3	4	5	6
18. When we work on something in class, I get involved	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very often	Always
	1	2	3	4	5	6
19. When I'm in class, I just act like I'm working	1	2	3	4	5	6
20. I don't try very hard at school	1	2	3	4	5	6
21. In class, I do just enough to get by	1	2	3	4	5	6
22. When I'm in class, I think about other things	1	2	3	4	5	6
23. When I'm in class, my mind wanders	1	2	3	4	5	6
24. When we work on something in class, I feel bored	1	2	3	4	5	6
25. When I'm in class, I feel worried	1	2	3	4	5	6
26. When we work on something in class, I feel discouraged	1	2	3	4	5	6
27. Class is not all that fun for me	1	2	3	4	5	6
28. When I'm in class, I feel bad	1	2	3	4	5	6
29. My teachers care about me	1	2	3	4	5	6
30. My teachers listen to what I have to say	1	2	3	4	5	6
31. My teachers care whether or not I come to school	1	2	3	4	5	6
32. I receive a lot of encouragement from my teachers	1	2	3	4	5	6
33. I am respected and appreciated by my teachers	1	2	3	4	5	6
34. My teachers praise my efforts when I work hard	1	2	3	4	5	6
35. My teachers care about the grades I make	1	2	3	4	5	6
36. My teachers expect me to do my best	1	2	3	4	5	6
37. I can trust my friends	1	2	3	4	5	6
38. I am able to tell my problems to my friends	1	2	3	4	5	6
39. I feel close to my friends	1	2	3	4	5	6
40. I can count on my friends for support	1	2	3	4	5	6
41. I can talk to my friends about things that bother me	1	2	3	4	5	6

General Information: Please circle the answers that best suited for you

42. I am a: 1. Girl 2. Boy

43. My Ethnicity / Origin or belonging group is: (*You can circle more than one option)*

1. Pakeha / European 2. Maori 3. Pacific 4. Asian 5. Other:_____
Please specify

44. I was born in:

1. New Zealand 2. Other country_____ Please specify

45. If born overseas: At what age did you come to New Zealand? _____ years old

46. The languages that are spoken in my home are: (*You can circle more than one option)*

1. English 2. Other language(s) _____
Please specify what language(s)

47. I have English for speakers of other languages (ESOL) lessons at school: 1. Yes 2. No

48. I live most of the time in:

1. A family with two parents 2. A family with one parent 3. In a another type of family situation: _____
Please specify

51. How many brothers and sisters do you have? _____ (Pleases specify number)

52. How many brothers or sisters **are <u>older</u> than you**? _____ (Pleases specify number)

53. The number of books that we have at home is:

1. 0-10 books 2. 11-50 books 3. 1-100 books 4. More than 100 books 5. Don't know

54. My **<u>mother's</u>** highest level of schooling that she has completed is:

1. Did not finish High school 2. Finished High school qualification 3. Trade or professional qualification 4. University degree 5. Other: _____
Please specify
6. Don't know

55. My **<u>father's</u>** highest level of schooling that he has completed is:

1. Did not finish High school 2. Finished High school qualification 3. Trade or professional qualification 4. University degree 5. Other: _____
Please specify
6. Don't know

Appendix B

The ASE Questionnaire – Version 2

Students' school-life experience

Student questionnaire – Round III

Hello,

Please answer each question thoughtfully and honestly, there is no right or wrong answer.

We appreciate the time and energy you put into completing this survey. It helps to make this study possible. Thank you for your participation in this survey!

The research team

First, let's try some examples.

Please <u>circle only one number for each</u> question which best describe you:

	Never	Rarely	Sometimes	Often	Very often	Always
	1	2	3	4	5	6
42. I like to play basketball	1	2	3	4	5	6

There is no right or wrong answer. If you want to change your answer, make a cross out the one you marked and tick a new one, like this:

	Never	Rarely	Sometimes	Often	Very often	Always
	1	2	3	4	5	6
43. I like to play basketball	1	2	~~3~~	4	(5)	6

Remember, we will not share your answers with anyone! Also, it's OK to ask questions during the survey. Let's get started.

Please <u>circle only one number for each</u> question which best describe your school life experience:

	Never 1	Rarely 2	Sometimes 3	Often 4	Very often 5	Always 6
1. I try hard to do well in school	1	2	3	4	5	6
2. In class, I work as hard as I can	1	2	3	4	5	6
3. When I'm in class, I participate in class discussions	1	2	3	4	5	6
4. I pay attention in class						
5. When I'm in class, I listen very carefully	1	2	3	4	5	6
6. I check my schoolwork for mistakes	1	2	3	4	5	6
7. I study at home even when I don't have a test	1	2	3	4	5	6
8. When I read a book, I ask myself questions to make sure I understand what it is about	1	2	3	4	5	6
9. If I don't know what a word means when I am reading, I do something to figure it out	1	2	3	4	5	6
10. I read extra books to learn more about things we do in school	1	2	3	4	5	6
11. If I don't understand what I read, I go back and read it over again	1	2	3	4	5	6
12. I talk with people outside of school about what I am learning in class	1	2	3	4	5	6
13. I try to watch TV shows about things we do in school	1	2	3	4	5	6
14. When I'm in class, I feel good	1	2	3	4	5	6
15. When we work on something in class, I feel interested	1	2	3	4	5	6
16. Class is fun	1	2	3	4	5	6
17. I enjoy learning new things in class	1	2	3	4	5	6
18. When we work on something in class, I get involved	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very often	Always
	1	2	3	4	5	6
19. When I'm in class, I just act like I'm working	1	2	3	4	5	6
20. I don't try very hard at school	1	2	3	4	5	6
21. In class, I do just enough to get by	1	2	3	4	5	6
22. When I'm in class, I think about other things	1	2	3	4	5	6
23. When I'm in class, my mind wanders	1	2	3	4	5	6
24. When we work on something in class, I feel bored	1	2	3	4	5	6
25. When I'm in class, I feel worried	1	2	3	4	5	6
26. When we work on something in class, I feel discouraged	1	2	3	4	5	6
27. Class is not all that fun for me	1	2	3	4	5	6
28. When I'm in class, I feel bad	1	2	3	4	5	6
29. My teachers care about me	1	2	3	4	5	6
30. My teachers listen to what I have to say	1	2	3	4	5	6
31. My teachers care whether or not I come to school	1	2	3	4	5	6
32. I receive a lot of encouragement from my teachers	1	2	3	4	5	6
33. I am respected and appreciated by my teachers	1	2	3	4	5	6
34. My teachers praise my efforts when I work hard	1	2	3	4	5	6
35. My teachers care about the grades I make	1	2	3	4	5	6
36. My teachers expect me to do my best	1	2	3	4	5	6
37. I can trust my friends	1	2	3	4	5	6
38. I am able to tell my problems to my friends	1	2	3	4	5	6
39. I feel close to my friends	1	2	3	4	5	6
40. I can count on my friends for support	1	2	3	4	5	6
41. I can talk to my friends about things that bother me	1	2	3	4	5	6

	Never 1	Rarely 2	Sometimes 3	Often 4	Very often 5	Always 6
42a. I do my best in class	1	2	3	4	5	6
43a. I participate in class activities	1	2	3	4	5	6
44a. In class, I do more than we are asked to do	1	2	3	4	5	6
45a. When I'm in class, my mind is focused on class work	1	2	3	4	5	6
46a. When I'm in class, I wish I was in another place	1	2	3	4	5	6
47a. When I'm in class, I do not work as hard as I can	1	2	3	4	5	6
48a. When I'm in class, I do things which are not related to the lesson	1	2	3	4	5	6
49a. When I'm in class, I cannot wait for the lesson to end	1	2	3	4	5	6
50a. I like being in my class	1	2	3	4	5	6
51a. I enjoy class activities	1	2	3	4	5	6
52a. I like what we do in class	1	2	3	4	5	6
53a. I feel welcome in my class	1	2	3	4	5	6
54a. I get bored with class activities	1	2	3	4	5	6
55a. When I am in class, I feel anxious	1	2	3	4	5	6
56a. When I am in class, I feel uncomfortable	1	2	3	4	5	6
57a. When I am in class, I feel unsafe	1	2	3	4	5	6
58a. When I am in class, I feel disconnected	1	2	3	4	5	6

General Information: Please circle the answers that best suited for you

42. I am a: 1. Girl 2. Boy

43. My Ethnicity / Origin or belonging group is: (*You can circle more than one option)*

1. Pakeha / European 2. Maori 3. Pacific 4. Asian 5. Other:_____
Please specify

44. I was born in:

1. New Zealand 2. Other country_____ Please specify

45. If born overseas: At what age did you come to New Zealand? _____ years old

46. The languages that are spoken in my home are: (*You can circle more than one option)*

1. English 2. Other language(s) _____
Please specify what language(s)

47. I have English for speakers of other languages (ESOL) lessons at school: 1. Yes 2. No

48. I live most of the time in:

1. A family with two parents 2. A family with one parent 3. In a another type of family situation: _____
Please specify

49. How many brothers and sisters do you have? _____ (Pleases specify number)

50. How many brothers or sisters **are <u>older</u> than you**? _____ (Pleases specify number)

51. The number of books that we have at home is:

1. 0-10 books 2. 11-50 books 3. 1-100 books 4. More than 100 books 5. Don't know

52. My **<u>mother's</u>** highest level of schooling that she has completed is:

1. Did not finish High school 2. Finished High school qualification 3. Trade or professional qualification 4. University degree 5. Other: _____
Please specify
6. Don't know

53. My **<u>father's</u>** highest level of schooling that he has completed is:

1. Did not finish High school 2. Finished High school qualification 3. Trade or professional qualification 4. University degree 5. Other: _____
Please specify
6. Don't know

Appendix D

Chapter 3 – Tables and Figures

Table 3.2

Summary of regression analysis for Academic Achievement at T2 regressed by Student Engagement at T1and Potential Confounders (N = 1,617)

Model 1: Engagement only				95% CI	
	B	SE	*β*	Lower	Upper
Constant	5.91	0.43		5.07	6.74
Behavioural Engagement	0.24	0.09	.08**	0.06	0.42
Behavioural Disengagement (R)	0.08	0.06	.04	–0.04	0.21
Emotional Engagement	–0.38	0.07	–.18***	–0.53	–0.24
Emotional Disengagement (R)	0.54	0.08	.20***	0.39	0.69
Cognitive Engagement	0.15	0.07	.07*	0.01	0.29
Note: R^2 = .057 (p < .001), *p < .05, **p < .01, ***p < .001					
Model 2: with Potential Confounders				95% CI	
	B	SE	*β*	Lower	Upper
Constant	3.81	0.42		2.99	4.64
Behavioural Engagement	0.19	0.08	.07*	0.03	0.35
Behavioural Disengagement (R)	0.02	0.05	.01	–0.09	0.13
Emotional Engagement	–0.23	0.07	–.11***	–0.36	–0.11
Emotional Disengagement (R)	0.41	0.07	.15***	0.28	0.54
Cognitive Engagement	0.10	0.06	.04	–0.02	0.22
Teacher Support	0.08	0.06	.03	–0.04	0.21
Peer Support	0.06	0.05	.03	–0.03	0.16
Year level 9[a]	3.64	0.20	.43***	3.25	4.03
Year level 8[a]	1.05	0.10	.24***	0.86	1.23
School 4[a]	1.15	0.11	.26***	0.94	1.36
Gender (Female)[a]	0.69	0.09	.16***	0.50	0.87
Number of books at home (4)[a]	0.72	0.10	.16***	0.51	0.92
School 5[a]	1.13	0.15	.19***	0.84	1.42
Father level of Schooling (4)[a]	0.37	0.10	.08***	0.17	0.56
Ethnicity (Pacific)[a]	–0.97	0.26	–.08***	–1.47	–0.47
Ethnicity (Māori)[a]	–0.51	0.15	–.07***	–0.81	–0.21
Number of books at home (3)[a]	0.37	0.13	.07**	0.11	0.63
Birth Order	–0.09	0.04	–.05*	–0.16	–0.01

Note: R^2 = .321 (p < .001), *p < .05, **p < .01, ***p < .001

[a] The reference groups are Year level 7; School 2; Male; No. of books at home 1–10; Ethnicity European.

Table 3.3

Summary of regression analysis for the Change in Academic Achievement regressed by Student Engagement T1 and Potential Confounders (N = 1,617)

Model 1: Engagement only				95% CI	
	B	SE	*β*	Lower	Upper
Constant	.80	.34		.13	1.47
Behavioural Engagement	.06	.07	.03	–.09	.20
Behavioural Disengagement (R)	.08	.05	.05	–.02	.18
Emotional Engagement	–.12	.06	–.07*	–.24	–.01
Emotional Disengagement (R)	.12	.06	.06*	.00	.24
Cognitive Engagement	.01	.06	.00	–.11	.12
Note: R^2 = .008 (p < .05), *p < .05					
Model 2: With Potential Confounders				95% CI	
	B	SE	*β*	Lower	Upper
Constant	–.09	.35		–.77	.59
Behavioural Engagement	.12	.07	.05	–.02	.26
Behavioural Disengagement (R)	–.01	.05	–.01	–.10	.08
Emotional Engagement	–.14	.06	–.08*	–.25	–.03
Emotional Disengagement (R)	.11	.06	.05	.00	.22
Cognitive Engagement	.02	.05	.01	–.09	.12
Teacher Support	.00	.05	.00	–.10	.11
Peer Support	.03	.04	.02	–.05	.11
School 4[a]	1.47	.09	.43***	1.29	1.65
School 5[a]	1.64	.13	.35***	1.39	1.89
Year level 8[a]	–.28	.08	–.08***	–.44	–.12
Number of books at home (5)[a]	–.44	.14	–.07**	–.70	–.17
Year level 9[a]	.49	.17	.07**	.15	.82
Language[a] (not English)	.24	.09	.07**	.07	.42
Ethnicity (Pacific)[a]	–.50	.22	–.05*	–.92	–.07

Note: R^2 = .186 (p < .05), *p < .05, **p < .01, ***p < .001

[a] The reference groups are Year level 7; School 2; No. of books at home "don't know"; Ethnicity European, Language English.

Table 3.4

Summary of regression analysis for the Change in Academic Achievement regressed by the Change in Student Engagement1 and Potential Confounders (N = 1,617)

Model 1: Engagement only				95% CI	
	B	SE	*β*	Lower	Upper
Constant	1.53	0.04		1.45	1.62
Behavioural Engagement	–0.09	0.07	–0.04	–0.22	0.05
Behavioural Disengagement (R)	–0.06	0.05	–0.04*	–0.15	0.03
Emotional Engagement	0.10	0.05	0.06	0.00	0.20
Emotional Disengagement (R)	0.00	0.05	0.00	–0.10	0.10
Cognitive Engagement	–0.01	0.06	–0.01	–0.12	0.10
Note: R^2 = .004 (p > .05), *p < .05					
Model 2: With Potential Confounders				95% CI	
	B	SE	*β*	Lower	Upper
Constant	0.44	0.26		–0.08	0.96
Behavioural Engagement	–0.08	0.06	–.03	–0.21	0.05
Behavioural Disengagement (R)	–0.03	0.04	–.02	–0.11	0.05
Emotional Engagement	0.07	0.05	.04	–0.02	0.16
Emotional Disengagement (R)	0.00	0.05	.00	–0.09	0.09
Cognitive Engagement	–0.02	0.05	–.01	–0.12	0.08
Teacher Support	0.01	0.05	.00	–0.08	0.10
Peer Support	0.03	0.04	.02	–0.05	0.11
School 4[a]	1.47	0.09	.43***	1.29	1.65
School 5[a]	1.63	0.13	.34***	1.38	1.88
Year level 8[a]	–0.26	0.08	–.08***	–0.42	–0.10
Number of books at home (5)[a]	–0.44	0.14	–.07***	–0.71	–0.17
Year level 9[a]	0.50	0.17	.07**	0.16	0.84
Language (not English)	0.24	0.09	.06**	0.06	0.41
Ethnicity (Pacific)[a]	–0.53	0.22	–.06*	–0.96	–0.10
Note: R^2 = .183 (p < .001), *p < .05, **p < .01, ***p < .001					

[a] The reference groups are Year level 7; School 2; No. of books at home "don't know"; Ethnicity European, Language English.

Interaction effect of Gender, Student Engagement and Academic Achievement -

Figure 3.3

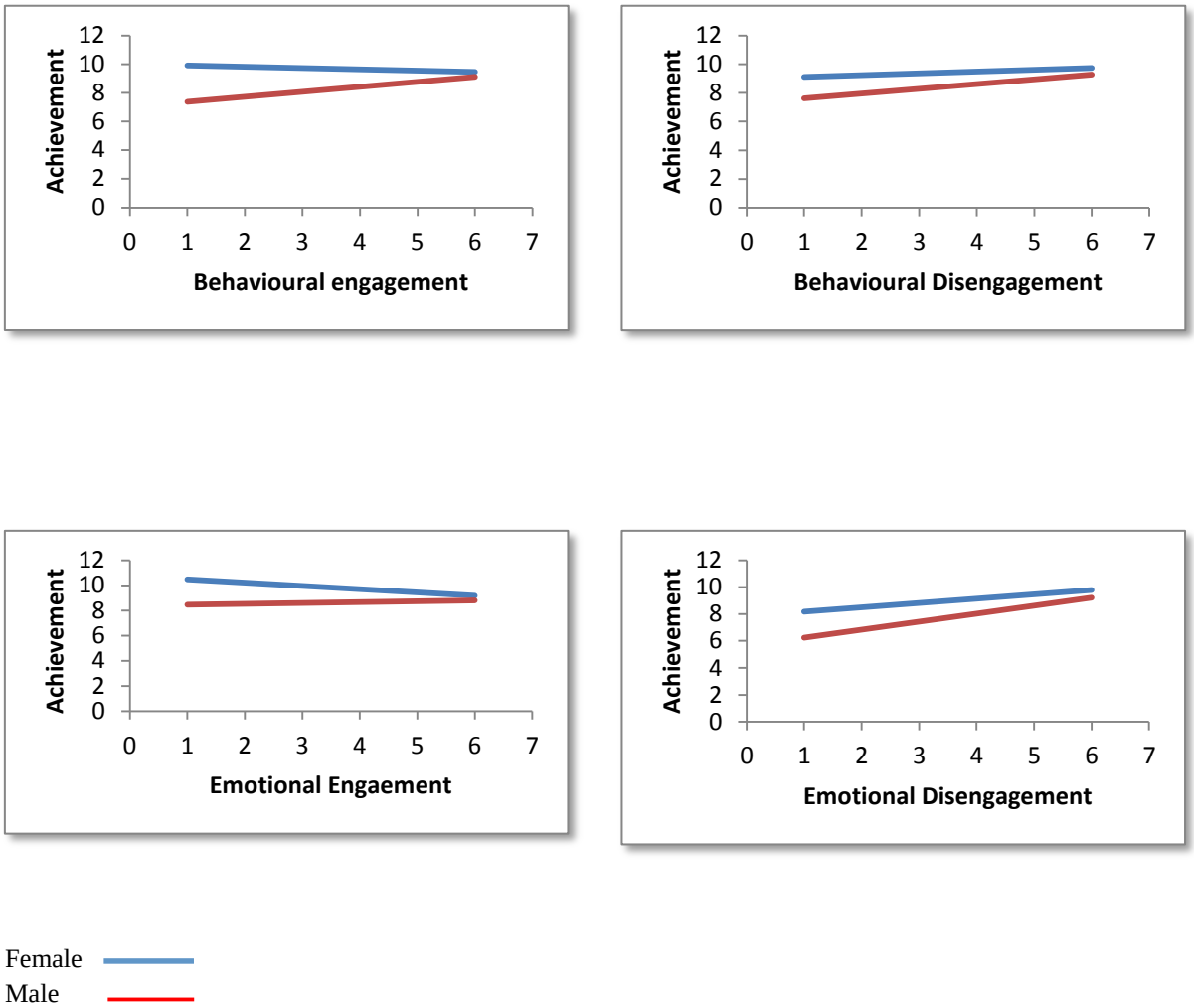

Figure 3.3. Interaction plot of effect of ***Gender*** on the relationship between Student Engagement factors and achievement

Interaction effect of School, student engagement and Academic Achievement –

Figure 3.4

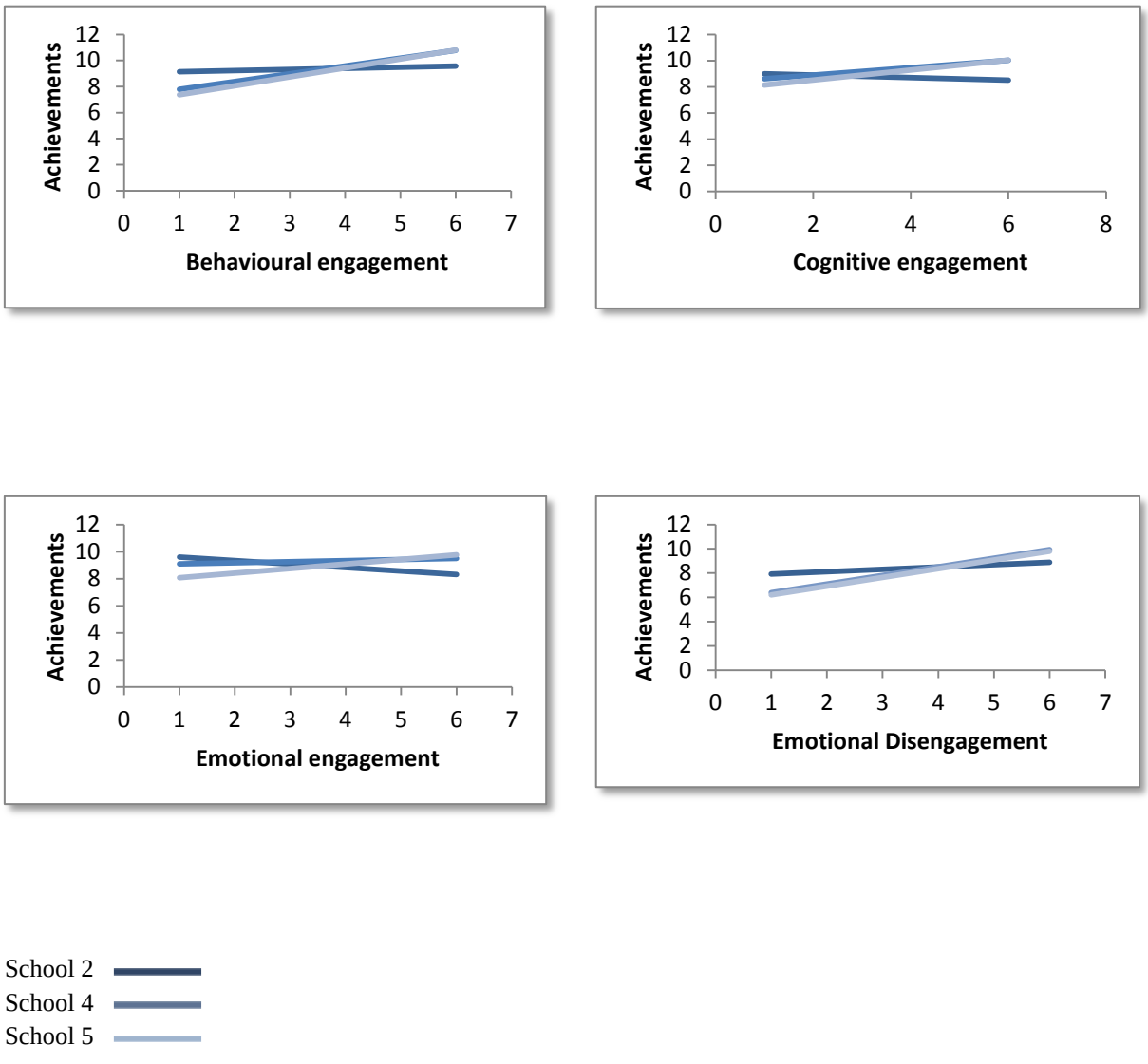

Figure 3.4. Interaction plot of effect of ***School*** on the relationship between Student Engagement factors and achievement

Table 3.5

Paired sample t-test for Engagement factors, Support factors and Achievement at T1 and T2, by school (N = 1,617)

		T1		T2				
Dependent Variable	School No.	*Mean*	*SD*	*Mean*	*SD*	Mean Diff	*t*	*Cohen's d*
Total engagement	School 2	4.37	0.72	4.19	0.77	–0.18	–6.99***	0.24
	School 4	4.34	0.66	4.24	0.71	–0.14	–4.87***	0.15
	School 5	4.42	0.73	4.23	0.69	–0.20	–5.28***	0.27
Behavioural engagement	School 2	4.94	0.76	4.74	0.80	–0.20	–6.66***	0.26
	School 4	4.92	0.74	4.78	0.76	–0.15	–5.37***	0.19
	School 5	4.83	0.84	4.61	0.78	–0.22	–4.69***	0.27
Behavioural disengagement (R)	School 2	4.23	1.10	4.10	1.18	–0.12	–2.64**	0.11
	School 4	4.40	0.95	4.25	1.10	–0.05	–4.06***	0.15
	School 5	4.35	0.98	4.18	0.98	–0.17	–3.05**	0.17
Emotional engagement	School 2	4.43	1.03	4.18	4.18	–0.25	–5.74***	0.08
	School 4	4.40	0.98	4.35	0.98	–0.05	–1.26	0.05
	School 5	4.47	1.03	4.18	0.96	–0.29	–4.60***	0.29
Emotional disengagement (R)	School 2	5.12	0.86	5.06	0.97	–0.06	–1.43	0.07
	School 4	5.20	0.78	5.15	0.84	–0.12	–1.6	0.06
	School 5	5.24	0.76	5.21	0.69	–0.02	–0.38	0.04
Cognitive engagement	School 2	3.83	0.98	3.62	1.03	–0.22	–5.92***	0.21
	School 4	3.69	0.94	3.57	0.97	–0.07	–3.67***	0.13
	School 5	3.92	0.96	3.70	0.97	–0.22	–4.24***	0.23
Teacher support	School 2	4.80	0.96	4.58	1.10	–0.23	–5.62***	0.21
	School 4	5.01	0.81	4.94	0.95	–0.17	–1.99*	0.08
	School 5	4.80	0.97	4.59	0.99	–0.22	–3.58***	0.21
Peer support	School 2	4.94	1.05	4.88	1.17	–0.06	–1.3	0.05
	School 4	4.91	1.00	4.75	1.12	–0.14	–3.75***	0.15
	School 5	4.88	1.14	4.65	1.25	–0.23	–2.96**	0.19
Achievement	School 2	8.07	2.13	8.72	2.11	0.64	11.31***	0.31
	School 4	7.37	1.94	9.37	2.15	2.00	32.49***	0.98
	School 5	7.08	2.27	9.25	2.28	2.17	24.32***	0.95

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3.6

Paired sample t-test for Engagement factors, Support factors and Achievement at T1 and T2, by gender (N = 1,617)

		T1		T2				
Dependent Variable	Gender	*Mean*	*SD*	*Mean*	*SD*	Mean Diff	*t*	*Cohen's d*
Total engagement	Female	4.52	0.63	4.31	0.70	–0.20	–9.95***	0.32
	Male	4.20	0.72	4.12	0.75	–0.09	–3.87***	0.11
Behavioural	Female	5.07	0.69	4.84	0.75	–0.23	–9.58***	0.32
engagement	Male	4.74	0.80	4.63	0.79	–0.12	–4.23***	0.14
Behavioural	Female	4.46	0.98	4.25	1.11	–0.20	–5.60***	0.20
disengagement (R)	Male	4.20	1.03	4.12	1.11	–0.08	–2.19*	0.07
Emotional	Female	4.58	0.93	4.35	0.97	–0.24	–7.04***	0.24
engagement	Male	4.25	1.05	4.18	1.06	–0.07	–1.83	0.07
Emotional	Female	5.25	0.74	5.14	0.89	–0.11	–3.55***	0.13
disengagement (R)	Male	5.10	0.87	5.11	0.85	0.01	0.39	0.01
Cognitive	Female	3.96	0.87	3.75	0.93	–0.21	–7.43***	0.23
engagement	Male	3.58	1.02	3.46	1.04	–0.12	–3.62***	0.12
Teacher support	Female	5.01	0.84	4.82	1.03	–0.19	–5.99***	0.20
	Male	4.79	0.94	4.70	1.02	–0.10	–2.71**	0.09
Peer support	Female	5.14	0.99	4.93	1.15	–0.21	–5.04***	0.20
	Male	4.68	1.05	4.62	1.15	–0.06	–1.49	0.05
Achievement	Female	8.03	2.01	9.54	2.11	1.51	26.31***	0.73
	Male	7.10	2.08	8.68	2.15	1.58	25.39***	0.75

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3.7

Correlations among Student Engagement factors and Academic Achievement at T1 and at T2 (N = 1,617)

Domains and subscales	1	2	3	4	5	6	7
Academic Achievement	–	.08**	.12**	.03	.03	.10**	.06*
Total student engagement	.09**	–	.78**	.71**	.77**	.50**	.86**
Behavioural engagement	.08**	.75**	–	.53**	.59**	.33**	.55**
Behavioural disengagement (R)*	.09**	.63**	.45**	–	.45**	.47**	.42**
Emotional engagement	.01	.78**	.57**	.35**	–	.40**	.56**
Emotional disengagement (R)	.15**	.51**	.29**	.47**	.36**	–	.16**
Cognitive engagement	.06*	.87**	.54**	.33**	.61**	.22**	–

Note: *(R) = reversed score

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

* Correlation is statistically significant at the 0.05 level (2-tailed)

All correlations in white area are of T1, and all correlations in the shaded area in grey are of T2.